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FISH INSPECTION LEGISLATION

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HEARINGS

BEFORE THE

SUBCOMMITTEE ON THE ENVIRONMENT

OF THE

COMMITTEE ON COMMERCE
UNITED STATES SENATE

NINETY-SECOND CONGRESS

FIRST SESSION

ON

S. 296, S. 700, and S. 1528

FISH INSPECTION LEGISLATION

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MAY 20 AND 21, 1971

Serial No. 92–16

Printed for the use of the Committee on Commerce



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U.S. GOVERNMENT PRINTING OFFICE

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FISH INSPECTION LEGISLATION

THURSDAY, MAY 20, 1971

U.S. SENATE,
COMMITTEE ON COMMERCE,
SUBCOMMITTEE ON THE ENVIRONMENT,
Washington, D.C.

The subcommittee met at 11:05 a.m., in room 1318, New Senate Office Building, Senator Philip A. Hart (chairman of the subcommittee) presiding.

Present: Senators Hart, Hatfield, and Stevens.

Senator HART. The committee will be in order.

OPENING STATEMENT BY THE CHAIRMAN

Permit me first to make a brief opening statement.

This is the Subcommittee on the Environment of the Committee on Commerce. Today we begin a 2-day set of hearings on proposed fish inspection legislation. Specifically we will be considering the administration's S. 700, Senator Kennedy's S. 296, and S. 1528, which I introduced several weeks ago.

In previous Congresses we have, as a Committee on Commerce, considered bills similar in character. We were unable to reach any agreement on which proposals or combinations were most desirable. However, this committee will draw heavily on the hearing record which considered those earlier bills as we consider the subject matter at issue.

This week's hearings will concentrate on a provision of S. 1528 which is new this year and on which no testimony has yet been taken. The proposal, which is aimed at the growing threat to human health through contamination of fish by environmental pollutants, would require intensive screening of fish and fishery products for all toxic materials by the Food and Drug Administration. Last year, the subcommittee investigated the nationwide mercury crisis as well as potential dangers to humans posed by other toxic metals. What is proposed today is essentially an outgrowth of those investigations.

Under the new provision, FDA would be required to develop a list of dangerous polluting substances and to prescribe procedures necessary to eliminate the threat they pose to human health through the consumption of fish. It is provided that private citizens could challenge both the list and the procedures by petitioning the Administration. Those adversely affected by his decisions would be further entitled to public hearings and judicial review of his action.

Had this system been in effect several years ago, the present mercury crisis might well have been less acute. It is worth noting that Dr.

Staff member assigned to this hearing: Leonard Bickwit.

John Wood, who will be testifying later today, in September of 1967 established conclusively that industrial discharges of metallic mercury then presumed to be harmless could be converted into deadly methyl mercury. Had this information been called to the attention of FDA through the petition procedure proposed today, screening of fish for mercury could have started immediately rather than years following the discovery. Dr. Wood, in a letter to the committee staff commenting on S. 1528, has stated that, had these procedures been available in 1967, he would have used them to alert the FDA to his work.

It is, of course, true that information such as this can be brought to the regulator's attention under existing law. Yet, S. 1528—by arming the concerned and informed citizen with legal procedures to effect action—is designed to make that result more likely.

It is also true that existing law presently authorizes the FDA to screen systematically for the presence of toxic materials. Yet it is implicit in my sponsorship of S. 1528 that I do not believe the agency is effectively carrying out its responsibilities under that authorization. As I see it, the time therefore has arrived to require the FDA to do what it has had authority to do all along—that is to protect the fish consumer from dangers which grow more worrisome with each passing month, and if Congress has not given that agency the means effectively to perform this job, let that be corrected.

(The bills and agency comments follow:)

92D CONGRESS
1ST SESSION

S. 296

IN THE SENATE OF THE UNITED STATES

JANUARY 26, 1971

Mr. KENNEDY introduced the following bill; which was read twice and referred to the Committee on Commerce

A BILL

To protect consumers and to assist the commercial fishing industry by providing for the inspection of establishments processing fish and fishery products in commerce, and to amend the Fish and Wildlife Act of 1956 to provide technical and financial assistance to the commercial fishing industry in meeting such requirements.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "Fishery Products Protection Act of 1971".

SEC. 2. For the purpose of this Act—

(1) The term "commerce" means travel, trade, traffic, transportation, or communication in any State and a point

outside thereof, or between points in the same State but through a point outside thereof;

(2) The term "State" includes the States of the United States, its territories and possessions, the District of Columbia, and the Commonwealth of Puerto Rico;

(3) The term "Secretary" means the Secretary of the Interior acting through the Bureau of Commercial Fisheries;

(4) The term "person" means any individual, partnership, corporation, or association;

(5) The term "fish" means any aquatic animal or part thereof intended for human food;

(6) The term "fishery products" means any edible part of fish that is processed separately or in combination with other ingredients for human food;

(7) The terms "process" or "processed" or "processing" means the handling, storing, preparation, production, manufacture, preserving, packing, transporting, or holding of any fish or fishery products;

(8) The term "wholesome" means sound, healthful, clean, and otherwise suitable for use as human food;

(9) The term "unwholesome" means—

(A) unsound, injurious to health, or otherwise rendered unsuitable for use as human food; or

(B) consisting in whole or in part of any filthy, putrid, or decomposed substance; or

(C) presence of bacteria of public health significance; or

(D) processed under unsanitary conditions whereby fish or any fishery products may have become contaminated with filth, or whereby any fishery products may have been rendered injurious to health; or

(E) packaged in a container composed of any poisonous or deleterious substance which may render the contents injurious to health;

(10) The term "inspection service" means the agency or agencies designated by the Secretary as having the responsibility to carry out the provisions of this Act;

(11) The term "inspector" means any person authorized by the Secretary to inspect fish and fishery products;

(12) The term "official inspection mark" means any symbol prescribed by the Secretary;

(13) The term "official establishment" means any establishment that has been issued a certificate of registration by the Secretary;

(14) The term "establishment" means the premises, buildings, structures, facilities, and equipment used in the processing of fish and fishery products;

(15) The term "vessel of the United States" means any vessel of five net tons and upward that is enrolled, licensed,

or documented under the laws of the United States and entitled to the privileges of vessels employed in the fisheries;

(16) The terms "container" or "package" include, but are not limited to, any box, can, tin, cloth, plastic, or any other receptacle, wrapper, or cover;

(17) The term "label" means any written, printed, or graphic material upon the shipping container, if any, or upon the immediate container of the fishery product or accompanying such product, including, but not limited to, the individual consumer package;

(18) The term "shipping container" means any container used or intended for use in packaging the product packed in an immediate container;

(19) The term "immediate container" includes any consumer package, or any other container in which fish or fishery products, not consumer packaged, are packed.

SEC. 3. Congress declares that wholesome fish and fishery products are an important source of the Nation's food supply; and that unwholesome and adulterated fish or fishery products moving in the channels of commerce or directly affecting commerce are injurious to the consumers, adversely affect the marketing of wholesome fish and fishery products, result in losses to producers and fishermen, and limit markets for such products. It is the purpose of this Act to prevent such adverse effects.

SEC. 4. (a) In furtherance of the purpose of this Act, the Secretary shall conduct, directly or by contract, a survey of the methods, practices, and sanitary conditions of the establishments in the United States and vessels of the United States processing fish or fishery products. The Secretary shall then develop and promulgate, by regulation, adequate sanitary standards and practices for establishments processing fish or fishery products in any State for movement in commerce and for establishments the operations of which directly affect the movement of fish and fishery products in commerce and for vessels of the United States.

(b) The Secretary shall, based on studies, surveys, and other information, also issue adequate and effective regulations to assure (1) that imported fish or fishery products are safe, healthful, wholesome, unadulterated, and suitable for human food, and (2) that the containers of such products are safe and comply with such sanitary standards as he may prescribe.

(c) Such regulations shall be promulgated within one year after the effective date of this Act.

SEC. 5. Effective two years after the effective date of the regulations promulgated under section 4 of this Act:

(1) No person shall process any fish or fishery products in any establishment for movement in commerce or in any establishment the operations of which directly affect

the movement of fish and fishery products in commerce unless such establishment has been issued a certificate of registration by the Secretary, or unless the Secretary determines, in accordance with the provisions of section 8 of this Act, that the State wherein such establishment is located provides an adequate and enforcible system of regulation, certification, and inspection of such establishment and the fish and fishery products processed therein.

(2) No fish or fishery products shall be imported into the United States unless they comply, as determined by the Secretary, with the regulations issued under section 4 of this Act for imported fish and fishery products. All imported fish and fishery products, after entry into any State in compliance with such regulations, shall be treated as domestic fish and fishery products within the meaning of, and subject to, the provisions of this Act.

(3) The Secretary of State, in consultation with the Secretary, shall encourage foreign countries importing fish and fishery products into any State to establish enforcible sanitary standards and practices for establishments and vessels of those countries processing fish and fishery products for such importation and a system of certification and inspection of such establishments and vessels. Such standards and practices must be consistent with those promulgated by the Secretary under this Act. The Secretary may authorize

such countries to use an official inspection mark on each immediate container and shipping container of imported wholesome and unadulterated fishery products. No country shall use such a mark on containers of imported fishery products unless authorized by the Secretary. Containers with unauthorized marks shall not be allowed to enter into any State.

SEC. 6. (a) Any person who is required by section 5 of this Act to have a certificate of registration, and who is denied a certificate of registration shall upon request be given a hearing by the Secretary whose determination shall be final.

(b) The certificate of registration of any official establishment that fails to comply with the provisions of this Act and the regulations issued thereunder may be suspended upon notice by the Secretary. The holder of the suspended certificate may at any time apply for reinstatement of the certificate, and the Secretary shall immediately reinstate it if, after an opportunity for a hearing, he finds that adequate measures have been taken to comply with the requirements of the Act and regulations.

(c) Any inspector shall have access to any official establishment for the purpose of ascertaining whether the conditions of the certificate are being complied with. Denial of

access for such inspection shall be ground for suspension of the certificate.

SEC. 7. (a) In order to provide technical assistance to the commercial fishing industry in meeting the requirements of this Act and the regulations issued thereunder, the Secretary shall utilize to the greatest extent feasible the provisions of the Fish and Wildlife Act of 1956, as amended.

(b) Section 4 of the Fish and Wildlife Act of 1956 (70 Stat. 1121; 16 U.S.C. 742c) is amended—

(1) by inserting before the period at the end of subsection (a) the following: "or new or operating establishments processing fish and fishery products subject to regulations issued under the Fishery Products Protection Act of 1971";

(2) by inserting immediately after the word "gear" in the first sentence of subsection (b) (4) the words "and establishments processing fish and fishery products", and by inserting before the period at the end of such sentence the phrase "and commercial fish processors";

(3) by inserting immediately after the word "applicant" in subsection (b) (5) the words "for a loan relating to vessels or gear", and by adding at the end thereof the following new sentence: "The applicant for a loan relating to an establishment processing fish and fishery

products shall have the ability, experience, resources, and other qualifications necessary to operate and maintain the establishment in a sound, businesslike manner."; and

(4) by amending the last sentence of subsection (c) of such section to read as follows: "There is authorized to be appropriated to the fisheries loan fund the sum of $35,000,000 to provide initial capital.".

(c) Section 7(a) of the Fish and Wildlife Act of 1956 (70 Stat. 1122; 16 U.S.C. 742f(a)) is amended—

(1) by redesignating paragraphs (4) and (5) as paragraphs (5) and (6); and

(2) by inserting after paragraph (3) a new paragraph to read as follows:

"(4) provide technical assistance to the commercial fishing industry in developing economically feasible technical improvements to meet any standards of sanitation and quality control for the processing of fish and fishery products promulgated under the Fishery Products Protection Act of 1971 and any other provisions of such Act, and to assure that the processing of all fish and fishery products fully complies with such standards;".

SEC. 8. The Secretary shall encourage each State to provide an adequate system of regulation, certification, and

inspection of establishments located in the State that process fish and fishery products for movement in commerce and establishments the operations of which directly affect the movement of fish and fishery products in commerce, and the fish and fishery products processed therein, including, but not limited to, the promulgation and enforcement of sanitary standards and practices that are consistent with those promulgated by the Secretary. Whenever the Secretary determines that State has provided such system, he shall publish in the Federal Register a notice to that effect and thereafter establishments and persons in that State shall be subject to the requirements of said system in lieu of the requirements of this Act, except that nothing in this section shall preclude the Secretary from rescinding such notice and reasserting Federal jurisdiction over such establishments and persons under this Act if he determines that such action is in the public interest.

SEC. 9. For the purpose of this Act, fish and fishery products shall be deemed to be adulterated—

(1) If they bear or contain any poisonous or deleterious substance which may render them injurious to health, but, if the substance is not an added substance such fish and fishery products shall not be considered adulterated under this paragraph if the quantity of such substance in such fish and fishery

products does not ordinarily render them injurious to health; or

(2) If they bear or contain any added poisonous or added deleterious substance, unless such substance is permitted in their production or is unavoidable under good manufacturing practices, as may be determined by the Secretary or under other provisions of Federal law limiting or tolerating the quantity of such added substance, except that any quantity of such added substances exceeding the limits so fixed shall also be deemed to constitute adulteration; or

(3) If any substance has been substituted, wholly or in part therefor; or

(4) If damage or inferiority has been concealed in any manner; or

(5) If any substance has been added thereto or mixed or packed therewith so as to increase its bulk or weight, or reduce its quality, or make it appear better or of greater value than it is.

SEC. 10. Every vessel of the United States harvesting or processing fish or fishery products for movement in commerce shall be constructed, equipped, operated, and maintained, to meet such sanitary standards and practices as the Secretary may prescribe.

SEC. 11. All fish and fishery products processed in an

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official establishment for movement in commerce or in an official establishment the operations of which directly affect the movement of fish and fishery products in commerce or on vessels of the United States and the containers of such products shall be subject to inspection and reinspection by sampling or other methods by the Secretary at any time when processed for introduction into commerce.

SEC. 12. (a) Each immediate container and shipping container of wholesome and unadulterated fishery products may bear in distinctly legible form at the time such products leave the official establishment an official inspection mark. Such container shall bear in distinctly legible form the name of the products, a statement of ingredients, if fabricated from two or more ingredients, including a declaration as to artificial flavors, colors, or preservatives, if any, the net weight or other appropriate measure of the contents of such container, and the name of the processor or the name and address of the distributor. The Secretary may permit reasonable variations and grant exemptions from the foregoing requirements when, in his judgment, such variations and exemptions would effectuate the purpose of this Act.

(b) The use of any written, printed, or graphic matter on or accompanying any fishery products or the immediate container or shipping container thereof leaving an official

establishment which is false or misleading in any manner is prohibited.

(c) No fishery products leaving an official establishment may be sold or offered for sale by any person under any false or deceptive name. Established trade names which are usual to such products and which are not false and deceptive are permitted.

(d) If the Secretary determines that any label used or prepared for use by any person is false or misleading in any particular, he may order such person to discontinue the use of such label except as modified in the manner prescribed by the Secretary. Such person may request a hearing, but the use of the label shall, if the Secretary so directs, be withheld pending a hearing and final determination by the Secretary. Such final determination shall be conclusive unless within thirty days after receipt of notice of such determination such person appeals to the United States court of appeals for the circuit in which such person has his principal place of business or to the United States Court of Appeals for the District of Columbia. An appeal may be taken by filing with the clerk of such court a written petition praying that the Secretary's order be set aside or modified in the manner stated in the petition, together with a bond in such sum as the court may determine to cover the costs of the proceed-

ings, if the court so directs. The provisions of section 204 (b) through (h) of the Act of August 15, 1921, as amended (7 U.S.C. 194), shall be applicable to appeals taken under this section.

SEC. 13. No person shall—

(1) Process, sell, offer for sale, transport, or deliver any fish or fishery products from any establishment for movement in commerce or the operations of which directly affect the movement of fish and fishery products in commerce or from a vessel of the United States which is unwholesome, adulterated, or otherwise unsuitable for use as human food;

(2) Sell or otherwise dispose of for human food any fish or fishery products which have been inspected and declared to be unwholesome or adulterated or otherwise unsuitable for use as human food under this Act;

(3) Deliver, receive, transport, sell, or offer for sale or transport for human food any fish or part thereof separately or in combination with other ingredients, other than fishery products, from an official establishment or vessel of the United States except in accordance with the provisions of this Act;

(4) Deliver, receive, transport, sell, or offer for sale or transport for human food fish or fishery products from an establishment whose certificate of registration has been suspended;

(5) Use or reuse any immediate or shipping container bearing an official inspection mark except for fishery products from an official establishment unless the mark is removed, obliterated, or otherwise destroyed;

(6) Falsely make or issue, alter, forge, simulate, counterfeit, use, or possess any official inspection certificate, memorandum, mark, or other identification, or device for making such mark or identification authorized by this Act, or cause, procure, aid, assist in, or be a party to, such false making, issuing, altering, forging, simulating, counterfeiting, use, or possession contrary to the provisions of this Act.

SEC. 14. For the purpose of enforcing the provisions of this Act, any person engaged in the business of processing, transporting, shipping, or receiving fish or fishery products for movement in commerce or conducting operations which directly affect the movement of fish or fishery products in commerce shall maintain records showing, to the extent that such person is concerned therewith, the receipt, delivery, sale, movement, or disposition of fish or fishery products and shall, upon request, permit the Secretary at reasonable times to inspect such records. Such records shall be maintained for a reasonable period to be determined by the Secretary.

SEC. 15. The provisions of this Act shall not apply to

any wholesale establishment where the only processing involved is the cutting up of fish or fishery products for sale to retail outlets of any kind or description; or to any retail establishments primarily engaged in selling fish and fishery products and other items directly to retail consumers; or to any fisherman selling fish harvested by him directly to retail consumers.

SEC. 16. The cost of inspection of fish or fishery products, establishments, vessels, containers, labels, or other matters in accordance with this Act and the regulations issued thereunder shall be borne by the United States, except that the cost of overtime and holiday pay for inspection service performed, in an establishment subject to inspection at the convenience of the establishment and not owing to the conditions of harvesting or processing beyond the control of the establishment, shall, at such rates as the Secretary may determine in accordance with regulations be borne by such establishment. Sums received by the Secretary for such work shall be credited to the appropriation from which payments for such work were made.

SEC. 17. The district courts of the United States shall have jurisdiction for good cause shown to restrain any violation of this Act or the regulations issued thereunder.

SEC. 18. All fish and fishery products determined to be unwholesome or adulterated pursuant to any inspection or

reinspection conducted pursuant to section 11 of this Act shall be condemned. Any person whose fish and fishery products are condemned may appeal to the Secretary from such initial inspection and the condemned fish and fishery products shall be marked and segregated pending such appeal. The determination of the Secretary on appeal shall be final and if he sustains the initial determination the fish and fishery products shall be destroyed. Any fish and fishery products that may be made wholesome and unadulterated by reprocessing shall not be condemned and destroyed if reprocessed under the supervision of an inspector and found by him to be wholesome and unadulterated.

SEC. 19. There are authorized to be appropriated such sums as may be necessary to carry out the provisions of this Act. The Secretary may utilize the services, equipment, and facilities of any Federal agency with or without reimbursement in carrying out the provisions of this Act and may designate any Federal agency as an inspection agency.

SEC. 20. If any provision of this Act or the application thereof to any person or circumstances is held invalid, the validity of the remainder of the Act and the application of such provision to other persons and circumstances shall not be affected thereby.

92D CONGRESS
1ST SESSION

S. 700

IN THE SENATE OF THE UNITED STATES

FEBRUARY 10 (legislative day, JANUARY 26), 1971

Mr. COTTON (for himself and Mr. MAGNUSON) (by request) introduced the following bill; which was read twice and referred to the Committee on Commerce

A BILL

To regulate interstate commerce by strengthening and improving consumer protection under the Federal Food, Drug, and Cosmetic Act with respect to fish and fishery products, including provisions for assistance to and cooperation with the States in the administration of their related programs and assistance by them in the carrying out of the Federal program, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "Wholesome Fish and Fishery Products Act of 1971".

CONGRESSIONAL FINDINGS AND PURPOSE

SEC. 2. The Congress finds and declares—

(1) that fish and fishery products are an important source of the Nation's total supply of food;

(2) that these foods are consumed throughout the Nation and the major portion of the supply moves in interstate commerce, some from foreign sources;

(3) that it is essential that the health and welfare of consumers be better protected by assuring that fish and fishery products distributed to them are of good quality, wholesome, unadulterated, and properly marked, labeled, and packaged;

(4) that fish or fishery products, whether processed for intrastate or interstate commerce, which do not meet these standards depress markets for and compete unfairly with fish and fishery products that do meet such standards, to the detriment of consumers, commercial fishermen, and processors of fish and fishery products; and

(5) that, therefore, all fish and fishery products regulated under the amendments made by this Act are either in interstate commerce or substantially affect such commerce, and that Federal regulation and cooperation by the States and other jurisdictions as contemplated by this Act (including cooperation through federally approved State programs for control of shellfish growing areas and shellfish harvesting) are appropriate to pre-

vent and eliminate burdens upon such commerce, to effectively regulate such commerce, and to protect the health and welfare of the consumer.

WHOLESOME FISH AND FISHERY PRODUCTS AMENDMENTS TO THE FEDERAL FOOD, DRUG, AND COSMETIC ACT—DEFINITIONS

SEC. 101. Section 201 of the Federal Food, Drug, and Cosmetic Act is amended by adding at the end of such section the following new paragraphs:

"(y) (1) The term 'fish' means any aquatic animal, including amphibians, or part thereof capable of use as human food.

"(2) The term 'shellfish', as used in sections 402(f), 421, and 423, means any species of oyster, clam, or mussel, either shucked or in the shell, and either fresh or frozen or otherwise processed, or any part thereof.

"(z) The term 'fishery product' means any product capable of use as human food which is made wholly or in part from any fish or portion thereof, except products which contain fish only in small proportions or historically have not been, in the judgment of the Secretary, considered by consumers as products of the commercial fishing industry, and which are excepted from the definition as a fishery product by the Secretary under such conditions as he may prescribe to assure that the fish or portions thereof contained therein

are not adulterated and that such products are not represented as fishery products.

"(aa) The term 'capable of use as human food' applies to any fish or part or product thereof, unless it is denatured or otherwise identified as required by regulations prescribed by the Secretary to deter its use as human food, or unless it is naturally inedible by humans.

"(bb) The terms 'process', 'processed', and 'processing', with respect to fish or fishery products, mean harvesting, handling, storing, preparing, producing, manufacturing, preserving, packing, transporting, or holding thereof.

"(cc) The term 'official mark' means any symbol prescribed by regulations of the Secretary to identify the status of any fish or fishery product or of any processing establishment or vessel under this Act.

"(dd) The term 'official certificate' means any certificate prescribed by regulation of the Secretary for issuance by an inspector or other person performing official functions under this Act.

"(ee) The term 'official device' means any device prescribed or authorized by the Secretary for use in applying any official mark.

"(ff) The term 'owner or operator' means any person who, as the case may be, owns, operates, leases, charters, or otherwise controls any establishment or vessel.

"(gg) The term 'vessel' means a vessel, as defined in section 3 of title 1, United States Code, which is engaged primarily in the processing of fish for landing and human consumption in any State.

"(hh) The term 'establishment' means the premises, buildings, structures, facilities, and equipment (including vehicles) used in the processing of fish and fishery products.

"(ii) The term 'continuous inspection' means the application of inspection by a full-time inspector.

"(jj) The term 'inspector' means an individual appointed or commissioned as an officer or employee of the Department and authorized by the Secretary to inspect articles under the authority of this Act."

PROHIBITED ACTS

SEC. 102. (a) Section 301 of the Federal Food, Drug, and Cosmetic Act is further amended by adding at the end of such section the following new paragraphs:

"(r) (1) Casting, printing, lithographing, or otherwise making, except as authorized by the Secretary, any official mark, official certificate, official device, or simulation thereof.

"(2) Forging, counterfeiting, simulating, or falsely representing, any official mark, official certificate, or official device.

"(3) (i) Without authorization from the Secretary using any official device, official mark, or official certificate,

or simulation thereof, or altering, defacing, detaching, or destroying any official mark, official certificate, or official device; or (ii) contrary to regulations prescribed by the Secretary, failing to use, or to detach, deface, or destroy, any official device, official mark, or official certificate.

"(4) Possessing, without promptly notifying the Secretary thereof, (i) any official device, or (ii) any forged, counterfeited, simulated, or improperly altered official certificate, or (iii) any device or labeling, or any fish or fishery product or part thereof, bearing a forged, counterfeit, simulated, or improperly altered official mark.

"(5) Making a false statement in a shipper's or other certificate provided for in regulations.

"(6) Falsely or misleadingly representing that any fish or fishery product has been inspected and passed or exempted from inspection.

"(s) (1) The processing of any fish or fishery product in any establishment or vessel preparing any such article in violation of any requirement of part B of chapter IV or regulations prescribed pursuant thereto.

"(2) The doing of any act in violation of section 411(e) or regulations thereunder, with respect to any fish or fishery product which is not intended for use as human food.

"(t) The importation of fish and fishery products in violation of section 410(i)."

(b) Section 301(e) of such Act is amended (1) by striking out "or" after "507 (d) or (g)," and (2) by inserting "or 411(b)," after "512 (j), (l), or (m),".

(c) Section 301(f) of such Act is amended by inserting "410(d), 422(d), or" after "section".

(d) Section 303(c) of such Act is amended by striking out the period at the end thereof and inserting in lieu thereof the following: "; or (6) for having violated section 301(r) (4) (ii) or (iii), if the possession involved was in good faith and such person had no reason to believe that the certificate or mark involved was forged, counterfeited, simulated, or improperly altered; or (7) for having violated section 301(r) (5) or (6) if the statement or representation involved was made by such person with respect to fish or a fishery product in good faith reliance on a like statement or representation in a shipper's or other certificate of another person from whom he received such article and he had no reason to believe that the statement or representation was false or misleading, unless the person charged with such violation refuses to furnish on request of an officer or employee duly designated by the Secretary the name and address of the person from whom he received

such article and copies of the certificate relied upon and of any other documents pertaining to the delivery of the article to him."

ADULTERATION

SEC. 103. Section 402 of the Federal Food, Drug, and Cosmetic Act is amended by adding at the end of such section the following new paragraph:

"(f) (1) If it is, or it bears or contains, any fish or fishery product, and it has been processed in violation of section 410 or 411 or any regulations issued by the Secretary under such sections.

"(2) If it is, or is made or derived in whole or in part from, shellfish and such shellfish (A) was harvested in a State or foreign country that did not at the time of harvesting have in effect (i) an annual State plan for classification and control of shellfish growing areas and for regulation and control of shellfish harvesting practices, approved by the Secretary on the basis of standards promulgated by him by regulation, or (ii) in the case of a foreign country, a shellfish control program at least equal to such standards; or (B) was not harvested, or was not purified after harvesting, in conformity with such State plan or foreign program; or (C) was harvested in a growing area that has been declared closed for such purposes by regulation of the Secretary on the

basis of a finding of necessity for the protection of the public health."

SURVEILLANCE OF FISH AND FISHERY PRODUCTS, ESTABLISHMENTS, AND VESSELS

SEC. 104. Chapter IV of the Federal Food, Drug, and Cosmetic Act is further amended (1) by inserting "PART A—GENERAL" immediately below the chapter heading, and (2) by adding at the end of such chapter the following:

"PART B—FISH AND FISHERY PRODUCTS

"SUBPART 1—SURVEILLANCE AND REGULATION OF PRODUCTS, ESTABLISHMENTS, AND VESSELS

"SEC. 410. (a) GOOD PROCESSING PRACTICES.—The Secretary shall by regulation prescribe standards of sanitation and quality control for the processing (including storage or other handling) of fish and fishery products which shall be applicable to persons covered by this part, and he may from time to time amend such regulations. Prior to the issuance of such standards the Secretary shall consult with other interested Federal agencies, representatives of States, appropriate representatives of consumer organizations and the commercial fishing industry, other interested persons and organizations, and the advisory committee appointed pursuant to section 434. The initial regulations pursuant to this subsection shall be issued within one year after funds

are first appropriated to carry out the provisions of this part. Regulations (including amendments to regulations) prescribed pursuant to this subsection shall become effective on the date specified in the order prescribing them, but the initial regulations shall be made effective within one year after the day on which they are issued, unless the Secretary finds that additional time, not in excess of one year, is necessary to place all or part of such regulations into effect. On and after the effective date of such regulations no person shall process in or for interstate commerce fish or fishery products in any establishment under his control without complying with such regulations.

"(b) CERTIFICATION OF ESTABLISHMENTS AND VESSELS.—On and after the 60th day following the effective date of such regulations, no person shall process in or for interstate commerce fish or fishery products in any establishments or vessel under his control unless there is in effect for such establishment or vessel an annual certificate of registration issued by the Secretary. The application therefor shall be accompanied by such assurance as may be required by regulations that the establishment or vessel will be maintained in compliance with applicable standards. No such certificate shall be issued for any establishment unless the Secretary, on the basis of such application and of an intensive inspection made after the issuance of regulations pursuant to

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subsection (a), determines that there is satisfactory assurance that the establishment is adequately equipped, staffed, and managed to conform to the standards issued pursuant to subsection (a) and that fish and fishery products processed by it, including the labeling and packaging thereof, will in all respects comply with the requirements of this Act. If a certificate of registration is denied, the denial shall be subject to the opportunity for hearing and judicial review provided by section 412.

"(c) SUSPENSION AND REINSTATEMENT OF CERTIFICATES.—The certificate of registration of any establishment or vessel may be suspended, after opportunity for hearing, for failure to comply with the requirements of this subpart. The certificate may be immediately suspended by the Secretary (1) for failure to permit access for inspection, or (2) where an inspection or investigation discloses violation of any provision of this chapter or any regulation issued thereunder which the Secretary determines would involve an undue risk of imminent harm to consumers if processing were to continue prior to the correction of such violation: *Provided*, That the authority conferred by this sentence may not be delegated to a nonsupervisory officer or employee of the Department. The holder of such suspended certificate may at any time apply for reinstatement, and the Secretary shall immediately grant such reinstatement if he finds that

adequate measures have been taken to comply with the provisions of this chapter and the regulations. Suspension of a certificate and the denial of reinstatement shall be subject to the procedures provided by section 412, but a summary suspension shall remain in effect during the pendency of the administrative proceeding under that section. In the event of any judicial proceeding relating to such summary suspension before the proceeding under section 412 the only issue to be judicially determined shall be whether the secretary had reasonable cause under the circumstances of the case to take summary action.

"(d) SURVEILLANCE, INCLUDING INSPECTION.—(1) For the purpose of preventing the introduction or use in interstate commerce of fish or fishery products which are adulterated or misbranded, the Secretary shall, in accordance with the most modern public health and food protection practice, establish and maintain continuous and effective surveillance of all segments of the industries involved. As a part thereof, the Secretary shall, through inspectors, cause to be made such inspections, including continuous inspection whenever deemed necessary by him, of establishments and vessels as in his judgment will reasonably assure continuing compliance with, and will most effectively achieve, the purposes of this subpart and of this Act. In determining from time to time the appropriate degree (including continuity

or frequency) of such inspections to be applied in any establishment or vessel, the Secretary shall, among other relevant factors, consider the results of the intensive inspection required for certification under subsection (b) and any other relevant experience or information (whether obtained through inspection or otherwise), relating to such establishment or vessel or to fish or fishery products processed by it. Any inspector appointed or commissioned for the purposes of this part shall at any time have access to any establishment or vessel where fish or fishery products are processed for interstate commerce. Denial of access to such inspector shall be ground for suspension of the certificate of registration. The Secretary, whenever processing operations are being conducted, may, at his discretion, provide for the sampling, detention, and reinspection of fish or fishery products at each such establishment or vessel. Any fish or fishery products found to be adulterated shall be immediately condemned and segregated and shall, if no administrative appeal is taken from the inspector's determination of condemnation or if upon completion of an appeal inspection such condemnation is sustained, be destroyed for human food purposes under the supervision of an inspector: *Provided,* That any fish or fishery products which may by reprocessing be made not adulterated shall not be so condemned and destroyed if reprocessed under the supervision of an inspector and thereafter

found not to be adultered. Failure to comply with the requirements of the preceding sentence shall be ground for suspension of the certificate of registration. An appeal under this paragraph from the determination of condemnation shall be at the cost of the appellant if the Secretary determines that the appeal was frivolous.

"(2) The cost of any inspection, including any continuous inspection, under this subpart, other than any cost of appeal determined to be payable by the appellant pursuant to paragraph (1), shall be borne by the United States, except that the cost of overtime and holiday pay for inspection service performed, in an establishment subject to inspection, at the convenience of the establishment and not owing to conditions of harvesting or processing beyond the control of the establishment, shall, at such rates as the Secretary may determine in accordance with regulations, be borne by such establishment. Sums received by the Secretary in reimbursement for sums paid out by him for such premium pay work shall be available without fiscal year limitation to carry out the purposes of this section.

"(e) USE OF OFFICIAL MARK.—When fish or fishery products are processed for interstate commerce in an establishment or vessel holding an unsuspended certificate of registration and are placed or packed in any container or wrapper, the person processing such products shall, at the

time they leave the establishment or vessel, cause the label thereof to bear or contain such identifying official mark as may be required by the Secretary by regulation.

"(f) LABELING AND PACKAGING.—If the Secretary has reason to believe that any labeling or packaging in use or proposed for use with respect to any article subject to this subpart renders or would render such article misbranded, he may direct that such use be withheld, and any otherwise required official mark not used, unless the labeling and packaging is modified in such manner as he may prescribe to comply fully with this Act. If the person using or proposing to use such labeling or packaging does not accept the determination of the Secretary, such person may request a hearing, but the use of such labeling or packaging shall, if the Secretary so directs, be withheld pending hearing and final determination by the Secretary. Any such determination by the Secretary shall be subject to the opportunity for hearing and judicial review provided by section 412.

"(g) TRADE NAMES AND ESTABLISHED PACKAGES.—Established trade names or other labeling and packaging which are not false or misleading in any particular are permitted.

"(h) STORAGE OR HANDLING REGULATIONS.—Regulations pursuant to subsection (a) shall include standards prescribing conditions under which fish or fishery products

capable of use as human food shall be stored or otherwise handled by any person engaged in the business of buying, selling, freezing, storing, or transporting, in or for interstate commerce, or importing, such articles.

"(i) IMPORTATION OF FISH AND FISHERY PRODUCTS.—After the effective date of regulations issued under this subpart the following provisions shall apply:

"(1) No fish or fishery products which are capable of use as human food shall be imported into the United States if such articles are adulterated or misbranded or otherwise fail to comply with all the surveillance and inspection, good processing practice, and other provisions of this Act and regulations issued thereunder applicable to such articles in interstate commerce within the United States: *Provided*, That whenever, in the case of any foreign country, it shall be determined by the Secretary, after such investigation and evaluation, conducted at least annually, as he considers necessary or appropriate, that its system of surveillance, including plant and vessel inspection, of fish and fishery products is at least equal to all the surveillance, including inspection, good processing practice, and other provisions of this Act and regulations issued thereunder, and that reliance can be placed on certificates required by regulation of the Secretary as to compliance with that country's inspection, good processing practice, and other requirements, the Secretary may

accept such certificates as compliance with the comparable requirements of this subpart for such period and on such terms and conditions as he may prescribe: *Provided further*, That any fish or fishery products covered by such certificates shall be marked and labeled as may be required by regulations for such imported articles.

"(2) The Secretary may prescribe, under section 801 of this Act, the terms and conditions of the destruction of all such articles which are imported contrary to this section, unless (A) they are exported by the consignee within the time fixed therefor by the Secretary, or (B) in the case of articles which are not in compliance with this Act solely because of misbranding, such articles are brought into compliance with the Act under supervision of authorized representatives of the Secretary.

"(3) For the purpose of facilitating enforcement of this section and reducing the costs thereof, the Secretary, with the approval of the Secretary of the Treasury and the Secretary of State, may from time to time, by regulation, designate ports in the United States for the importation of fish or fishery products for commercial purposes into the United States. After the effective date of such regulations such importation, except into ports so designated, is prohibited.

"(4) Nothing in this section shall apply to a person who

purchases fish outside the United States for consumption by himself or members of his household except that the total amount of such fish shall not exceed such weight as the Secretary may prescribe by regulation; and the Secretary may further, by or pursuant to regulation, exempt from all or any part of this section, on such terms and conditions as he may deem appropriate, fish that are caught by an individual in the bona fide pursuit of sport and not for commercial purposes in waters outside the United States and that are brought into the United States by such individual by himself or members of his household.

"ADMINISTRATIVE AND AUXILIARY PROVISIONS

"SEC. 411. (a) WITHHOLDING, WITHDRAWING, AND REINSTATING CERTIFICATES.—The Secretary (for such period, or indefinitely, as he deems necessary to effectuate the purposes of this Act) may withhold a certificate of registration under section 410 or may suspend or withdraw such a certificate issued under that section, with respect to any establishment if he determines that the applicant or holder of such certificate is unfit to engage in any business requiring a certificate under that section because such person, or anyone responsibly connected with him, has been convicted, in any Federal or State court, within the previous ten years of (1) any felony, or more than one misdemeanor, based upon the acquiring, handling, or distributing of adulterated, mis-

labeled, or deceptively packaged food or fraud in connection with transactions in food; or (2) any felony involving fraud, bribery, extortion, or any other act or circumstance indicating a lack of the integrity needed for the conduct of operations affecting the public health. This section shall not affect in any way other provisions of this Act for suspension of a certificate under section 410. For the purpose of this section, a person shall be deemed to be responsibly connected with the business if he was a partner, officer, director, holder, or owner of 10 per centum or more of its voting stock, or an employee in a managerial or executive capacity. Withholding, withdrawal, and refusal to reinstate a certificate under this section shall be subject to the opportunity for hearing and judicial review provided by section 412.

"(b) RECORDS AND REPORTS.—For the purpose of facilitating enforcement of the provisions of this Act, persons engaged in the business of processing fish or fishery products for human consumption in or for interstate commerce or holding such products after transportation in interstate commerce shall, as may be required by regulations of the Secretary—

"(1) maintain accurate records (A) showing, to the extent that such persons are concerned therewith, the receipt, delivery, sale, movement, or disposition of fish or fishery products, or (B) showing matters bearing

upon sanitation and quality control in establishments or vessels under the control of such persons, or relating to the labeling of fish or fishery products processed in such establishments or vessels, or otherwise relating to whether fish or fishery products subject to this subpart are adulterated or misbranded;

"(2) upon the request of the Secretary permit him at reasonable times to have access to and copy any such records; and

"(3) make such reports to the Secretary with respect to such matters, including reports as to labeling practices, as the Secretary may reasonably require.

Any record required to be maintained by this section shall be maintained for two years after the transaction which is the subject of such record has taken place.

"(c) ADMINISTRATIVE DETENTION OF FISH OR FISHERY PRODUCTS.—Whenever any fish or fishery product is found by any authorized representative of the Secretary upon any premises where it is held for purposes of, or during or after distribution in, interstate commerce or otherwise subject to this Act, and there is reason to believe that any such article is adulterated or misbranded or otherwise in violation of the provisions of this Act or of any other Federal or State law, or that such article has been or is intended to be distributed in violation of any such provisions, such fish or

fishery products, if not otherwise subject to condemnation under section 410(d), may be detained by such representative for a period not to exceed 20 days pending action under section 304 of this Act or notification of any Federal, State, or other governmental authorities having jurisdiction over such article, and shall not be moved by any person from the place at which it is located when so detained until released by such representative. Such fish or fishery product shall be detained in a suitable manner to prevent decomposition and the costs thereof shall be borne by the owner thereof. All official marks may be required by such representative to be removed from such article before it is released unless it appears to the satisfaction of the Secretary that the article is eligible to retain such marks.

"(d) INSPECTION EXEMPTIONS.—(1) The provisions of this subpart shall not apply to the processing by any person of fish of his own raising or harvesting, and the preparation by him and transportation in interstate commerce of the fish or fishery products exclusively for use by him and members of his household and his nonpaying guests and employees, if such person does not engage in the business of buying or selling any fish or fishery products capable of use as human food.

"(2) The Secretary may, by regulation and under such conditions as to sanitary standards, practices, and procedures

as he may prescribe, exempt from specific provisions of this subpart retail dealers with respect to fishery products sold directly to consumers in individual retail stores, if the only processing operations performed by such retail dealers are conducted on the premises where such sales to consumers are made.

"(3) Regulations pursuant to section 410(a) with respect to storage or other handling of fish or fishery products by persons engaged in the business of buying, selling, freezing, storing, transporting, or importing the same shall not apply to storage and handling at any retail store or other establishment that would be subject to that section only because of purchases in interstate commerce, if such storage and handling at such establishment are regulated, under applicable State law, in a manner which the Secretary, after consultation with appropriate State representatives and other interested persons, determines to be adequate to effectuate the purposes of the storage or other handling regulations prescribed pursuant to section 410(a).

"(4) The Secretary may suspend or terminate any exemption under this section with respect to any person whenever he finds that such action will aid in effectuating the purposes of this Act.

"(e) PROCESSORS OF INDUSTRIAL FISHERY PRODUCTS AND RELATED INDUSTRIES.—No person shall buy, sell or

offer for sale, or transport or offer or receive for transportation, in interstate commerce, or import, any fish or fishery products which are not intended for use as human food unless they are denatured or otherwise identified as required by regulations of the Secretary or are naturally inedible by humans.

"OPPORTUNITY FOR HEARING AND JUDICIAL REVIEW OF DENIAL, WITHHOLDING, SUSPENSION, OR WITHDRAWAL OF CERTIFICATES, AND OF WITHHOLDING OF APPROVAL OF LABELING OR PACKAGING

"SEC. 412. (a) OPPORTUNITY FOR HEARING.—(1) Any person denied a certificate under section 410(b) or 411(a), or whose certificate has been suspended or who has been denied reinstatement under section 410(c), or who has been refused any official mark authorized or required by regulation for proposed labeling or packaging under section 410(f), or from whom it is proposed to withdraw a certificate under section 411(a), may file objections thereto with the Secretary, specifying with particularity reasonable grounds for his objection, and request a hearing upon such objections. The Secretary shall afford an opportunity for a hearing on such objections, and shall expedite such hearing upon request. As soon as practicable, after the hearing, the Secretary shall act upon the objections.

"(2) Such order shall be based upon a fair evaluation of

the entire record at such hearing, and shall contain findings of fact and conclusions on which the Secretary's action was based.

"(3) The Secretary shall grant such interim relief from any order suspending or withdrawing a certificate as he finds justified upon considering the interests of the person holding the certificate and the necessity for protection of the public health and the interest of consumers.

"(b) JUDICIAL REVIEW.—(1) Any person adversely affected by the Secretary's action on his objections may obtain judicial review by filing in the United States court of appeals for the circuit in which he resides or has his principal place of business, within sixty days after the entry of the Secretary's order, a petition for judicial review.

"(2) A copy of the petition shall be transmitted by the clerk of the court to the Secretary, and the Secretary shall file in the court the record of the proceeding. The findings of the Secretary with respect to questions of fact shall be sustained if based upon a fair evaluation of the entire record.

"(3) The judgment of the court affirming or setting aside, in whole or in part, any order under this section shall be final, subject to review by the Supreme Court of the United States upon certiorari or certification as provided in section 1254 of title 28 of the United States Code.

"EVIDENCE FOR INVESTIGATIONS AND HEARINGS—SUBPENAS

"SEC. 413. For the purpose of any hearing, investigation, or other proceeding authorized or directed under this part, the Secretary is authorized to issue subpenas requiring the attendance and testimony of witnesses and the production of any documentary or other evidence that relates to any matter under investigation or in question before the Secretary and to administer oaths or affirmations. Witnesses so subpenaed shall be paid the same fees and mileage that are paid witnesses in the courts of the United States. In case of contumacy by, or refusal to obey a subpena duly served upon, any person, the district court of the United States for the district in which the person charged with contumacy or refusal to obey is found or resides or transacts business shall, upon application by the United States and after notice to such person, have jurisdiction to issue an order requiring such person to appear and give testimony before the Secretary, or to appear and produce documentary or other evidence before the Secretary, or both, and any failure to obey such order of the court may be punished by such court as a contempt thereof.

"SUBPART 2.—FEDERAL AND STATE COOPERATION

"SEC. 421. (a) It is the policy of the Congress to assist in efforts by State and other Government agencies

to protect the consuming public from fish and fishery products that are adulterated, misbranded, or otherwise not processed in accordance with standards in effect under this Act. In furtherance of this policy—

"(1) The Secretary is authorized, whenever he determines that it would effectuate the purposes of this Act, (A) to cooperate with the appropriate State agency in developing and administering a State fish and fishery products surveillance program in any State which has enacted a State fish and fishery products surveillance law that imposes mandatory requirements that are at least equal to those under subpart 1 of this part, and provisions of this Act related to such subpart, with respect to all or certain classes of persons engaged in the State in processing fish and fishery products for use as human food solely for distribution within such State; and (B) to cooperate with the appropriate State agency in the development of an effective State program (described in a State plan approved on an annual basis by the Secretary as meeting standards established by him) for the classification and control of shellfish growing areas and for regulation and control of shellfish harvesting practices, including shellfish intended for introduction into interstate commerce.

"(2) Cooperation with State agencies under this section may include furnishing to the appropriate State agency (A)

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advisory assistance in planning and otherwise developing an adequate State program under the State law, and (B) technical and laboratory assistance and training, including necessary curricular and instructional materials and equipment, and financial and other aid for administration of such program. Grants to any State under this section from Federal funds for any fiscal year shall not exceed 50 per centum of the estimated total cost of the cooperative program in such State. Such cooperation and payment shall be contingent at all times (i) upon the administration of the State program in a manner which the Secretary, after such consultation with the advisory committee appointed under section 434 as he considers appropriate, deems adequate to effectuate the purpose of this section, and (ii) upon agreement by the State, when requested by the Secretary, to cooperate with the Department by making available (upon a reimbursable basis or otherwise, as may be agreed upon) the services of qualified personnel of the State agency, when duly commissioned by the Secretary pursuant to section 702, for the conduct of surveillance (including inspection) activities on behalf of the Department for the purposes of subpart 1 of this part.

"(b) The appropriate State agency with which the Secretary may cooperate under this subpart shall be an agency designated by the State which is primarily respon-

sible for the coordination of the State programs having objectives similar to those under this Act: *Provided*, That with respect to the shellfish control program referred to in clause (B) of paragraph (1) of subsection (a) such State agency may, in the case of a State in which different functions of its shellfish control program are vested in different State agencies, be an interdepartmental agency if found by the Secretary to be consistent with the purposes of this Act, including this part. When the State program, or the performance of services on behalf of the Department (referred to in clause (ii) of the third sentence of subsection (a) (2)), includes performance of certain functions by a municipality or other subordinate governmental unit, such unit shall be deemed to be a part of the State agency for purposes of this section.

"SEC. 422. (a) (1) If the Secretary believes, by thirty days prior to the expiration of two years after the effective date of regulations promulgated under section 410 (a) of this Act, that a State has failed to develop or is not enforcing, with respect to all establishments within its jurisdiction at which fish or fishery products are processed for use as human food for distribution solely within the State, requirements at least equal to those imposed under subpart 1 of this part and other provisions of this Act related to such subpart, he shall promptly notify the Governor of the State of this fact. If

the Secretary determines, after consultation with the Governor of the State, or a representative selected by him, that such requirements have not been developed and activated, he shall promptly after the expiration of such two-year period designate such State as one in which the provisions of such subpart 1 and related provisions of this Act shall apply to operations and transactions wholly within such State: *Provided,* That if the Secretary determines that there is reason to believe that the State will activate such requirements within one additional year, he may delay such designation for that period, and he shall in that event not designate the State if he further determines at the end of that period that the State then has such requirements in effective operation.

"(2) The Secretary shall publish any such designation in the Federal Register and, upon the expiration of thirty days after such publication, the provisions of subpart 1 and other provisions of this Act related thereto shall apply to operations and transactions and to persons engaged therein in the State to the same extent and in the same manner as if such operations and transactions were conducted in or for interstate commerce.

"(3) Notwithstanding any other provision of this subpart, if the Secretary determines, at any time prior to designation of a State under this section, that any establishment

within a State is producing adulterated fish or fishery products for distribution within such State which would clearly endanger the public health, he shall, with a view to achievement of effective action under State or local law, notify the Governor of the State of such fact. If the State does not take action to prevent such endangering of the public health within a reasonable time after such notice, as determined by the Secretary in the light of the risk to public health, the Secretary may forthwith designate any such establishment as subject to the provisions of subpart 1 and related provisions of this Act, and thereupon the establishment and operator thereof shall be subject to such provisions as though engaged in interstate commerce until such time as the Secretary determines that such State has developed and will enforce requirements at least equal to those imposed under such provisions.

"(b) Whenever the Secretary determines that any State designated under this section has developed and will enforce State requirements at least equal to those imposed under subpart 1 and related provisions of this Act with respect to the operations and transactions within such State which are regulated under this section, he shall terminate the designation of such State under this section, but this shall not preclude the subsequent redesignation of the State at any time upon thirty days' notice to the Governor and publication of

such notice in the Federal Register; and any State may be designated upon such notice and publication at any time after the period specified in this subsection, whether or not the State has theretofore been designated, upon the Secretary determining that it is not effectively enforcing requirements at least equal to those imposed under such subpart and related provisions.

"(c) The Secretary shall promptly upon enactment of this subpart 2, and periodically thereafter but at least annually, review the requirements, including the enforcement thereof, of the States not designated under this section, with respect to the processing of fish or fishery products and the surveillance, including inspection, of such operations.

"(d) For the purpose of enabling the Secretary to make determinations required of him under this section, the authority conferred by subpart 1 of this part and by section 704 to cause to be made inspections of establishments by inspectors appointed by him shall extend to establishments in any State processing fish and fishery products solely for distribution in such State.

"STATE JURISDICTION

"SEC. 423. (a) Requirements within the scope of subpart 1 of this part, with respect to any establishment or vessel at which a certificate of registration is required under subpart 1, which are in addition to or different from those

made under such subpart may not be imposed by any State, except that any such jurisdiction may impose recordkeeping and other requirements within the scope of section 411 (b) with respect to any such establishment. Marking, labeling, packaging, or ingredient requirements in addition to, or different from, those made under this Act may not be imposed by any State with respect to articles processed at any establishment or vessel in accordance with the requirements under such subpart, but any State may, consistent with the requirements under this Act, exercise concurrent jurisdiction with the Secretary over such articles (including imported articles after their entry into the United States) for the purpose of preventing distribution of any such articles which are adulterated or misbranded, including the exercise of such concurrent jurisdiction in any such establishment or vessel (with respect to such articles) as the Secretary, by or pursuant to regulation, determines will not conflict with or unnecessarily duplicate activities of the Secretary therein.

"(b) Nothing in this section shall be construed to preclude the establishment and operation and enforcement of a State shellfish program (meeting Federal standards and administered under an annual plan approved by the Secretary) for classification and control of growing areas and for regulation and control of harvesting practices for shellfish, including shellfish intended for introduction in interstate com-

merce. This section shall not preclude any State from making requirements or taking other action, consistent with subpart 1, with respect to any other matters not regulated thereunder. Nothing in this section shall be construed to preclude the utilization of State or local personnel for services on behalf of the Department, upon being commissioned by the Secretary pursuant to section 702.

"SUBPART 3.—GENERAL

"INTERDEPARTMENTAL COOPERATION

"SEC. 431. (a) There shall be consultation between the Secretary and the Secretary of Commerce, and any other interested agencies, prior to the issuance of standards under this Act applicable to fish or fishery products. There shall also be consultation between the Secretary and the advisory committee provided for under this Act, prior to the issuance of such standards under this Act, to avoid, insofar as feasible, inconsistency between Federal and State standards.

"(b) For the purpose of facilitating enforcement and reducing the costs thereof, the Secretary may, by agreement with the agency concerned, utilize with or without reimbursement law enforcement officers or other personnel and facilities of other Federal agencies to carry out the provisions of this Act and, in connection therewith, may commission such personnel as officers of the Department. The Secretary is also encouraged to enter, where appropriate, into

agreements or other arrangements (on a reimbursable basis or otherwise) with any State for utilization of the facilities, services, and qualified personnel of such State (duly commissioned by him pursuant to section 702) in carrying out the provisions of this Act, and in particular subpart 1 of this part, including enforcement.

"RESEARCH

"SEC. 432. The Secretary is authorized to conduct, directly or through grants to or contracts with public or private agencies or organizations and individuals, studies, research, experiments, and demonstrations—

"(1) to improve sanitation practices in the processing of fish and fishery products; and

"(2) to develop improved techniques in the conduct of surveillance (including inspection) activities under this Act.

"PERSONNEL—APPOINTMENT AND TRAINING

"SEC. 433. (a) The Secretary shall, subject to the civil service and classification laws, appoint such employees, qualified by training or education, as he deems requisite for the administration of this part and prescribe their duties.

"(b) The Secretary shall, to the extent necessary or appropriate, provide training for personnel appointed pursuant to this section. He shall work with educational insti-

tutions in developing programs designed to enable persons to qualify for positions in the administration of this part.

"NATIONAL ADVISORY COMMITTEE

"SEC. 434. (a) The Secretary shall appoint, without regard to the civil service and classification laws, a national advisory committee to advise him concerning Federal and State programs of fish and fishery product surveillance and on other matters within the scope of this part, including the evaluation of State programs for purposes of this part and the promotion of improved coordination among State programs and between Federal and State programs. The chairman (who shall be designated by the Secretary) and a majority of the members shall be drawn from the public (including persons representative of consumer organizations), from the fields of the environmental, and other relevant sciences, and from persons especially conversant with State programs, and shall have no economic interest in the commercial fisheries industry.

"(b) Members of the committee who are not regular full-time employees of the United States shall, while serving on business of the committee, be entitled to compensation at rates fixed by the Secretary, but not exceeding the daily rate applicable at the time of such service to grade GS–18 of the classified civil service, including traveltime; and while so

serving away from their homes or regular places of business they may be allowed travel expenses, including per diem in lieu of subsistence, as authorized by section 5703 of title 5, United States Code, for persons in the Government service employed intermittently."

EXISTING AUTHORITY

SEC. 105. (a) Notwithstanding any other provisions of law, the amendments made by this Act shall not derogate from any authority conferred upon any Federal officer, employee, or agency by or under provisions of the Federal Food, Drug, and Cosmetic Act in force prior to enactment of this Act, by the Fair Packaging and Labeling Act, by the Public Health Service Act or by any other Act.

(b) Compliance with the requirements prescribed by or pursuant to the Federal Food, Drug, and Cosmetic Act (including the amendments made thereto by the Wholesome Fish and Fishery Products Act of 1971) with respect to fish and fishery products, including any continuous inspection that may be established thereunder, shall not exempt any person from any liability under common or State law.

92D CONGRESS
1ST SESSION

S. 1528

IN THE SENATE OF THE UNITED STATES

APRIL 14, 1971

Mr. HART introduced the following bill; which was read twice and referred to the Committee on Commerce

A BILL

To regulate interstate commerce by amending the Federal Food, Drug, and Cosmetic Act to provide for the inspection of facilities used in the harvesting and processing of fish and fishery products for commercial purposes, for the inspection of fish and fishery products, and for cooperation with the States in the regulation of intrastate commerce with respect to State fish inspection programs, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "Wholesome Fish and Fishery Products Act of 1971".

CONGRESSIONAL FINDING

SEC. 2. Fish and fishery products are an important source of the Nation's total supply of food. These foods are

consumed throughout the Nation and the major portion of the supply moves in interstate commerce, some from foreign sources. It is essential that the health and welfare of consumers be protected by assuring that fish and fishery products distributed to them are of good quality, wholesome, not adulterated, and are properly marked, labeled, and packaged. Fish or fishery products which do not meet these standards depress markets for wholesome, not adulterated, and properly labeled and packaged fish and fishery products. Those articles that are unwholesome, adulterated, of poor quality, mislabeled, or deceptively packaged compete unfairly with articles that are of good quality, wholesome, not adulterated, and properly labeled and packaged, to the detriment of commercial fishermen, processors, and consumers of fish and fishery products. It is hereby found that all fish and fishery products regulated under this Act are either in interstate or foreign commerce or substantially affect such commerce, and that Federal regulation and cooperation by the States and other jurisdictions as contemplated by this Act (including cooperation through federally approved State programs for control of shellfish growing areas and shellfish harvesting) are appropriate to prevent and eliminate burdens upon such commerce, to effectively regulate such commerce, and to protect the health and welfare of the consumer.

WHOLESOME FISH AND FISHERY PRODUCTS AMENDMENTS TO THE FEDERAL FOOD, DRUG, AND COSMETIC ACT

DEFINITIONS

SEC. 101. Section 201, as amended, of the Federal Food, Drug, and Cosmetic Act is further amended by adding at the end of such section the following new paragraphs:

"(y) (1) The term 'fish' means any aquatic animal, including amphibians, or part thereof capable of use as human food.

"(2) The term 'shellfish', as used in sections 402 (f), 421, and 423, means any species of oyster, clam, or mussel, either shucked or in the shell, and either fresh, or frozen or otherwise processed, or any part thereof.

"(z) The term 'fishery products' means any product capable of use as human food which is made wholly or in part from any fish or portion thereof, except products which contain fish only in small proportions or historically have not been, in the judgment of the Secretary, considered by consumers as products of the commercial fishing industry, and which are exempted from definition as a fishery product by the Secretary under such conditions as he may prescribe to assure that the fish or portion thereof contained therein are

not adulterated and that such products are not represented as fishery products.

"(aa) The term 'capable of use as human food' applies to any fish or part or product thereof, unless it is denatured or otherwise identified as required by regulations prescribed by the Secretary to deter its use as human food, or unless it is naturally inedible by humans.

"(bb) The terms 'process', 'processed', and 'processing', with respect to fish or fishery products, mean to harvest, handle, store, prepare, produce, manufacture, preserve, pack, transport, or hold such products.

"(cc) The term 'official mark' means the official inspection legend or any other symbol prescribed by regulations of the Secretary to identify the status of any fish or fishery product under this Act.

"(dd) The term 'official inspection legend' means any symbol prescribed by regulations of the Secretary showing that an article is in accordance with the provisions of this Act.

"(ee) The term 'official inspection certificate' means any certificate prescribed by regulations of the Secretary for issuance by an inspector or other person performing official functions under this Act.

"(ff) The term 'official device' means any device prescribed or authorized by the Secretary for use in applying any official mark.

"(gg) The term 'vessel' means any watercraft of any description which is engaged in the processing of fish for landing and human consumption in any State.

"(hh) The term 'continuous inspection' means the application of inspection by a full-time inspector.

"(ii) The term 'inspector' means an individual appointed or commissioned as an officer or employee of the Department and authorized by the Secretary to inspect articles under the authority of this Act."

PROHIBITED ACTS

SEC. 102. Section 301, as amended, of the Federal Food, Drug, and Cosmetic Act is further amended by adding at the end of such section the following new paragraph:

"(r) Without authorization from the Secretary or contrary to regulations prescribed by him, casting, printing, lithographing, or otherwise making, simulating, using, or failing to use, altering, defacing, detaching, or destroying any form of official mark, official inspection legend, official inspection certificate, or official device; possessing, without promptly notifying the Secretary thereof, any forged, counterfeited, simulated, or improperly altered form of official mark, official inspection legend, official inspection certificate or official device; forging, counterfeiting, simulating, improperly altering any form of official mark, official inspection legend, official inspection certificate, or official device; mak-

ing any false statement in any shipper's or other certificate provided for in regulations; or falsely or misleadingly representing that any fish or fishery product has been inspected and passed or exempted from inspection.

"(s) The processing of any fish or fishery products in any establishment or vessel preparing any such article in violation of the requirements of part B of chapter IV and regulations prescribed pursuant thereto.

"(t) The importation of fish and fishery products in violation of section 410 (i).

"(u) The failure to maintain, or to afford access to, records as required by section 411 (b)."

ADULTERATION

SEC. 103. Section 402, as amended, of the Federal Food, Drug, and Cosmetic Act is further amended by adding at the end of such section the following new paragraph:

"(f) (1) If it is, or it bears or contains, any fish or fishery product, and it has been processed, stored, or handled in violation of section 410 or 411 or any regulations issued by the Secretary under such sections.

"(2) If it is, or is a product made or derived in whole or in part from, shellfish and such shellfish (a) was harvested in a State or foreign country that did not at the time of harvesting have in effect (i) an annual State plan for classification and control of shellfish growing areas and for

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regulation and control of shellfish harvesting practices, approved by the Secretary on the basis of standards promulgated by him by regulation, or (ii) in the case of a foreign country, a shellfish control program at least equal to such standards; or (b) was not harvested, or was not purified after harvesting, in conformity with such State plan or foreign program; or (c) was harvested in a growing area that has been declared closed for such purposes by regulation of the Secretary on the basis of a finding of necessity for the protection of the public health."

INSPECTION OF FISH AND FISHERY PRODUCTS, ESTABLISHMENTS, AND VESSELS

SEC. 104. Chapter IV of the Federal Food, Drug, and Cosmetic Act is further amended (1) by inserting "PART A—GENERAL" immediately below the chapter heading, and (2) by adding at the end of such chapter the following:

"PART B—FISH AND FISHERY PRODUCTS

"Subpart 1—Inspection and Regulation of Products, Establishments, and Vessels

"SEC. 410. (a) GOOD MANUFACTURING PRACTICES.—The Secretary shall, either directly or by contract, make, by experts in sanitation or other competent persons, such survey of as many establishments in the United States and vessels which process fish and fishery products for interstate commerce as he deems appropriate to inform himself concerning

the operations and sanitary conditions thereof for the purpose of developing adequate standards of good manufacturing practices, including but not limited to sanitation and quality control, under which such establishments and vessels shall be maintained and operated. The Secretary shall thereafter by regulation prescribe standards of sanitation and quality control for the processing of fish and fishery products which shall be applicable to persons covered by this part, and he may from time to time amend such regulations. The initial regulations pursuant to this subsection shall be issued within one year after funds are first appropriated to carry out the provisions of this part. Regulations (including amendments to regulations) prescribed pursuant to this subsection shall become effective upon the date specified in the order prescribing them, but the initial regulations shall become effective one year after the date on which such regulations have been issued, unless the Secretary finds that additional time, not in excess of one year, is necessary to place all or any part of such regulations into effect. On and after the effective date of such regulations no person shall process for interstate commerce fish or fishery products in any establishment under his control without complying with such regulations.

"(b) CERTIFICATION OF ESTABLISHMENTS AND VESSELS.—Sixty days after the effective date of such regulations, no person shall process for interstate commerce fish or fishery

products in any establishment or vessel under his control unless there is in effect for such establishment or vessel a certificate of registration issued by the Secretary. The Secretary shall issue such a certificate upon application accompanied by such assurance as may be required by regulations that such establishment or vessel is and will be maintained in compliance with applicable standards. The Secretary may deny the certificate of registration if an adequate assurance of compliance is not presented, and the denial shall be subject to the opportunity for hearing and judicial review provided by section 412.

"(c) SUSPENSION AND REINSTATEMENT OF CERTIFICATES.—The certificate of registration of any establishment or vessel may be suspended, after opportunity for hearing, for failure to comply with the requirements of this subpart. The certificate may be immediately suspended by the Secretary (1) for failure to permit access for inspection, or (2) where an inspection or investigation discloses violation of any provision of this chapter or any regulation issued thereunder which the Secretary determines would involve an undue risk of imminent harm to consumers if processing were to continue prior to the correction of such violation: *Provided,* That the authority conferred by this sentence may not be delegated to a nonsupervisory officer or employee of the

Department. The holder of such suspended certificate may at any time apply for reinstatement and the Secretary shall immediately grant such reinstatement if he finds that adequate measures have been taken to comply with the provisions of this chapter and the regulations. Suspension of a certificate and the denial of reinstatement shall be subject to the procedures provided by section 412, but a summary suspension shall remain in effect during the pendency of the administrative proceeding under that section. In the event of any judicial proceeding relating to such summary suspension before the proceeding under section 412 the only issue to be judicially determined shall be whether the Secretary had reasonable cause under the circumstances of the case to take summary action.

"(d) INSPECTION.—For the purpose of preventing the use in interstate commerce of fish or fishery products which are adulterated or misbranded, the Secretary shall cause to be made, by inspectors appointed by him for that purpose, a continuous inspection of each establishment where fish or fishery products are processed for interstate commerce. For the same purposes, the Secretary, at his discretion, may require that adequate inspections be made, by inspectors appointed for that purpose, of vessels processing fish or fishery products for interstate commerce. Any inspector appointed for the purposes of this title shall at any time have

access to any establishment or vessel where fish or fishery products are processed for interstate commerce. Denial of access to such inspector shall be ground for suspension of the certificate of registration. The Secretary, whenever processing operations are being conducted, may, at his discretion, provide for the sampling, detention, and reinspection of fish or fishery products at each such establishment or vessel. Any fish or fishery products found to be adulterated shall be immediately condemned and segregated and shall, if no appeal is taken from the inspector's determination of condemnation or if upon completion of an appeal inspection such condemnation is sustained, be destroyed for human food purposes under the supervision of an inspector: *Provided*, That any fish or fishery products which may by reprocessing be made not adulterated shall not be so condemned and destroyed if reprocessed under the supervision of an inspector and thereafter found not to be adulterated. Failure to comply with the requirements of the preceding sentence shall be ground for suspension of the certificate of registration. An appeal under this subsection from the determination of condemnation shall be at the cost of the appellant if the Secretary determines that the appeal was frivolous. The cost of inspection (other than any cost of appeal determined to be payable by the appellant pursuant to the preceding sentence) shall be borne by the United States, except that

the cost of overtime and holiday pay for inspection service performed, in an establishment subject to inspection, at the convenience of the establishment and not owing to conditions of harvesting or processing beyond the control of the establishment, shall, at such rates as the Secretary may determine in accordance with regulations, be borne by such establishment. Sums received by the Secretary in reimbursement for sums paid out by him for such premium pay work shall be available without fiscal year limitation to carry out the purposes of this section.

"(e) USE OF THE OFFICIAL MARK AND OFFICIAL INSPECTION LEGEND.—When fish or fishery products are processed for interstate commerce in an establishment holding an unsuspended certificate of registration and are placed or packed in any container or wrapper, the person processing such products shall, at the time they leave the establishment, cause a label to be attached thereon which shall bear or contain the official mark or official inspection legend except as may be otherwise authorized by regulation pursuant to clause (2) of section 405.

"(f) LABELING AND PACKAGING.—If the Secretary has reason to believe that any labeling or packaging in use or proposed for use with respect to any article subject to this subpart renders or would render such article misbranded, he may direct that such use be withheld, and the

official mark or the official inspection legend not used, unless the labeling and packaging is modified in such manner as he may prescribe to comply fully with this Act. If the person using or proposing to use such labeling or packaging does not accept the determination of the Secretary, such person may request a hearing, but the use of such labeling or packaging shall, if the Secretary so directs, be withheld pending hearing and final determination by the Secretary. Any such determination by the Secretary shall be subject to the opportunity for hearing and judicial review provided by section 412.

"(g) TRADE NAMES AND ESTABLISHED PACKAGES.—Established trade names or other labeling and packaging which are not false or misleading in any particular and which are approved by the Secretary are permitted.

"(h) STORAGE OR HANDLING REGULATIONS.—The Secretary may by regulation prescribe conditions under which fish or fishery products capable of use as human food shall be stored or otherwise handled by any person engaged in the business of buying, selling, freezing, storing, or transporting, in or for interstate commerce, or importing such articles, whenever the Secretary deems such action necessary to assure that such articles will not be adulterated, misbranded, or otherwise in violation of this Act when delivered to the consumer. Violation of any such regulation is pro-

hibited, and fish and fishery products stored or handled in violation of such regulation shall be deemed adulterated under section 402 (f) of the Act. Such regulations shall not apply to the storage or handling of such articles at any retail store or other establishment in any State that would be subject to this section only because of purchases in interstate commerce, if the storage and handling of such articles at such establishment are regulated, under the laws of the State in which such establishment is located, in a manner which the Secretary, after consultation with the appropriate advisory committee provided for in section 421 (a) of this Act, determines is adequate to effectuate the purposes of this subsection.

"(i) IMPORTATION OF FISH AND FISHERY PRODUCTS.—After the effective date of regulations issued under this subpart—

"(1) no fish or fishery products shall be imported into the United States if such articles are adulterated or misbranded or otherwise fail to comply with all the inspection, good manufacturing practice, and other provisions of this Act and regulations issued thereunder applicable to such articles in commerce within the United States: *Provided*, That whenever it shall be determined by the Secretary, in the case of any foreign country, that the system of plant and vessel inspection

of fish and fishery products is at least equal to all the inspection, good manufacturing practice, and other provisions of this Act and regulations issued thereunder, and that reliance can be placed on certificates required by regulation of the Secretary as to compliance with the country's inspection, good manufacturing practice, and other requirements, the Secretary may accept such certificates as compliance with the comparable requirements of this subpart: *Provided further,* That any fish or fishery products covered by such certificates shall be marked and labeled as required by regulations for such imported articles: *And provided further,* That (A) nothing in this section shall apply to a person who purchases fish outside the United States for consumption by himself or members of his household except that the total amount of such fish shall not exceed fifty pounds; and (B) the Secretary may further, by or pursuant to regulation. exempt from all or any part of this section, on such terms and conditions as he may deem appropriate, fish that are caught by an individual in the bona fide pursuit of sport and not for commercial purposes in waters outside the United States and that are brought into the United States by such individual by himself or members of his household.

"(2) The Secretary may prescribe, under section

801 of this Act, the terms and conditions of the destruction of all such articles which are imported contrary to this section, unless (1) they are exported by the consignee within the time fixed therefor by the Secretary, or (2) in the case of articles which are not in compliance with this Act solely because of misbranding, such articles are brought into compliance with the Act under supervision of authorized representatives of the Secretary.

"(3) For the purpose of facilitating enforcement of this section and reducing the costs thereof, the importation of fish or fishery products into any port in the United States, except such as may be designated by the Secretary with the approval of the Secretary of the Treasury is prohibited.

"(j) SURVEILLANCE FOR DANGEROUS MATERIALS.—(1) In order to protect consumers from the dangers of dangerous materials which may be found in fish and fishery products, the Secretary shall initiate and carry out an intensive screening system for the detection of such materials in fish and fishery products.

"(2) DEFINITIONS.—As used in this subsection—

"(A) The term 'dangerous material' means any material which can be expected to reach toxic levels in significant quantities of fish or fishery products.

"(B) The term 'intensive screening' means that level of surveillance required to discover and eliminate the threat to human health arising from the presence of dangerous materials in fish or fishery products.

"(3) Not more than ninety days after the date of enactment of this subsection, the Secretary shall propose regulations specifying all dangerous materials and indicating the intensive screening procedures that he will follow in carrying out this subsection.

"(4) Analyses performed under this subsection to determine the presence and amount of dangerous materials in fish or fishery products shall be performed using the best available technology.

"(5) The results of any analyses performed under this subsection shall be made available to any person upon request to the Secretary.

"(6) Nothing in this subsection shall limit the responsibility of any person to comply with quality control regulations established pursuant to section 410 of this Act or any other provision of law.

"(7) If the Secretary finds that there is a hazard to the public health that requires an immediate increase in the level of screening or research for any hazardous material in fish or fishery products, he may increase the level of such screen-

ing or research to such extent he determines necessary without regard to any requirement under this Act for previous notice or opportunity for a hearing: *Provided*, That the Secretary shall comply with such requirements as soon as practicable after initiating such increase in the level of screening for the hazardous material in question.

"ADMINISTRATIVE AND AUXILIARY PROVISIONS

"SEC. 411. (a) WITHHOLDING, WITHDRAWING, AND REINSTATING CERTIFICATES.—The Secretary (for such period, or indefinitely, as he deems necessary to effectuate the purposes of this Act) may withhold a certificate of registration under section 410 or may suspend or withdraw such a certificate issued under that section, with respect to any establishment if he determines that the applicant or holder of such certificate is unfit to engage in any business requiring a certificate under that section because such person, or anyone responsibly connected with him, has been convicted, in any Federal or State court, within the previous ten years of (1) any felony, or more than one misdemeanor, based upon the acquiring, handling, or distributing of adulterated, mislabeled, or deceptively packaged food or fraud in connection with transactions in food; or (2) any felony involving fraud, bribery, extortion, or any other act or circumstance indicating a lack of the integrity needed for the conduct of operations affecting the public health. This section shall not affect

in any way other provisions of this Act for suspension of a certificate under section 410. For the purpose of this section, a person shall be deemed to be responsibly connected with the business if he was a partner, officer, director, holder, or owner of 10 per centum or more of its voting stock, or employee in a managerial or executive capacity. Withholding, withdrawal, and refusal to reinstate a certificate under this section shall be subject to the opportunity for hearing and judicial review provided by section 412.

"(b) MAINTENANCE AND RETENTION OF RECORDS.—For the purpose of enforcing the provisions of this Act, persons engaged in the business of processing fish or fishery products for human consumption in interstate commerce or holding such products after transportation in interstate commerce shall maintain accurate records showing to the extent that they are concerned therewith, the receipt, delivery, sale, movement, or disposition of fish or fishery products and shall, upon the request of the Secretary, permit him at reasonable times to have access to and to copy all such records. Any record required to be maintained by this section shall be maintained for two years after the transaction which is the subject of such record has taken place.

"(c) ADMINISTRATIVE DETENTION OF FISH OR FISHERY PRODUCTS.—Whenever any fish or fishery product is found by any authorized representative of the Secretary

upon any premises where it is held for purposes of, or during or after distribution in, interstate commerce or otherwise subject to this Act, and there is reason to believe that any such article is adulterated, or misbranded or otherwise in violation of the provisions of this Act or of any other Federal law, or that such article has been or is intended to be distributed in violation of any such provisions, such fish or fishery products, if not otherwise subject to condemnation under section 410 (d), may be detained by such representative for a period not to exceed twenty days pending action under section 304 of this Act or notification of any Federal, State, or other governmental authorities having jurisdiction over such article, and shall not be moved by any person from the place at which it is located when so detained until released by such representative. Such fish or fishery product shall be detained in a suitable manner to prevent decomposition and the costs thereof shall be borne by the owner thereof. All official marks may be required by such representative to be removed from such article before it is released unless it appears to the satisfaction of the Secretary that the article is eligible to retain such marks.

"(d) INSPECTION EXEMPTIONS.—(1) The provisions of this subpart shall not apply to the processing by any person of fish of his own raising or harvesting, and the preparation by him and transportation in commerce of the

fish or fishery products exclusively for use by him and members of his household and his nonpaying guests and employees, if such person does not engage in the business of buying or selling any fish or fishery products capable of use as human food.

"(2) The Secretary may, by regulation and under such conditions as to sanitary standards, practices, and procedures as he may prescribe, exempt from specific provisions of this subpart retail dealers with respect to fishery products sold directly to consumers in individual retail stores, if the only processing operations performed by such retail dealers are conducted on the premises where such sales to consumers are made. The Secretary may suspend or terminate any such exemption at any time with respect to any person, upon a finding that the conditions of exemption, prescribed by regulations, are not being met.

"(3) The Secretary may by regulation, under such conditions as to sanitary standards, practices, and procedures as he may prescribe, exempt from the requirement of continuous inspection imposed by the first sentence of section 410(d) any establishment, known in the trade as a 'fish house', in which no processing of fish or fishery products is performed except (A) the unloading of fresh whole fish from vessels into appropriate bulk containers, (B) icing or other refrigeration of such fish, and (C) prompt ship-

ment thereof either (i) to an establishment subject to continuous inspection or (ii) to a retail dealer described in paragraph (2) of this subsection.

"(e) PROCESSORS OF INDUSTRIAL FISHERY PRODUCTS AND RELATED INDUSTRIES.—Inspection shall not be provided under this subpart of any establishment or vessel processing fish and fishery products which are not intended for use as human food, but such articles shall, prior to their offer for sale or transportation in interstate commerce, unless naturally inedible by humans, be denatured or otherwise identified as prescribed by regulations of the Secretary to deter their use for human food. No person shall buy, sell, transport, or offer for sale or transportation or receive for transportation, in commerce, or import, any fish or fishery products which are not intended for use as human food unless they are denatured or otherwise identified as required by the regulations of the Secretary or are naturally inedible by humans.

"OPPORTUNITY FOR HEARING AND JUDICIAL REVIEW OF DENIAL, WITHHOLDING, SUSPENSION, OR WITHDRAWAL OF CERTIFICATES AND WITHHOLDING OF APPROVAL OF LABELING OR PACKAGING; REGULATIONS

"SEC. 412. (a) OPPORTUNITY FOR HEARING.—(1) Any person denied a certificate under section 410(b) or 411(a), or whose certificate has been suspended or who has been denied reinstatement under section 410(c), or who

has been refused the official mark for proposed labeling or packaging under section 410(f), or from whom it is proposed to withdraw a certificate under section 411(a), may file objections thereto with the Secretary, specifying with particularity reasonable grounds for his objection, and request a hearing upon such objection. The Secretary shall afford an opportunity for a hearing on such objections, and shall expedite such hearing upon request. As soon as possible after the hearing, the Secretary shall act upon the objections.

"(2) Such order shall be based upon a fair evaluation of the entire record at such hearing, and shall contain findings of fact and conclusions on which the Secretary's action was based.

"(3) The Secretary shall grant such interim relief from any order suspending or withdrawing a certificate as he finds justified upon considering the interests of the person holding the certificate and the necessity for protection of the public health and the interest of consumers.

"(b) JUDICIAL REVIEW.—(1) Any person adversely affected by the Secretary's action on his objections may obtain judicial review by filing in the United States court of appeals for the circuit in which he resides or has his principal place of business, within sixty days after the entry of the Secretary's order, a petition for judicial review.

"(2) A copy of the petition shall be transmitted by the clerk of the court to the Secretary, and the Secretary shall file in the court the record of the proceeding. The findings of the Secretary with respect to questions of fact shall be sustained if based upon a fair evaluation of the entire record.

"(3) The judgment of the court affirming or setting aside, in whole or in part, any order under this section shall be final subject to review by the Supreme Court of the United States upon certiorari or certification as provided in section 1254 of title 28 of the United States Code.

"(c) REGULATIONS.—Any regulation proposed or issued under this subpart and any amendment or modification of any such regulation shall be subject to the provisions of section 701 (e), (f), and (g) of this Act.

"Subpart 2—Federal and State Cooperation

"SEC. 421. (a) It is policy of the Congress to protect the consuming public from fish and fishery products that are adulterated, misbranded, or otherwise in violation of this Act, and to assist in efforts by State and other government agencies to accomplish this objective. In furtherance of this policy:

"(1) The Secretary is authorized, whenever he determines that it would effectuate the purposes of this Act, (A) to cooperate with the appropriate State agency in developing and administering a State fish and fishery

products inspection program in any State which has enacted at State fish and fishery products inspection law that imposes mandatory inspection, reinspection, and sanitation requirements that are at least equal to those under subpart 1 of this part, and provisions of this Act related to such subpart, with respect to all or certain classes of persons engaged in the State in processing fish and fishery products for use as human food solely for distribution within such State; and (B) to cooperate with the appropriate State agency in the development of an effective State program (described in a State plan approved on an annual basis by the Secretary as meeting standards established by him) for the classification and control of shellfish growing areas and for regulation and control of shellfish harvesting practices, including shellfish intended for introduction into interstate commerce.

"(2) Cooperation with State agencies under this section may include furnishing to the appropriate State agency (A) advisory assistance in planning and otherwise developing an adequate State program under the State law, and (B) technical and laboratory assistance and training, including necessary curricular and instructional materials and equipment, and financial and other aid for administration of such program. Grants to any

State under this section from Federal funds for any fiscal year shall not exceed 50 per centum of the estimated total cost of the cooperative program in such State. Such cooperation and payment shall be contingent at all times upon the administration of the State program in a manner which the Secretary, in consultation with the appropriate advisory committee appointed under paragraph (3), deems adequate to effectuate the purpose of this section.

"(3) The Secretary may appoint advisory committees consisting of such representatives of appropriate State agencies and representatives of consumers and industry as the Secretary and the State agencies may designate to consult with him concerning State and Federal programs with respect to fish inspection and other matters within the scope of this part, including evaluating State programs for purposes of this part, and obtaining better coordination and more uniformity among the State programs and between the Federal and State programs and adequate protection of consumers.

"(b) The appropriate State agency with which the Secretary may cooperate under this subpart shall be a single agency in the State which is primarily responsible for the coordination of the State programs having objectives similar

to those under this Act: *Provided*, That with respect to the shellfish control program referred to in clause (B) of paragraph (1) of subsection (a) such State agency may, in the case of a State in which different functions of its shellfish control program are vested in different State agencies, be an interdepartmental agency if found by the Secretary to be consistent with the purposes of this Act, including this part. When the State program includes performance of certain functions by a municipality or other subordinate governmental unit, such unit shall be deemed to be a part of the State agency for purposes of this section.

"SEC. 422. (a) (1) If the Secretary believes, by thirty days prior to the expiration of two years after the effective date of regulations promulgated under this Act, that a State has failed to develop or is not enforcing, with respect to all establishments within its jurisdiction at which fish or fishery products are processed for use as human food for distribution solely within the State, inspection, reinspection, and sanitation requirements at least equal to those imposed under subpart 1 of this part and other provisions of this Act related to such subpart, he shall promptly notify the Governor of the State of this fact. If the Secretary determines, after consultation with the Governor of the State, or representative selected by him, that such requirements have not been developed and activated, he shall promptly after the expiration of such two-

year period designate such State as one in which the provisions of such subpart 1 and related provisions of this Act shall apply to operations and transactions wholly within such State: *Provided,* That if the Secretary determines that there is reason to believe that the State will activate such requirements within one additional year, he may delay such designation for that period, and he shall in that event not designate the State if he further determines at the end of that period that the State then has such requirements in effective operation.

"(2) The Secretary shall publish any such designation in the Federal Register and, upon the expiration of thirty days after such publication, the provisions of subpart 1 and other provisions of this Act related thereto shall apply to operations and transactions and to persons engaged therein in the State to the same extent and in the same manner as if such operations and transactions were conducted in or for interstate commerce.

"(3) Notwithstanding any other provision of this subpart, if the Secretary determines, at any time prior to designation of a State under this section, that any establishment within a State is producing adulterated fish or fishery products for distribution within such State which would clearly endanger the public health, he shall, with a view to achievement of effective action under State or local law, notify the

Governor of the State and the appropriate advisory committee provided under this subpart of such fact. If the State does not take action to prevent such endangering of the public health within a reasonable time after such notice, as determined by the Secretary in the light of the risk to public health, the Secretary may forthwith designate any such establishment as subject to the provisions of subpart 1 and related provisions of this Act, and thereupon the establishment and operator thereof shall be subject to such provisions as though engaged in interstate commerce until such time as the Secretary determines that such State has developed and will enforce requirements at least equal to those imposed under such provisions.

"(b) Whenever the Secretary determines that any State designated under this section has developed and will enforce State fish inspection requirements at least equal to those imposed under subpart 1 and related provisions of this Act with respect to the operations and transactions within such State which are regulated under this subsection, he shall terminate the designation of such State under this section, but this shall not preclude the subsequent redesignation of the State at any time upon thirty days' notice to the Governor and publication of such notice in the Federal Register, and any State may be designated upon such notice and publication at any time after the period specified in this

subsection, whether or not the State has theretofore been designated upon the Secretary determining that it is not effectively enforcing requirements at least equal to those imposed under such subpart and related provisions.

"(c) The Secretary shall promptly upon enactment of this subpart 2, and periodically thereafter but at least annually, review the requirements, including the enforcement thereof, of the States not designated under this section, with respect to the processing of fish or fishery production and inspection of such operations.

"STATE JURISDICTION

"SEC. 423. Requirements within the scope of subpart 1 of part B of this chapter with respect to any establishment or vessel at which a certificate of registration is required under subpart 1 of this part, which are in addition to or different from those made under such subpart may not be imposed by any State, except that any such jurisdiction may impose recordkeeping and other requirements within the scope of section 411 (b) with respect to any such establishment. Marking, labeling, packaging, or ingredient requirements in addition to, or different from, those made under this Act may not be imposed by any State with respect to articles processed at any establishment or vessel in accordance with the requirements under such subpart, but any State may, consistent with the requirements under this Act, exer-

cise concurrent jurisdiction with the Secretary over articles inspected under such subpart, for the purpose of preventing the distribution for human food purposes of any such articles which are adulterated or misbranded and are outside of such an establishment, or, in the case of imported articles which are not at such an establishment, after their entry into the United States. Nothing in this section shall be construed to preclude the establishment and operation and enforcement of a State shellfish program (meeting Federal standards and administered under an annual plan approved by the Secretary) for classification and control of growing areas and for regulation and control of harvesting practices for shellfish, including shellfish intended for introduction in interstate commerce. This Act shall not preclude any State from making requirements or taking other action, consistent with such subpart, with respect to any other matters not regulated thereunder.

INTERDEPARTMENTAL COOPERATION

"SEC. 424. (a) There shall be consultation between the Secretary and the Secretary of the Commerce prior to the issuance of standards under this Act applicable to fish or fishery products. There shall also be consultation between the Secretary and an appropriate advisory committee provided for in this Act, prior to the issuance of such standards

under this Act, to avoid, insofar as feasible, inconsistency between Federal and State standards.

"(b) For the purpose of facilitating enforcement and reducing the costs thereof, the Secretary may utilize by agreement, with or without reimbursement, law enforcement officers or other personnel and facilities of other Federal agencies to carry out the provisions of this Act. The Secretary is also encouraged to enter into agreements or other arrangements, with or without reimbursement, with any State in carrying out the provisions of this Act, including enforcement."

OTHER LAWS

SEC. 105. (a) Notwithstanding any other provisions of law, the amendments made by this Act shall not derogate from any authority conferred upon any Federal officer, employee, or agency by the Federal Food, Drug, and Cosmetic Act prior to enactment of this Act, by the Fair Packaging and Labeling Act, by the Public Health Service Act, or by any other Act.

(b) Continuous inspection under, and compliance with the requirements prescribed by or pursuant to, the Federal Food, Drug, and Cosmetic Act (including the amendments

made thereto by the Wholesome Fish and Fishery Products Act) with respect to fish and fishery products shall not exempt any person from any liability under common or State law.

COMPTROLLER GENERAL OF THE UNITED STATES,
Washington, D.C., April 29, 1971.

XXXXXXXX

HON. WARREN G. MAGNUSON,
Chairman, Committee on Commerce,
U.S. Senate

DEAR MR. CHAIRMAN: By letter of February 24, 1971, you requested our comments on S. 296, 92d Congress.

S. 296 is a bill to protect consumers and to assist the commercial fishing industry by providing for the inspection of establishments processing fish and fishery products in commerce, and to amend the Fish and Wildlife Act of 1956 to provide technical and financial assistance to the commercial fishing industry in meeting such requirements. The bill, if enacted, would be cited as the "Fishery Products Protection Act of 1971."

While we have no special information as to the advantages or disadvantages of this measure, we offer the following comments on specific provisions of the bill.

We are also submitting comments on a similar measure, S. 700, a bill to regulate interstate commerce by strengthening and improving consumer protection under the Federal Food, Drug, and Cosmetic Act with respect to fish and fishery products, including provisions for assistance to and cooperation with the States in the administration of their related programs and assistance by them in the carrying out of the Federal program, and for other purposes. S. 700, if enacted, would be cited as the "Wholesome Fish and Fishery Products Act of 1971."

S. 296 provides that the Secretary of Commerce would administer similar inspection activities to those that S. 700 would assign to the Secretary of Health, Education, and Welfare (HEW). Presently, the Secretary of Commerce through the National Marine Fisheries Service administers a voluntary inspection service where inspections of processing plants are made at the request of the processor. Inspection services being administered by the Secretary of HEW through the Food and Drug Administration are made at the processor's plants at the discretion of the Secretary of HEW. Due to the potential overlap or duplication of inspection services, the committee may wish to consider the need for two Federal agencies to be involved in similar inspection activities.

Section 2 of S. 296 and section 101 of S. 700 provide definitions for terms included in the two bills. We note that the following terms, "fish," "fishery product[s]," "process, processed, processing," "inspector," "official [inspection] mark," "establishment," and "vessel [of the United States]" are defined in both bills but with slightly different definitions. We suggest that the committee consider the desirability of having the same definitions in each bill.

Section 2(3) of S. 296 provides that the term "Secretary" means the Secretary of the Interior acting through the Bureau of Commercial Fisheries. On October 3, 1970, the Bureau of Commercial Fisheries became part of the National Marine Fisheries Service of the newly established National Oceanic and Atmospheric Administration within the Department of Commerce. Therefore, the bill should be revised to provide that the term "Secretary" means the Secretary of Commerce acting through the National Marine Fisheries Service.

Section 16 of the bill would provide that the cost of inspection rendered under the requirements of this act shall be borne by the United States, except that the cost of overtime and holiday work performed in official establishments or on vessels of the United States shall be borne by the owner or person in charge of such establishments or vessels at such rates as the Secretary may determine. This language is basically identical with the first sentence of section 19 of Public Law 85–172, which provides for the compulsory inspection of poultry and poultry products by the Department of Agriculture. We assume that the first sentence of section 16, with respect to overtime and holiday work, is intended to assure that rates of overtime and holiday pay to be charged processing establishments be set at a reasonable uniform rate instead of being computed on an individual basis: that holidays to be counted, with respect to Federal employees, are those which apply to Federal civil service employees either by law or by Executive or administrative order; and that holidays to be counted with respect to State employees will be those legally observed by employees of that State. (*Cf.* House Report No. 1170, 85th Congress, first session, p. 13.)

On page 10, line 9, of the bill the word "a" should be inserted after the word "that."

On page 15, line 15, of the bill the word "transporting" could be eliminated since it is included in the definition of the term "processing."

Sincerely yours,

ROBERT F. KELLER,
Assistant Comptroller General of the United States.

DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D.C., April 12, 1971.

Hon. WARREN G. MAGNUSON,
Chairman, Committee on Commerce,
U.S. Senate

DEAR MR. CHAIRMAN: We appreciate this opportunity to respond to your request of March 3, 1971, for a report on S. 700, a bill to regulate interstate commerce by strengthening and improving consumer protection under the Federal Food, Drug, and Cosmetic Act with respect to fish and fishery products, including provision for assistance to and cooperation with the States in the administration of their related programs and assistance by them in the carrying out of the Federal program, and for other purposes.

This Department recommends enactment of S. 700, the Wholesome Fish and Fishery Products Act of 1971.

S. 700 is identical to draft legislation submitted to the Congress by the Secretary of Health, Education, and Welfare to implement the recommendations of the President in his message of January 26, 1971. It provides for a system of continuous surveillance and for continuous in-plant vessel inspection, when deemed necessary by the Secretary of Health, Education, and Welfare. Additionally, the bill proposes to establish a National Advisory Committee composed largely of private citizens so that consumers may have a more significant role in the policymaking and evaluation of the adequacy of the inspection program. It authorizes the Secretary of Health, Education, and Welfare, at his discretion, to provide for the sampling, detention, and reinspection of fish and fishery products. Foreign inspection procedures would be required to be at least equal to those imposed on the domestic fishing industry.

The Office of Management and Budget advises that the enactment of this proposed legislation would be in accord with the President's program.

Sincerely,

J. PHIL CAMPBELL,
Under Secretary.

COMPTROLLER GENERAL OF THE UNITED STATES,
Washington, D.C., April 29, 1971.

Hon. WARREN G. MAGNUSON,
Chairman, Committee on Commerce,
U.S. Senate

DEAR MR. CHAIRMAN: By letter of March 3, 1971, you requested our comments on S. 700, 92d Congress, which if enacted would be cited as the "Wholesome Fish and Fishery Products Act of 1971."

Whether there should be mandatory inspections of fish and fishery products moving in interstate commerce is a policy matter for determination by the Congress. However, since S. 700 would provide for mandatory inspection of fish and fishery products comparable to that existing for meat and poultry, we believe that the committee should consider the overall provisions of the Federal Meat Inspection Act and the Poultry Products Inspection Act in order to equitably regulate and uniformly administer, to the extent possible, the three separate inspection programs.

Section 410(i)(1), page 16, provides, in part, that in the case of foreign countries, if the Secretary can determine that the system of plant and vessel inspection of fish and fishery products is at least equal to the provisions of S. 700, and reliance can be placed on certificates required by regulation of the Secretary as to compliance, the Secretary may accept such certificates as compliance with the comparable requirements, provided that the products covered by such certificates are properly marked and labeled as required by regulations for imported articles. It should be noted that the Federal Meat Inspection Act appears to provide greater protection for consumers in that 21 U.S.C. 620(a) provides for the Secretary to certify that foreign plants exporting meat or meat products to the United States have complied with requirements at least equal to all the inspection, building construction standards, and all other provisions of the act, whereas under S. 700 the Secretary only has to make a determination as to the foreign country's overall inspection system.

Section 431(a), page 33, provides that there shall be consultation between the Secretary and the Secretary of Commerce, and any other interested agencies, prior to the issuance of standards under this act applicable to fish or fishery products. The committee may wish to be more explicit and add the Secretary of Agriculture to this section because of that Department's experience in administering the comparable inspection programs for meat and poultry.

Section 432 would authorize the Secretary to make grants to public or private agencies and individuals. We suggest that a provision for maintenance and access to adequate cost records be inserted in the bill. Language similar to 42 U.S.C. 295h–5, with minor revisions, would accomplish this purpose.

We suggest that there be included in the bill a provision authorizing appropriations to carry out its various purposes.

Sincerely yours,

ROBERT F. KELLER,
Assistant Comptroller General of the United States.

DEPARTMENT OF STATE,
Washington, D.C., April 16, 1971.

Hon. WARREN G. MAGNUSON,
Chairman, Committee on Commerce,
U.S. Senate

DEAR MR. CHAIRMAN: I refer to your letter of March 3, 1971, to Secretary Rogers in which you requested the views of the Department of State on S. 700, a bill "To regulate interstate commerce by strengthening and improving consumer protection under the Federal Food, Drug and Cosmetic Act with respect to fish and fishery products, including provision for assistance to and cooperation with the States in the administration of their related programs and assistance by them in the carrying out of the Federal program, and for other purposes."

S. 700 is identical to draft legislation submitted by the Secretary of Health, Education and Welfare to implement the recommendations made by the President in his message of January 26, 1971. The Department supports the objective of ensuring the wholesomeness of fishery products sold in the United States. S. 700 would accomplish this objective and at the same time permit the importation of fishery products to continue provided that they conform to the relevant United States standards applying to domestically produced fishery products. Accordingly, the Department recommends enactment of S. 700.

The Office of Management and Budget advises that from the standpoint of the Administration's program there is no objection to the submission of this report and that enactment of S. 700 would be in accord with the program of the President.

Sincerely,

DAVID M. ABSHIRE,
Assistant Secretary for Congressional Relations.

UNITED STATES OF AMERICA,
GENERAL SERVICES ADMINISTRATION,
Washington, D.C., May 24, 1971.

Hon. WARREN G. MAGNUSON,
Chairman, Committee on Commerce,
U.S. Senate,
Washington, D.C.

DEAR MR. CHAIRMAN: Your letter of March 3, 1971, requested the views of the General Services Administration on S. 700, 92nd Congress, a bill "To regulate interstate commerce by strengthening and improving consumer protection under the Federal Food, Drug, and Cosmetic Act with respect to fish and fishery products, including provisions for assistance to and cooperation with the States in the administration of their related programs and assistance by them in the carrying out of the Federal program, and for other purposes."

S. 700 is identical to draft legislation submitted to the Congress by the Secretary of Health, Education, and Welfare to implement recommendations made by the President in his message of January 26, 1971.

Accordingly, we recommend enactment of S. 700.

The Office of Management and Budget has advised that there is no objection to the submission of this report to your Committee, and that enactment of S. 700 would be in accord with the program of the President.

Sincerely,

HAROLD S. TRIMMER, JR.,
Assistant Administrator.

DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D.C., May 19, 1971.

Hon. WARREN G. MAGNUSON,
Chairman, Committee on Commerce,
U.S. Senate

DEAR MR. CHAIRMAN: This responds to your request of April 21, 1971, for a report on S. 1528, the proposed "Wholesome Fish and Fishery Products Act of 1971."

Although this Department favors the objectives of legislation designed to offer additional protection to consumers of fish and fish products, we recommend enactment of a similar but more comprehensive bill S. 700 in lieu of S. 1528. The Department's report recommending enactment of S. 700 was submitted to your Committee on April 12, 1971.

The Office of Management and Budget advises that there is no objection to the presentation of this report and that enactment of S. 700 would be in accord with the President's program.

Sincerely,

J. PHIL CAMPBELL,
Under Secretary.

Senator HART. To help identify the actual extent of these dangers, the subcommittee has invited Dr. Roger Herdman, deputy director of the New York State Department of Health as our first witness.

Dr. Herdman is invited to come forward.

I would ask the able Senator from Oregon if he would like to make some comment.

Senator HATFIELD. No. Thank you, Mr. Chairman.

STATEMENT OF DR. ROGER C. HERDMAN, DEPUTY COMMISSIONER FOR RESEARCH AND DEVELOPMENT, NEW YORK STATE DEPARTMENT OF HEALTH

Dr. HERDMAN. My name is Dr. Roger C. Herdman. I am deputy commissioner for research and development with the New York State Department of Health.

I am here today at your invitation to discuss the complex relationship between the problem of microchemical contamination of our environment and human symptomatology. I will also explain the fish consumption guideline we have developed in New York State which promises to safeguard human health while permitting limited eating of sport fish taken from the State's lakes and streams.

Pinpointing the precise nature of the hazards that these toxic materials pose to human health, and finding means to counteract or eliminate them, will continue to be a grave challenge to our scientists—and to our national will to support their research.

To illustrate the difficulty of that challenge, I will cite some of the details surrounding what we believe to be the first case of human illness in this Nation directly attributable to mercury poisoning from ordinary marketable food—in this case swordfish.

In early March 1971, Mrs. N. Y., 44 years of age, who resides in Long Island, wrote to the New York State Department of Health concerning her history of prolonged ingestion of swordfish as part of a rigorous weight-reduction program. A department of health epidemiologist suggested that she submit a hair sample for mercury determination. This was done; and the report from the laboratory, dated April 8, indicated a level of 42 parts per million—average of two determinations.

On April 15, a physician from the New York State Department of Health visited Mrs. Y. in her home. He found Mrs. Y. to be an intelligent, interested, and conscientious individual. Her memory of details seemed accurate and was not apparently biased by her limited reading about the mercury problem.

Mrs. Y. said that in September 1964, she became rigidly committed to a program for watching her weight. She was then 38 years old and weighed 165 pounds, height 5 feet 2½ inches. At that time, she started a diet which included 6 ounces of swordfish for dinner and 4 ounces for lunch. (This was the weight after cooking of approximately 12½ ounces wet weight of swordfish.) This diet was then supplemented with shrimp and was consumed daily without interruption until July 1965. During this period, she achieved her objective of losing 45 pounds.

At that time, she had some minor symptoms of lethargy, headache, visual complaints, and tremor that became more extreme later. However, she attributed these to the large weight loss.

Since 1965, her usual diet has been interrupted two to three times a year for another trial of 3 to 6 weeks of the swordfish regimen described previously. Her last episode was in November 1970, for 4 weeks. The swordfish was almost entirely fresh and purchased from the same fish market.

Beginning in May 1966, she noted the following symptoms which persisted over the next several years: (1) dizziness; (2) loss of memory; (3) tremor of the hands; (4) quiver of the tongue; (5) hypersensitivity to light and difficulty focusing; (6) difficulty walking down stairs due to uncertainty as to which foot should take the next step; (7) difficulty in understanding what she was reading; (8) difficulty in speaking, mispronunciation of words; and (9) handwriting.

At the present time, these signs and symptoms have receded, although she feels she is still not her former athletically active self, and to some slight extent she still has a few symptoms. She also recollects that the syndrome was accentuated after the periods of swordfish diet.

In June 1966, Mrs. Y. was admitted to the Neurological Institute in New York City because of the previously mentioned complaints. Although the workup at the time did not focus on a toxic episode since the staff considered her complaint to be psychogenic in origin, her broad-based awkward locomotion was noted.

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An electroencephalogram was read as normal at rest, but showed bilateral slowing of brain waves with occasional spikes on hyperventilation. She was signed out as suffering from psychosomatic complaints and it was suggested that she seek psychiatric consultation which she did weekly for the ensuing 2½ years with no obvious benefit.

Recently, the senior neurologist at the Neurological Institute was asked to review Mrs. Y.'s record. In his opinion, her symptomatology was not neurotic in origin but, more likely, indicated organic disease.

A second hair sample was taken from Mrs. Y. at the time of the April 15 interview. This hair sample, divided into three segments—scalp, middle, and tip, gave the following results, respectively: 35, 30, and 39 parts per million. Whole blood showed 6 micrograms of mercury per 100 milliliter (0.06 parts per million, 60 parts per million) (normal blood less than 1 microgram per 100 milliliter, normal hair less than 3 parts per million).

The FDA has apparently agreed with the results of Swedish studies which set the lowest whole blood concentration at which toxic symptoms occur at 20 micrograms per 100 milliliter. This level is associated, on the basis of a steady intake, with 60 parts per million in hair and a daily intake of 300 micrograms for a 154-pound human.

Applying the standard tenfold safety factor gives the following safe levels: For whole blood, 2 micrograms/100 milliliter; hair, 6 parts per million; an allowable daily intake of 0.5 parts per million concentration of mercury in fish. At this level, the allowable daily intake of 30 micrograms per day is exceeded after consumption of 2½ ounces of fish (e.g. tunafish), and a food faddist might exceed the toxic level by consuming 22 ounces per day of fish at this level—admittedly a high, but not impossible, daily intake.

Swordfish is known to average approximately 1.0 parts per million of mercury. At this level, Mrs. Y., consuming 12½ ounces per day, ingested 355 micrograms of mercury each day. It appears, then, that Mrs. Y., over a very prolonged period of time, ingested an amount of mercury which world experts assume to be sufficient to cause toxic symptoms.

Mrs. Y.'s clinical picture was consistent with the symptoms described for methylmercury poisoning. Mrs. Y.'s symptoms have disappeared following cessation of her unusual dietary habits. However, mercury levels in her whole blood and hair, even 4 to 5 months after last exposure, were markedly above normal and approached the toxic range.

Mrs. Y.'s story lacks the following essential information. We do not have mercury determinations at the time of illness to actually demonstrate toxic levels. A really thorough clinical study was not done with such important information as visual fields and electomyography. Certain neurological changes were either not looked for or not present.

The lack of these data make a precise diagnosis impossible. At present, however, on the basis of the real evidence at hand—most particularly the actual mercury levels, the best medical judgment must be that Mrs. Y. suffered an episode of methylmercury poisoning subsequent to ingestion of swordfish. Such episodes have been possible

with high quantity ingestion of certain mercury-containing foods by food faddists. However, they undoubtedly are rare since determined searches for such individuals by the New York State Department of Health have not been successful.

The sport fish consumption guideline we have developed for New York State is an example of applied research leading to at least a useful and practical solution to one microchemical pollution problem. As a result, New York State, which is blessed with thousands of lakes and streams, will be able to continue to provide recreation and sport fishing for millions of people. As you know, it is not uncommon to find some fish carrying methylmercury burdens above the FDA-recommended limit of 0.5 parts per million in many waters. Moreover, the bigger the fish—the "keepers" in fisherman's parlance—the more likely it is to be carrying up to 1 part per million mercury, or twice the FDA guideline.

A number of conflicting needs and problems, then, must be reconciled for effective regulation in a State such as New York. On the one hand, there is the desire not to unnecessarily destroy a large and thriving recreational industry. On the other hand, there is concern for public health, not only for the obvious toxic episodes such as the one illustrated by the case I have described here, but for the problems of repeated low-level insults incident to consuming small quantities of the toxic material; the question of additive effects of mercury and other toxic materials in fish; the possibility that certain members of the population may be more susceptible because of compensated central nervous system disease, secondary to infectious agents, birth trauma, and the like; the known increased susceptibility of the human fetus; and the likelihood that a very small percentage of the population may have unusual food habits which lead them to consume vastly greater quantities of the potentially hazardous food than does the general public.

To protect both the health and the economy of the citizens of the State, New York decided that in the light of the potentiality for toxicity due to high-level consumption of fish even within the FDA guideline, and the certainty that many individuals were eroding into the safety factor between the allowable daily intake and the toxic levels at the FDA guideline, it would be reasonable to allow consumption of fish averaging up to 1.0 part per million which would include the overwhelming majority of all fish caught for sport in New York State, if the frequency were limited to one meal per week. At one meal a week it would be impossible for anyone to consume enough fish at the mercury concentrations known to be present in fish in New York to suffer adverse effects. The only exception in our guideline applies to pregnant women who are advised not to eat any fresh water fish until more is known about the effect of methylmercury on fetal brain tissue.

We are concerned that the recommendation on one meal per week for sport fishermen may not be followed. Furthermore, of course, we must always be generally dissatisfied with regulations which permit the consumption by the general population of any potentially toxic materials at all, especially when there may be some few highly susceptible individuals in the population.

The uncertainties, unknowns, and problems associated with the present position that regulatory agencies find themselves in regard to mercury stresses the need for further knowledge.

New York State has begun studies in pregnant monkeys to check for toxic effects on the developing fetus and is currently in the planning and grant application state of large-scale, long-range studies with rhesus monkeys and, ultimately, with chimpanzees in which psychological and behavioral testing at various body burdens of methylmercury can be carried out, maternal brain versis fetal brain levels can be studies to learn about placental transfer, and actual structural changes in brain and nerve can be correlated with blood levels, hair levels, and other factors associated with symptomatology. It is hoped that all of the necessary questions can be answered in species which are as close to humans as possible.

We feel that only by this approach will the necessary knowledge be at hand to deal with the toxicological problems associated with methylmercury over the many years this toxic substance will be in our food and environment.

This is really the crucial point. We do need more information.

I have been asked to comment on the new provisions in the legislation concerning the testing of fish, and I have gathered the following information.

What I can say in general is that this provision will be an expensive one. I have some information on what it costs us to test for mercury, and in our laboratory which is set up to do about 25,000 mercury determinations of fish each year, which is a reasonably large size operation and should have efficiency associated with a large operation, it still runs about $4 per examination.

There are 47 wholesalers in New York State that deal with fish, and I am sure that there are a number of these operations elsewhere in the country. Many of the New York State operations are quite small. As a matter of fact, about half of them employ less than 10 people.

So I think that the provision for testing fish at the wholesalers or dealers is one that is a matter of priorities. I hope that part of the priority system will involve support for gathering more information on the biology of these problems.

Thank you.

Senator HART. Doctor, thank you. Given your background as well as your familiarity with this one very dramatic example of what we are trying to safeguard Americans from, the subcommittee would appreciate an opportunity to ask you some questions. But a distinguished Member of the Senate from Massachusetts, Mr. Kennedy, is here, and if you would, Doctor, just step aside until we can hear from Senator Kennedy.

We welcome the Senator from Massachusetts for the reason, among others, that he has introduced a bill which carries the number S. 296, to protect the consumers of this country and to assist the commercial fishing industry; he represents both in Massachusetts. I am delighted that he would find time in his schedule to give us his suggestions.

STATEMENT OF HON. EDWARD M. KENNEDY, U.S. SENATOR FROM MASSACHUSETTS

Senator KENNEDY. Thank you very much, Mr. Chairman.

I first of all want to commend you, Mr. Chairman, and this committee for the leadership you have provided in this whole area. Your legislation was introduced some 3 to 4 years ago; you have held hearings on this subject. It has been a source of strength to all of us who live in the maritime States to recognize your leadership in this area, along with Senator Magnuson, Senator Cotton, and other members of the committee. Speaking for the people of Massachusetts and for myself I want to express appreciation for the hearings that you are having today and for the hope and the expectation of the legislation that will come from the results of this hearing.

I want also to indicate that I am honored to cosponsor the legislation which you have introduced. I think it is a farreaching piece of legislation, and I think it is well equipped to meet the problems of contamination of fish that have been confirmed by results that have been completed by technical people and by other consumer groups.

As you well understand, Mr. Chairman, the formulation of legislation which I have introduced consists principally of three parts: mandatory inspection of all fish and fish products to be put on the market; technical assistance grants to aid the fishermen and processors in meeting qualitative requirements; and strict labeling requirements for all imported fish (the technical assistance grants are) perhaps the one feature of the legislation which is different from your program, but one for which there is very considerable need.

The fishing industry, as you know, is extremely hard pressed to compete with heavily subsidized foreign fleets. If we establish additional requirements of qualitative controls and labeling we must recognize that it will prove to be an extraordinary burden upon an industry which today is literally fighting for its life. It is fighting for its life not only at the marketplaces of this country, but also out on the New England coast. As recently as 5:45 this morning 16 Russian ships ran through fixed lines of New England fishing boats. This action by the Russian ships follows the results of conversations that took place only yesterday. The initial reports on those conversations were somewhat hopeful. But, again many of us were cautioned by the fact that even though this was the first time that such conversations had taken place that the results are what count.

The preliminary reports of the action this morning indicate that the Russian ships failed to have their radars on, even though there are reflectors on the lobster pots and other gear and could have been able to be easily detected by the Soviet ships.

I am hopeful that the action that will be taken now will be moved certainly further be hopeful that as part of the Soviet determination that they will not continue in this transgression that they will offer some compensation to the injured fishermen. Compensation is recognized in international law and the law of the sea. The incidents that have been documented not only by these seamen, but by the Coast Guard, I think, make most compelling the case for the American fishing fleet.

Another feature of my legislation relates specifically to the problem of foreign competition it provides for strict labeling requirements which would insist on inspection and labeling of all fish and fish products marketed in this country by foreign fishing companies.

I might say, Mr. Chairman, in remarking on this field of legislation, the fishing people of Massachusetts want this legislation. At the present time they do not know when they go on out and fish in the Great Banks and when they go out into the sea if when they come back there will be a new consumer's report or a new study released, investigating metal contents or some other kind of contamination and making their catch virtually worthless in terms of the fishing markets of Massachusetts and New England.

They realize now, with so much concern that has been expressed by newspapers and congressional committees, that the best way that they are going to protect their interests is to have the kinds of inspection which have been suggested in this legislation. They are prepared, I believe, to live up to congressional requirements that are inherent in this kind of legislation. But they realize the importance of it. Without it, they know that the consumers of this country are going to be frightened to purchase fish. And they can see the ever-increasing spiral of disaster facing them in the future.

So, this is important legislation for them and for the future health of the industry.

I know I don't have to indicate the history of the industry particularly since the end of the Second World War. I know I don't have to indicate the nutritional potential of fish for the American consumers. And I know I don't have to review the reports and studies that have been done in the past; whether concerning frozen fish or raw breaded shrimp or whether it is cod or haddock or ocean perch, which are caught up in my part of the country, or whether it is canned salmon or salmon steaks that have been tested, this problem is a nationwide problem and affects not only the maritime states, but, of course, some of the heartland States of this Nation where commercial fishing is done.

I think we would have to realize, Mr. Chairman, that the existing regulations just can't begin to cope with problems of this magnitude.

Mandatory inspections are not carried out at the present time, but even in firms involved in interstate commerce. Of the more than 5,000 fish processing plants of the Nation, only about 2,200 are checked, even on a voluntary basis.

The Federal regulations just are not doing the job. Also, the voluntary program has standards of doubtful adequacy. Of 3,600 cans of fish, only three must be sampled. Of 20,000 units of frozen fish, only 13 must be sampled. Two of those 13 samples may fall below standards and the lot will still be accepted.

So the existing Federal regulations are completely inadequate to do the job.

The National Marine Fisheries Service operates this voluntary inspection service, but it has dual and perhaps contradictory purposes of promoting fish sales as well as eliminating unwholesome products. A subscriber pays a fee to have his plant and his product inspected. A seal of quality is then awarded if standards are met. The Bureau, however, has no powers of enforcement—and fish that is rejected may still reach the market.

And finally, States may exercise their authority in a limited sense under food inspection regulations to provide inspection services. Adequate surveillance of fishing techniques is carried out, as I understand, only in the states of Maine and California.

The Fisheries Products Protection Act states unequivocably that unwholesome and adulterated fish must not be permitted on the market shelves, and that the presence of such injurious products must be prevented by adequate detection and inspection procedures.

I think the time is long overdue, Mr. Chairman, to aid our fishing industry which must compete against the subsidized foreign fleets.

It would also provide in my legislation technical assistance loans of some $35 million to assist all the sectors of the commercial fishing industry to meet sanitation and quality control requirements. It would require a rigid labeling procedure of all foreign fish on the market today, would insure that imported products meet the same qualitative requirements that are imposed on domestic fishermen.

I hear time and time again about fish that come across the border maybe a number of days old and yet it is processed, stamped with a more recent mark and then distributed to compete with American fish that may be a day older in terms of its marked stamp, but in terms of when it is actually caught may be as much as a week or 2 weeks fresher. And this is disconcerting to housewives and to consumers and it puts the American product at an unfair disadvantage.

So, Mr. Chairman, I want to again thank you and commend you for this hearing and for the determination of this committee to come to grips with this problem. There is an extraordinary need among the fishing fleets which work in the areas of New England which have been depleted heavily in recent years. Still they are holding on and struggling against some of the most desperate kinds of foreign competition. They are still prepared to attempt to meet this competition, but they can't fight the dread of consuming housewives whose fears have been aroused by the almost weekly disclosure of new contaminants found in fish.

I think the best way that we can alleviate those fears is by having meaningful legislation which is before you this morning and to which I know that you will give quick and speedy consideration.

I want to thank you again for the chance to appear before you, and I appreciate the courtesy of the witness in letting me testify.

Senator HART. Let me thank you particularly for opening the hearings by indicating the several claims for affirmative action that are involved. It is a mix, it is a combination. First, and perhaps the one most emotionally appealing, is the need to protect the health of Americans and others who may consume our fish products.

But additionally you remind us that when we impose standards and require certain performance levels a burden is assigned to industry, which, as you have again reminded us, has been carrying the burden that has almost sunk the ship already. And the addition of your Section 7 with its assistance for the fishing industry I think is an appropriate obligation for the Federal Government to undertake. So you do put it in the balance.

And then you remind us that warfare goes on even now off the Massachusetts coast.

Senator STEVENS. And not just the Massachusetts coast, Mr. Chairman.

Senator HART. I was going to say off of Alaska.

Senator STEVENS. We lost the *Viking Queen* and the Alaska crab vessels to the Russian fleet just 3 weeks to a month ago, and I am sure that we have got to do something. I hope that we would include in some of this legislation a total conservation concept of a surveillance area as far as conservation is concerned. These people are destroying not only their own fields, but they are fouling our nets, too, by the methods they are using.

The Saltenstall-Kennedy Acts started the concept of assistance to the fishing industry. It is unfortunate we haven't continued it; and I am pleased to join with many of these bills because of our mutual interest.

We now have your New Bedford scallop fleet, as you know, in Kodiak, Alaska, and we have a mutuality of interest in this. I congratulate you for what you are doing.

Senator KENNEDY. Thank you.

Senator HART. And I know you fellows think the only maritime areas are on the three traditional seacoasts, the Atlantic, gulf, and Pacific. America has a fourth seacoast, the Great Lakes Basin. And I know from the experience described to me by fishing interests in the Great Lakes Basin the need for the kind of technical assistance that Senator Kennedy's bill provides.

Senator KENNEDY. Thank you very much.

Senator HART. I have often said—this is one of the clearest examples—America, legislatively at least, seems to respond to problems which of themselves ought to compel response only after the Russians are injected into a situation. Now all of a sudden the Russians are a menace on the sea as they were in our pursuit of the moon.

Doctor, thanks for your kindness in stepping aside.

You have described the case of a woman who, as you indicated, is not representative of the general population. Her diet would be considered not a normal diet. And yet we can't, and I know we won't, dismiss the story you tell us simply because it happens only a few times. Her illness is not just an individual's misfortune. You suggest there are bound to be others; if not many, there are others right now suffering perhaps as she has. And the story that you have told us drives home much more clearly than all the rhetoric that has been pumped up around here just what we are doing to ourselves as a people.

Now I would hope that having heard from you of a woman who just from consuming fish from our water winds up in the hospital with brain damage reminds us that there is an element of madness in our society, that this story will prod us into changing our ways, and that we will attempt to guard more effectively against the dangers with the several bills before us.

Now you say that Mrs. Y's symptoms have receded although she feels she is still not her former athletic self. First, do we yet know whether there has been any permanent damage?

Dr. HERDMAN. Well, we don't know absolutely. We have made arrangements for Mrs. Y to be reexamined to make an effort to nail this down pretty firmly.

I spoke with Mrs. Y. yesterday evening, and she still feels that she has remnants of the symptomatology which prompted her admission in 1966 and which she associates with her periods of dieting. There is still some dizziness occasionally, and as I mentioned in the written testimony, a feeling of not really being up to par, not being quite able to carry on the high level of activity which she did before. She is married, has several children. She was pretty active before she went on the diet. You have to take into account that she still has pretty elevated mercury levels. I am hopeful that perhaps she will really be in tiptop condition when they recede to normal. At present we couldn't say she hasn't suffered permanent damage. We couldn't say either way for sure.

Senator HART. What evidence is there for the suggestion that even if a woman exposed to mercury is asymptomatic her child may suffer from mercury poisoning?

Dr. HERDMAN. Well, I thing there is a good deal of actual evidence and there are a number of theoretical considerations which make this likely.

The obvious one everybody knows is the devastating effects which a number of conditions, such as German measles, have on the developing organ systems of a human fetus, while their effect on the mother is completely negligible. So I think we are dealing with a very sensitive indicator system here.

The facts of the matter are that there is information available to show that blood levels of mercury in the fetus are higher than the maternal blood levels, which indicate that the fetus might be accumulating mercury selectively. And there are quite a number of case reports of mothers who were exposed to mercury, methyl mercury, by eating fish who had no symptomatology, but yet who gave birth to very severely damaged infants.

Senator HART. Are the studies adequate to determine whether the woman was pregnant at the time of exposure to the mercury element or became pregnant after exposure, or does it make any difference?

Dr. HERDMAN. Well, theoretically, if the mother had accumulated a sufficient toxic body burden it really wouldn't make any difference when she became pregnant because this is a long-term residue in the body.

But some of the studies, for example, in pork in New Mexico—there is a whole myriad of experience here. The mother of a severely damaged infant was known to have started eating the pork which was contaminated when she was 3 months pregnant and known to have stopped eating it when she was 6 months pregnant. She had little or no symptomatology, and yet her child, who now I guess is something like 6 months of age, is very, very severely damaged.

Senator HART. As a means of attempting to strengthen the protection that all of us will obtain against this kind of damage one of the bills before us, S. 1528, would require FDA to conduct intensive screening for all dangerous materials. Let me ask this very explicitly: Do you think this desirable?

Dr. HERDMAN. I think some method of detecting, investigating health effects of dangerous materials in fish is certainly desirable. I

think it is reasonable, aside from any other conditions, scientifically reasonable to select fish because fish has been shown so many times to be a very sensitive indicator where environment pollutants concentrate so well.

So I think it is desirable. I am not sure I am wholly familiar with all the provisions of the legislation. So I wouldn't want to comment too specifically.

Senator HART. Well, without pinning you down then on proposed legislative language, let me turn to your field and ask you to tell us what kind of screening you think is feasible on a national basis for mercury and other toxic material.

Dr. HERDMAN. Well, let me just answer that by telling you what we do, which is clearly something that is feasible. The State has three agencies involved in its program, environmental conservation, agriculture and markets, and health. The health department does the biological investigation and the laboratory determinations, and with the help of environmental conservation and agriculture markets we screen fish, or the State screens fish as they appear on the wharves. You mention the Great Lakes. This is an area of concern, and there is mercury in fish in the Great Lakes. These fish are screened as they appear on the wharf, not every boatload, but samples from some boats. Fish entering the State from Canada or other States are selectively screened.

We have had a large program, some 3,000 or 4,000 fish from most of the major bodies of water in New York State have been analyzed for mercury, different species, to get a notion of what the problem might be. Now that we have a notion, I think we can focus in a little more selectively. This is a financial burden which the State has been able to assume. I see no reason why the Nation couldn't do similar.

Senator HART. You described a program which, to the credit of the State of New York, is responsibly directed and within limits adequately funded. Are there any other States which do the kind of job New York does?

Dr. HERDMAN. Not to my knowledge. Governor Rockefeller has been interested in this problem for some time. It has been part of his annual state of the State message, and so we have been doing this for, I think, longer. I am not aware of any State that has a program of this magnitude. I don't mean to say this in any pejorative sense. As far as I know, there are a number of States that do test. It is just a matter of degree.

Senator HART. But given the potential health threat and the sweep of fish in the flow of commerce and the track record of the States so far, do you recommend that the screening and testing program be national?

Dr. HERDMAN. Yes; I think that some States—I can mention a few besides New York—California and Massachusetts and Michigan have agencies which are of sufficient size and knowledgeable to deal with this. But I do think there will have to be some perhaps very significant Federal element in the program.

Senator HART. Doctor, this committee is fortunate to have a member who comes from a State where the fishing industry is of very great significance. I am delighted Senator Stevens is here.

Senator STEVENS. Thank you, Mr. Chairman.

Doctor, you are really sampling as the product comes into New York as opposed to the proposals in the bill, which is sampling before the fish product enters into commerce. Do you see any difference in the approach that you have used in New York and the approach that would have to be used in the canneries or in places where they process those fish?

Dr. HERDMAN. No; really actually we do the sample at the wharves. In many cases I think you have to sample at the wharf, at least on the Great Lakes where there is a relatively small operation, and they may not go through a central collecting point if you don't hail them down there.

I am not an expert in fishing, that sort of thing. I don't know much about the wholesale fish business at all. But it seems to me that is wouldn't be technically feasible in my State to have this any different.

Senator STEVENS. I think Senator Kennedy mentioned one of the problems which is contamination. For instance, in my area, we had a contaminated shipment detected in Seattle after it had come in from the Aleutians. It was from one of the cannery ships of which there are many. The whole catch had to be quarantined until they could locate the source of contamination. I wonder if you share Senator Kennedy's and my viewpoint that it would be more advantageous to have the inspection where the fish are caught or processed in the first instance rather than inspect them when it gets to the market.

Dr. HERDMAN. Well, I can speak just briefly to that. Our experience on the Great Lakes has been that with a little experience as time passes the fishermen begin to find out, and we begin to find out and tell the fishermen, what type, what size, and what location of catch will be the fish that are going to not be able to pass inspection. I don't know if that is true in ocean fishing or not. That would certainly make it a lot easier from a regulation standpoint if that were true for ocean fishing also. If it isn't so, then I can see it is a fairly different problem.

Senator STEVENS. I have just two more questions. Do you have any similar program for imported fish products that you have just described for the fresh fish products that come into New York?

Dr. HERDMAN. Agriculture and market does do inspections and surveillance of imports from Canada, for example.

Senator STEVENS. And were you able to identify, in terms of Mrs. Y, whether that was domestic caught swordfish or whether it was foreign caught swordfish?

Dr. HERDMAN. I can't answer that question. I don't know. I think we could identify that. We know where she bought it. She always buys it from the same fish market. That would be an interesting point to discover. I don't know.

Senator STEVENS. In all fairness, our fishermen say their major competitors are the foreign fishing fleets and they wonder what we are going to do to impose similar restrictions. We don't oppose these restrictions, but we want in all fairness to have equal restrictions placed on the foreign catch that enters this country.

Dr. HERDMAN. I would agree. I think most of the swordfish is by import.

Senator STEVENS. That is my understanding. I just wondered in this instance whether it was domestic or foreign.

Dr. HERDMAN. I don't know, to answer your question.

Senator HART. Mr. Bickwit.

Mr. BICKWIT. I would just like to clear up one matter. If I heard you correctly, there was some discrepancy between what you said and what your statement says here. Can you clarify for the record exactly how long Mrs. Y was on the intensive swordfish diet?

Dr. HERDMAN. I specifically asked her about this yesterday evening, and she began in September 1964 and she remained on it until just before the family left on vacation, which was in the middle of July or first part of August of 1965. That is really an error where it says May 1966; that should be July 1965. That would be a total of about 9 or 10 months, as an initial start. And then, thereafter, say on the average of about once every 4 months, she would be on for about—about 3 or 4 months out of the year every year thereafter.

Mr. BICKWIT. Starting in September 1964?

Dr. HERDMAN. Right, September 1964, continuing without interruption until July of 1964. I'm sorry—1965.

Mr. BICKWIT. Fine. Thank you.

Dr. HERDMAN. You can't go backwards. I am in error.

Senator HART. It's nice to discover that people are listening to you, isn't it?

Mr. BICKWIT. You say you are fearful that the fetus may be more sensitive to dosages of mercury than the mother carrying the fetus. Does that mean that although we are told that the level of mercury which is likely to bring about symptoms in a mother is 0.2 parts per million in her blood—does that mean that less than that might bring about symptoms in the fetus?

Dr. HERDMAN. I certainly think—well, what I am doing is speculating since we need experimental work to confirm this. I think the fact that the mother is symptom-free implies that the level is less than 0.2 parts per million. And we know that, at that level, the fetus is affected, and we also know that the fetus has a tendency certainly to have higher blood levels than the mother; so that we are confused as to whether the mother might be 0.15, let's say, and that would be the same as 0.2 in the fetus, and the mother would be protected from symptoms where the fetus might not be.

It would be hard to say that the fetus suffers damage at a lower level because we don't have the level. It would be fair to assume that, but you couldn't construct a theoretical model that would absolutely dictate that would have to be the case.

Mr. BICKWIT. Is that one of the things that a safety factor is supposed to take into account?

Dr. HERDMAN. Yes. You see, this is one of my concerns. This lady is a part of a national program for watching weight and they have recommended large consumptions of fish, which would be a very reasonable way to lose weight. And pregnant ladies are people who very frequently have weight problems and might naturally take part in such a program. Mrs. Y did it; just by chance she wasn't pregnant. She was young enough certainly to have a child. She had had children and she might have been pregnant.

Mr. BICKWIT. Do you think the safety factor that is now used by the FDA is an adequate safety factor?

Dr. HERDMAN. Well, I think that is an adequate safety factor if people would stick to it. But, unfortunately, the level of consumption is such that people constantly go over that factor. You have a perfect right to eat a pound of swordfish a day if you choose. So that people don't stick to it. That is what we are concerned about in New York, the one meal a week, we are afraid people won't stick with it. That is the problem.

Mr. BICKWIT. You say the allowable daily intake of 30 milligrams per day is exceeded after consumption of two and a half ounces of fish, for example, tunafish. Do many people eat two and a half ounces of tunafish per day?

Dr. HERDMAN. No, I don't think they do. I think the USDA figures on the average consumption of fish in the northeastern region, New York State region, was something like half a pound a week on the average. It certainly would be less than two and a half ounces a day.

Mr. BICKWIT. Do many weight watchers eat two and a half ounces of fish a day?

Dr. HERDMAN. I think they do. I would suspect they do. For example, a weight watcher who doesn't like fish, she knows she should eat fish because that is how you lose weight on the program, so she looks around for a fish that doesn't taste too fishy. It happens that she has enough funds to afford a swordfish diet, but if you don't like fish and you are looking around for a nonfishy fish I think tunafish would be a very logical choice that would combine taste and price for a person who wanted to lose weight.

Mr. BICKWIT. A fish that had 0.4 parts per million in it that was consumed by a weight watcher—about how many ounces of this fish would that weight watcher have to eat a day in order to reach dangerous levels?

Dr. HERDMAN. To get toxic levels—well, I figured it out to 0.5, and that was 22 ounces, so let's take 20 percent more, should be about 4 ounces—be about 26 ounces which would be a little over a pound and a half in a whole day. You could do that, but for safe levels you could eat about 3 ounces.

Mr. BICKWIT. Do many weight watchers eat 3 ounces?

Dr. HERDMAN. Some eat 10 ounces a day. So I presume they all eat more than 3 ounces.

Mr. BICKWIT. Doesn't this suggest that weight watchers right now who are eating only what FDA considers to be safe levels of mercury in tuna fish are in fact endangering themselves?

Dr. HERDMAN. It certainly suggests that they are exceeding the allowable daily intake each and every day.

Mr BICKWIT. Do you think you should advise them to that effect?

Dr. HERDMAN. Well, I think it is their privilege, I guess, to eat this amount, but I think they should be aware of it, they are going into the safety factor margin.

Senator STEVENS. Do you see an analogy between the cigarette problem and the problem of mercury content in terms of what Congress has done and what Government is doing in the fish area?

If we find a sampling that is bad, do we ban the whole product? In the cigarette area, we put a warning on the package. As a scientist, do you see any problems developing as to the different lines we are taking in dealing with the product?

Dr. HERDMAN. Well, there is a certain logical inconsistency there. We know that cigarette smoking is very hazardous to health and yet we just warn people about it. What you are saying is that we know that ingestion of contaminated fish is also hazardous to health if you eat enough of it and here we destroy or ban the product.

Senator HART. Doctor, thank you very much.

Dr. HERDMAN. You are welcome. Thank you.

Senator HART. Our next witness, is the man who I am advised first discovered a high level of mercury present in tuna fish, a professor of chemistry at State University of New York at Binghamton, Dr. Bruce McDuffie.

STATEMENT OF DR. BRUCE McDUFFIE, PROFESSOR OF CHEMISTRY, STATE UNIVERSITY OF NEW YORK AT BINGHAMTON

Dr. MCDUFFIE. I would like to thank the committee for holding these hearings. I realize that there are many crises that beset this Nation, and this may be a much more subtle thing than some of the crises we face, but I am glad that the Senate is taking up this question of dangerous or toxic substances in foods.

I wonder, should I read my whole statement or summarize?

Senator HART. Doctor, proceed as you think would be most helpful. We will order the statement printed in full in the record. While it is not a long one, it leaves some of the nontechnicians as you make your first turn. So if you could summarize it.

Dr. MCDUFFIE. Fine.

Our involvement in the mercury problem came as an offshoot of our studies of the Susquehanna River. Last fall we got around to analyzing some of these local freshwater fish for mercury because of the Great Lakes discoveries. And I did want to put in the record (appendix A of the statement) that we found concentrations of well over a half a part per million in some of these Susquehanna River fish, thus adding to the dimensions of the problem in New York State. Now it was an extension of that work that got us into the canned tuna, and then from that into the analysis of swordfish. The discovery of high concentrations of mercury in these fish led to widespread analysis with results of which the committee is familiar: As I understand it, millions of cans of tuna were found to be over 0.5 parts per million and were taken off the market or withheld from commerce, and swordfish, which tends to average around 1 part per million, is rapidly going off the market.

Let's put in a word here, though, for a lot of ocean fish that are low in mercury for example, as someone mentioned, cod and haddock and flounder. Much study needs to be done on the food chain for various types of ocean fish, but we wouldn't want to give people the impression that all fish is hazardous or that all fish is high in mercury. And so people who do want to be on a high-fish diet can still today, of course, find fish that are going to be low in mercury.

Senator HART. Well, I think that is a very important point to

make, not simply because of a sense of responsibility to the fishing industry which all of us feel, but in the interest of those who do seek a fish diet for whatever reason, if only for the pleasure, that kind of reassurance should be voiced in order to balance this alarm.

Dr. McDuffie. I think that it might be appropriate for some average analyses to be published by the FDA instead of just blanket assurances about different types of fish. I think seeing the numbers people could draw their own conclusions.

Senator Hart. You have in your appendix—Senator Stevens has pointed out to me an item of appendix B. Is that the kind of analysis that you suggest would be helpful?

Dr. McDuffie. We have done spot analyses of various types of fish, and, of course, the first thing I checked after the tuna fish was a couple of fish sandwiches from highway vendor A and B, and I was delighted that they came out a tenth of a part per million or less. I had a fish sandwich on the way down here to Washington, so (for the record) I eat fish.

Well, going back to the tuna and swordfish problem, one crucial point is that the mercury in these fish has, I understand, been found to be principally all methylmercury, which is the form that has been determined to be the most hazardous to humans. So we are dealing with a very hazardous substance in the mercury in these ocean fish.

Soon after we discovered the mercury in tuna and swordfish we learned about the diet clubs; there were many people in the Binghamton area that were eating substantial quantities of tuna and/or swordfish in their daily diet. The amounts of tuna being consumed ran up to 60 or 75 ounces a week, 10 cans or more a week. And some people were eating swordfish, say, several times a week. Thus it became obvious that many people in the country had been exposing themselves to significant concentrations of mercury in their food, some for long periods of time.

So we undertook on a crash basis, with the cooperation of the Broome County Health Department, a study of the mercury levels in 42 dieters, people who had been on a high tuna or swordfish diet, and a control group of 20 volunteers who had not eaten appreciable amounts of tuna or swordfish in the previous year. Those results are tabulated in appendix C in terms of the estimated increasing daily intake.

I will just note here, as explained in appendix C, that for all the tuna that the people ate we assumed one-fourth of a part per million of mercury, and for all the swordfish we assumed 1 part per million of mercury; this gave us an estimated average daily intake of mercury which was adjusted to a body weight of 150 pounds, with an adjustment also for the lengths of time a person had been on the diet. For each person we plotted the blood concentration of mercury found versus the estimated daily intake rate.

And now if you would hold up figure 1,—this is in the statement—the highest blood concentration we found at the time of that first analysis was about 0.04 parts per million—4 micrograms per hundred milliliters. The solid line in the figure indicates the average buildup rate as a function of the rate of daily intake. The high-

est estimated daily intake rate was about 75 micrograms per day. A level of 30 micrograms intake per day gave a blood level of about 0.01 parts per million.

The data presented here are based on calibrations where we added a known amount of mercury to the chemical reagents to see what was recovered. In recent weeks we have been able to start some more systematic studies of our method of analysis.

Now it is not uncommon when you are looking for a substance in a matrix like a blood sample that you might not recover 100 percent what you do in what is called a reagent blank. We are finding that our recoveries of mercury in blood are less than 100 percent based on our standards, so that, if anything, the values I have found and are reporting here are low. The people might have had 20 to 30 percent higher blood levels than the figures we have given here. Those studies on recovery are continuing.

When you go on to table 2 of my statement, dividing the dieters into four groups, you see that the top group of 10 people averaged about 1.7 micrograms of mercury per 100 milliliters of blood, that would be about 0.016 parts per million, a little bit below the recommended safe level of 0.02 parts per million that was referred to earlier.

At least 10 percent of our small group of dieters had blood levels exceeding this recommended safe level, and it is possible that 20 percent were over if you have some upward adjustment of the figures.

Well, the safe level, of course, is not precisely known. In an earlier study of the maximum allowable concentrations of mercury [Arch. Envir. Health, Dec. 1969] it was stated that the lowest symptom range would be 50 to 100 micrograms per 100 milliliters of blood.

However, the Swedish Commission for Evaluating the Toxicity of Mercury in Fish took note of the fact that in Niigata, Japan, toxic symptoms were observed at a blood concentration of 0.2 of a part per million instead of the higher value of 0.5 to one part per million.

The Swedish Commission adopted that level of 0.2 of a part per million as a symptom level and recommended then (using a safety factor of 10) that the safe level be set at 0.02 parts per million of methylmercury in blood. They further recommended that Sweden adopt the allowable daily intake (ADI) concept, and this allowable daily intake should be set at 30 micrograms a day for a 70-kilogram man or woman in order that the blood stay at this safe level.

I might insert here that I am a little surprised that New York State has gone to the old Swedish recommendation of 1 part per million of mercury, but eating only one meal a week. This is the first I heard of the recommendation that they are making now for the sport fisherman in New York State. And in view of Sweden's experience with that, where they definitely found that people wouldn't stick to that one meal a week business, I am a little bit concerned as to whether they are moving in the right direction there in setting that as an allowable limit.

I think more emphasis should be placed on the person's average daily intake, and, of course, that requires an analysis of the fish.

Since the original study in January we did a followup study on five of the dieters who had somewhat elevated mercury levels in their blood. Five persons volunteered for further testing. If we could look at figure 2 now, this is a logarithmic plot of the mercury concentrations in blood versus the time, or months, of the study.

At the top we see the symptom level recommended by the Swedish Commission of 0.2 parts per million, and then the safe level at 0.02 of a part per million. You will notice that the control group we tested had a level of only around 0.002 of a part per million. I call that the normal level.

The average concentration in the dieters we tested in January was 0.01 of a part per million. Of course, the five persons tested in the followup study were relatively high. Several of them were up above the recommended safe level, and you can see that a couple of them went up in mercury concentration before they started coming down. The early analyses were done on a single 10-milliliter sample of blood that was drawn. The open circles are where the analysis was done in duplicate, split the sample and do two 5-milliliter portions.

With the qualification that these results might be somewhat low because of the incomplete recovery, I thing that this certainly indicates that the previous diets that were available for people in this country led quite a number of people up over this recommended safe level.

Senator HART. Doctor, before you leave that chart, you made clear that, at least in the subjects you were studying a good many of those on the diet program had an intake that was dangerous. How about those who were not trying to lose weight? How many in this country with a normal diet, which in their case includes some fish, would present problems?

Dr. MCDUFFIE. Let me just say that I was surprised to find out about these sort of diets. I think that the human response is certainly variable not only biochemically, but in terms of what people choose to eat. So that it is quite possible that someone that just likes swordfish, for example, but wasn't trying to lose weight, would have eaten several swordfish meals a week. It is quite possible—well, a lot of people have a tuna fish sandwich for lunch every day. And, you know, one of the reasons is that if you go into a luncheonette and you want a relatively inexpensive sandwich what choices do you have—tunafish, egg salad, peanut butter and jelly. Well, a lot of people are staying away from the egg salad because of the cholesterol, so they will be getting the tunafish.

I don't know how many ounces of tuna in a tunafish sandwich, but I think there could well be several ounces of tuna in each sandwich. And I daresay there are people in this room that have a tunafish sandwich every day, most every working day. Now a sandwich a day would probably not have taken the person up above that safe level. But one of the disquieting factors here is that we don't know for sure what the safe level is.

In February, after we did this study of the dieters I proposed to the FDA and also to the National Science Foundation that a na-

tionwide search be undertaken for persons with high blood levels of mercury so that a group of several hundred persons could be identified for possible neurological and epidemiological study. I proposed to have people that had been eating a lot of tuna or swordfish telephone a certain number and then we would analyze a hair sample from those people, and if the level came out high we would get blood samples, and we would end up with several hundred people, I am sure, that were high in mercury. It seemed to me that this would have been very valuable information. The followup study of these people would have told us a lot about how much mercury is safe.

And it just makes me very sad that no agency of the Government that I contacted could respond in a hurry to this situation. I am not sure now whether the nationwide search would be as feasible because swordfish has gone off the market, tuna is being screened, so it would be hard to find out now what people's blood levels were in February. But possibly there is more around than I realized, so maybe it isn't too late to do a survey.

Senator HART. We will have the agency in tomorrow and make inquiry.

Dr. MCDUFFIE. My conclusions, of course, are that, as is well known, certain species of ocean fish and many fresh water fish contain mercury in concentrations that are significant or hazardous to human consumers.

Persons who had been eating significant quantities of tuna and/or swordfish developed higher than normal concentrations of mercury in their blood, hair, and urine. The buildup in blood and hair was roughly proportional to the estimated adjusted average daily intake. In other words, the more you eat, the higher the mercury level in your body. In the relatively small group tested in Binghamton, several persons had mercury concentrations exceeding the level considered safe by the Swedish Commission, approaching within a factor of around 3 or 4 the level once found to be associated with symptoms.

As has been so well documented by the hearings of this committee, fish and other foods must be monitored extensively for mercury and for other potentially toxic substances. At the same time the introduction of such substances to the environment must be stopped and even reversed.

With respect to fish inspection, if the concentration of mercury in fish or other foods exceeds 0.05 parts per million, then I would strongly recommend that the actual concentration or lot analysis be made available to consumers so that they can restrict their average daily intake to a safe amount, tentatively 30 micrograms a day for a 150-pound person. For tunafish, the analysis should be on the can.

Tuna is a very convenient, relatively inexpensive food, especially for persons such as heart patients who need a high-protein, low-fat, low-cholesterol diet. People who want to eat a large amount of tuna per week can do so in some confidence if it has a low mercury content, say 0.10 parts per million. Others who eat tuna only occasionally can buy the high-mercury brands at around 0.40 part per million without particular concern, insofar as anyone knows today.

There are varieties of tuna. The smaller ones that average about 10 pounds, say the Skipjack tuna, probably average a tenth of a part per million of mercury. As you get into the larger size tuna the average concentration will increase to 3- or 4-tenths of a part per million. And then, of course, some of them go over that.

So I think it is feasible, since the boats usually catch one type, and they can one species of a more or less uniform size at a time, to put the analysis on the can. I don't think it would cost much, and it certainly seems feasible.

I feel that the industry and the Government, if they are in fact able to assign mercury concentrations to various code numbers of tuna, must share this information with the consumer. We should trust the judgment of the public who are, after all, the ones paying the bill, externally and perhaps internally.

Putting the analysis on the can, or on the package, would also have this salutary effect: it would reassure the public that the fish had been tested, and thus help to restore public confidence in Government regulatory agencies, such as the FDA. In fact, if they did this, they would deserve our confidence.

In my statement I acknowledge the help of quite a few people in this work.

Thank you.

Senator HART. Thank you very much, Doctor. I think today you provided us with a record which will be very helpful.

You are concerned that New York State limit the intake of fish—was it one catch a week, one meal a week? You were not encouraged about that. If you think that kind of caution will not be effective, what kind of heed do you think that the consumers will take if we list on the can or label parts per million or any other formula, level of dangerous element?

Dr. MCDUFFIE. When you catch a fish in sport fishing in waters that may be somewhat high in mercury you don't know how high the fish is. If you are encouraged to go ahead and eat fish which may be around one part per million once a week, that, of course, would imply that you ate no other foods containing methylmercury during the week, you would have to cut out tuna, et cetera. I am not sure—I realize you are saying that if the people that catch fish would eat more than the State government suggests, why do I think that the analysis on the can would be heeded. Well, the people in diet clubs are extremely careful about their diet. It is almost a religion with them. They weigh their foods and pay close attention to what they are eating. It would be no trouble at all for them to count micrograms as well as calories if the analysis is on the can.

I think that we are dealing with two different groups of people—the sportsmen, who might as a group be a little more daring than the weight watchers.

Senator HART. Senator Stevens.

Senator STEVENS. I think you have presented a very fair statement. I am intrigued by your concept that if you put these on the can then, perhaps people will pay some attention to it. I think the point has been made that people really don't pay much attention to the warning on cigarette packages, so I am not sure that I share your feelings.

I recall a fish that was preserved at the turn of the century. Upon examination it was determined that the mercury content was as high as present day levels. Do you recall that? I think it was in New York, as a matter of fact.

Dr. McDuffie. I have seen the figures for the analysis of preserved fish in New York State, at least some of them. These analyses were done at the Rome, N.Y., pollution lab of the department of environmental conservation by Mr. Earl Harris there. And the highest level of mercury found in fish from around 1930 was something around 1 part per million. But that fish was caught near Rochester, N.Y., in the Irondequoit Bay that might well have been polluted, as Commissioner Diamond mentioned in his press statement.

The next highest level was around 0.8 part per million from a fish caught in Lake Champlain in about 1930, and Lake Champlain was perhaps already polluted at that time from the operations of the paper company which I think used mercury long before 1930.

So the two analyses I recall as being most crucial were of a couple of bass, small-mouth bass I think, from a couple of lakes in the Adirondacks which were caught around 1930 and had somewhere around 0.5 or 0.6 parts per million of mercury. In order to assess the importance of that finding the same size fish from those same lakes today should be analyzed, and then one can determine whether there has been any big increase; if there has been an increase in those same size fish in those lakes compared to 1930 then you could probably put that down to industrial pollution. If there has been no increase then maybe that is a natural level for those waters.

I heard some months ago that the National Marine Fishery Service analyzed some tuna that were preserved in the custody of the Smithsonian Institution and they found something over half a part per million in some of those preserved tuna. This was toward the end of February, and they were going to put out a press release any day on that. I don't know if it has come out yet or not. They were also analyzing for methylmercury, and it may be the results were inconclusive.

But it is possible to use certain preserved speciments as environmental indicators as they did in Sweden when they analyzed feathers of birds and showed the increase from the turn of the century in the fisheating birds. Much more study needs to be done to determine the natural levels of mercury back about a hundred years ago.

Senator Stevens. Thank you very much, Mr. Chairman.

I am intrigued with your analysis, and I think you have done a very fine job of presenting your testimony. Thank you very much.

Senator Hart. Mr. Bickwit.

Mr. Bickwit. Have you given any thought as to how the legislation we are considering, particularly that portion of S. 1528 relating to surveillance for dangerous materials, might bear on some of the problems that you have discussed? In particular do you think it might help us avoid future "mercuries?"

Dr. McDuffie. Well, I am sure that if the Government was required to analyze representative samples of fish and fish products for the list of potentially dangerous substances, then anything on

the list would be seen before it got to any hazardous level. I think that it is difficult to anticipate the future. You might end up with a very long list, particularly since there are so many organic compounds that have been used and are being used for pesticides and that sort of thing. But you do what you can to anticipate the problems, and I think just having the list and working on it and testing whether or not something should be added to it is the sort of activity that the Government should be undertaking on more or less of a crash basis at this time.

I assume in this bill that mercury which is in fish possibly even from natural causes, like perhaps the swordfish, would come under the heading of an adulterated product, and we are not referring to something that has to be added, is that correct?

Mr. BICKWIT. It is already adulterated under existing law.

Dr. MCDUFFIE. The philosophy is well put in the bill here. But, of course, the details of inspecton and what you set as a safe level are things that have to be hammered out; you do need to use, of course, some statistically valid criteria on the sampling.

I asked the FDA for information about how they analyzed a lot or a code number of tuna. In other words, there are several thousands of cans that may bear the same code number, and I don't know what sort of a distribution they are finding within a given code number. I understand that they take about 12 cans at random and after they blend them together get an analysis. I would like to see the individual analyses on the cans to see how much of a variation there is within a lot. I assume that they are able on a statistically valid basis to say this lot is good and that one is bad, but I would like to know how much overlap there is.

Incidentally, there are some relatively simple mercury analyzers coming on the market. The analysis is still tricky, but I see no reason why a fish boat couldn't have a small lab—all you need is a hot plate and a source of electric current—and the fishermen on any large-scale operation fishing boat could do some analysis on board if they wanted to, as a preliminary screening anyway.

Mr. BICKWIT. If you have any documented information on that we would appreciate it for the record.

Thank you very much.

(The following information was subsequently received for the record:)

STATE UNIVERSITY OF NEW YORK AT BINGHAMTON,
DEPARTMENT OF CHEMISTRY,
Binghamton, N.Y., June 11, 1971.

FEASIBILITY OF ANALYZING FISH FOR TOTAL MERCURY ON SHIPBOARD

Two examples of relatively inexpensive (less than $1000) mercury analyzers are attached: (1) Coleman Division of Perkin-Elmer, Model MAS–50 "Mercury Analyzer System", which our laboratory uses; (2) Air-Pollution Technology Corp., "Mercometer", which we have not used but which was advertised at the Ottowa Conference on "Mercury in Man's Environment" in February 1971. Both of these instruments operate on the cold-vapor atomic absorption principle and are self-contained, with air pump for circulating mercury vapor from the sample to gas absorption cell, where absorption from an internal mercury lamp is measured and indicated. Other such instruments may be on the market.

The procedure for analyzing fish for total mercury involves the following general steps: (a) weighing the sample to the nearest hundredths of a gram; (b) dissolving the sample in warm chemical reagents, using simple flask and hot plate or heating bath; (c) adding water and certain other reagents to convert the mercury in the sample to the elemental form; (d) attaching the sample bottle to the analyzer to measure the concentration of mercury vapor produced; (e)

putting reagent blanks and mercury standards through the procedure to calibrate the instrument. Once calibration is established, a sample can be put through the entire procedure in less than an hour.

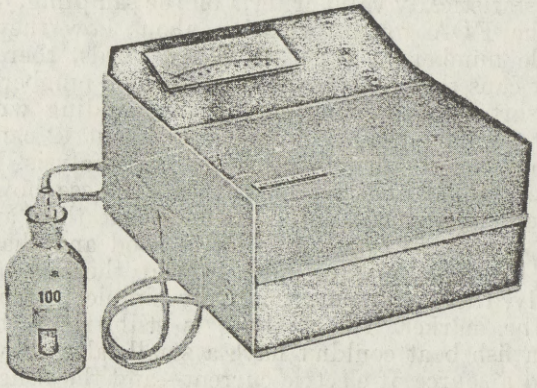
On shipboard one would need something like galley facilities: a table or two, a sink, supplies of chemicals and a modest amount of rinse water, an electric outlet for steam) for hot plates with (preferably) an exhaust fan overhead to serve as a hood for fumes, and an electric outlet with fairly constant voltage for operation of the mercury analyzer instrument.

In our Laboratory for Trace Methods and Environmental Analysis, I have trained an unemployed person from the inner city who had good aptitude to do mercury analyses after only one week of the training program. (He had taken some science courses in high school, but had no college education.) This trainee helped me operate a "Trout Clinic" in April—we analyzed trout for local fishermen while they waited.

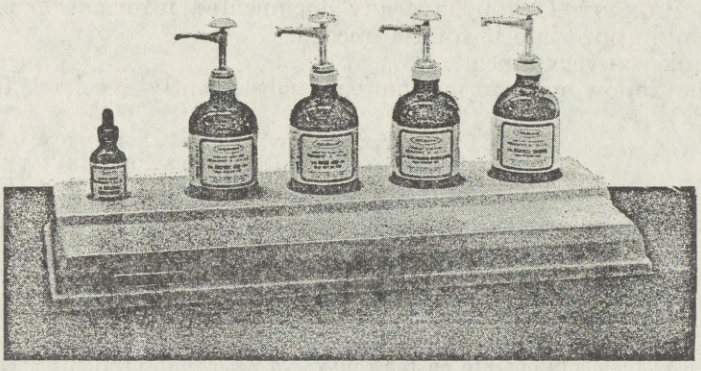
Thus people can be taught rather speedily to do a mercury analysis, and the analysis itself does not require a long time from start to finish. One must be careful, however, as in all trace analysis. We routinely run duplicate samples to safeguard against spurious results.

Submitted June 11, 1971.

BRUCE MCDUFFIE.



COLEMAN MODEL MAS-50 MERCURY ANALYZER SYSTEM



Cat. No. 50-050 Mercury Analysis Reagent Kit
shown ready for use on No. 50-052 Reagent Tray

COLEMAN INSTRUMENTS • 42 MADISON ST. • MAYWOOD, ILLINOIS • 60153

A Division of The Perkin-Elmer Corporation

COLEMAN MODEL MAS-50 MERCURY ANALYZER SYSTEM

Catalog No.	Description	Price
50-000	Mercury Analyzer System, Coleman Model MAS-50. With built-in pump; No. 50-300 Absorption Cell with windows and gaskets; 50-305 Window and Gasket Set; 50-500 Mercury Lamp; 50-600 Photodetector Tube; BOD Bottle with 50-805 Aerator and connecting tubing; 50-215 Dust Cover; and 50-900 Operating Manual. Without Reagents, Reagent Tray, or Dispensers. For operation on 110/220 volts. 50/60 Hz.	$875.00
	Accessories and replacement parts for Model MAS-50:	
50-050	Mercury Analysis Reagent Kit. Consists of mercury-free Potassium Permanganate, Nitric Acid, Sulfuric Acid, Hydroxylamine Hydrochloride, and Stannous Chloride, 450 ml of each, in bottles. Sufficient for approximately 100 determinations on Coleman Model MAS-50 Mercury Analyzer. Includes one Dropper Bottle, four No. 50-056 Reagent Dispensers, and instruction sheet with procedures for sample preparation. Without Reagent Tray.	49.50
50-052	Reagent Tray, only, for use with No. 50-050 Reagent Kit	18.00
50-056	Reagent Dispenser, only, as supplied with No. 50-050 Reagent Kit	3.95
50-215	Dust Cover, only, as supplied with Model MAS-50	4.00
50-300	Absorption Cell, 155 mm, with windows and gaskets, as supplied with Model MAS-50	25.00
50-305	Windows and Gaskets for replacement in No. 50-300 Absorption Cells. Sold in package containing 10 windows and two gaskets.	5.00
50-500	Mercury Lamp, only, as supplied with Model MAS-50	9.00
50-600	Photodetector Tube, only, as supplied with Model MAS-50	35.00
50-805	Aerator, only, as supplied with Model MAS-50. Without BOD Bottle or connecting tubing	16.00
50-807	Mercury Scrubber Kit, to prevent possible atmospheric contamination from affecting readings on Mercury Analysis Units. With filter bodies, tubing, end caps, and adsorbent.	9.95
33-110	Manganese Dioxide Adsorbent, 40 grams, as supplied with No. 50-807	9.50
50-809	Desiccant Kit, for use with Mercury Analysis Units. With filter bodies, tubing, end caps, and desiccant.	8.00
50-150	Magnesium Perchlorate Desiccant, anhydrous, 100 grams, as supplied with No. 50-809	7.50
50-900	Operating Manual, only, for Coleman Model MAS-50	4.00

Printed in U.S.A. for Coleman Instruments, 42 Madison St., Maywood, Ill., 60153. A Division of The Perkin-Elmer Corp. All prices are F.O.B. Maywood, Ill., and are subject to change without notice.

Senator HART. Doctor, as Senator Stevens has said, it has been both interesting and helpful.

Dr. MCDUFFIE. Thank you.

(The statement follows:)

STATEMENT OF BRUCE MCDUFFIE, PROFESSOR OF CHEMISTRY, STATE UNIVERSITY OF NEW YORK AT BINGHAMTON

BACKGROUND INFORMATION

I am a Professor of Chemistry at the State University of New York at Binghamton, where I teach and do research in the field of analytical chemistry. My formal education and early training in chemical analysis was at Princeton University (A.B. 1942, M.A. 1946, Ph.D. 1947), where from 1943 to 1946 I worked on the Manhattan Project developing methods for trace analysis of atomic energy materials. I taught at Emory University and at Washington and Jefferson College before coming to the State University at Binghamton, where from 1961 to 1965 I was Chairman of the Chemistry Department. I am a member of the American Chemical Society, the Society of the Sigma Xi, and the American Association for the Advancement of Science.

In recent years my attention has been drawn increasingly toward environmental problems and the role of analytical chemistry in helping to solve some of those problems. At our institution we are developing a Laboratory for Trace Methods and Environmental Analysis to study analytical methods and to measure the concentrations of various air and water pollutants. Last summer, with partial support from the Broome County Health Department, we made a preliminary study of pollution in the Susquehanna River, to assess the impact of the Binghamton metropolitan area on the river. That program is continuing this year with increased support.

MERCURY ANALYSES OF FISH AND FOODS

In November 1970, as a result of the discovery of mercury pollution in the Great Lakes, our laboratory began to analyze fish from the Susquehanna River and its tributaries for total mercury, using the atomic absorption method of Hatch and Ott [*Analytical Chemistry 40*, 2085 (1968)]. We found significant and even hazardous concentrations of mercury, up to 1.6 parts per million (ppm), in these local fresh-water fish (see Appendix A), thus adding to the dimensions of the environmental mercury problem.

As an extension of this work (because a student said "The only fish I eat is tuna fish", and because of my wife's hunch), on December 2, 1970, we analyzed a can of tuna and found over 0.5 ppm of mercury, this being the FDA "actionable" level. (*Our* action was to notify immediately the local health authorities and the local press.) Then on December 11, 1970, seeking to sample some large fresh fish from the ocean, we analyzed portions of swordfish steak and halibut steak, finding average values of 1.3 ppm and 0.22 ppm, respectively. (See Appendix B for list of foods analyzed for total mercury. An important recent addition is the value of 0.9 ppm for a striped bass caught last June in Vineyard Sound near Woods Hole, Mass.)

This discovery of high concentrations of mercury in tuna and in swordfish, confirmed by subsequent analyses in government laboratories, touched off a world-wide investigation of these foods, with results which are no doubt familiar to the committee: millions of cans of tuna were withdrawn from commerce in this country, and swordfish (which is particularly high in mercury) is rapidly going off the market, at least in the United States. Of crucial importance is the finding by FDA laboratories and others that practically all the mercury in these fish is in the form of *methylmercury*, CH_3Hg^-, which has been found to be readily absorbed by humans upon ingestion and which tends to penetrate the placental barrier and the blood-brain barrier, attacking the central nervous system, thus being considerably more hazardous to man than elemental, inorganic, or phenyl mercury.

MERCURY LEVELS IN HUMAN CONSUMERS

Soon after this discovery of excess mercury in tuna and swordfish, we learned that many people in the Binghamton area and elsewhere were eating surprisingly large quantities of tuna and other fish in their diet. This was especially characteristic of members of certain diet clubs, which have become very popular in this relatively affluent society. Thus it became obvious that many people in the USA had been exposing themselves to significant concentrations of mercury in their food, some for long periods of time. We therefore undertook on a crash basis a study of the mercury levels in such people. (Our urgency was prompted by the realization that many diets would change in the wake of these mercury discoveries, coupled with the knowledge that in Sweden experiments had shown a 70-day half-life for elimination of methylmercury from the human body.)

Through the cooperation of the Broome County Health Department, samples of blood, hair, and urine were taken on January 6, 1971 from a volunteer group of 42 tuna-swordfish "dieters", and also from a volunteer control group of 20 persons who had not eaten appreciable quantities of tuna or swordfish in the previous year. The results of analyses for total mercury are tabulated in Appendix C, where the dieters are listed in order of increasing estimated dosage rate.

The average values found for the two groups are compared in Table I, which follows:

TABLE I. MERCURY LEVELS IN HUMAN CONSUMERS AND IN CONTROL GROUP

Materials analyzed	Average concentration of total mercury found [1]		
	Diet group	Control group	Ratio
Blood, whole, 10 ml	1.0 μg./100 ml. (42)	0.2 μg./100 ml. (18)	5:1
Hair,[2] unwashed, 0.1–0.2 g	8.8 μg./g. (41)	3.1 μg./g. (19)	3:1
Urine, 25 ml. of spot specimen	6.4 μg./liter (42)	1.3 μg./liter (11)	5:1

[1] Averages based on the number of participants shown in parentheses.
[2] Some hair samples cut too far from the scalp, thus reflecting previous body concentrations.

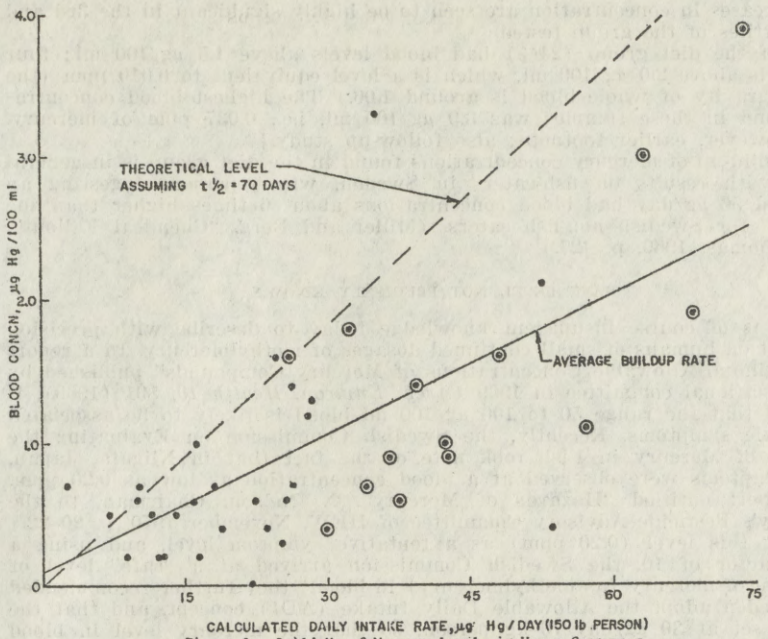


Figure 1. Build-Up of Mercury Levels in Human Consumers

Daily intake rate calculated from diet information, assuming tuna @ 0.25 ppm, swordfish @ 1.00 ppm, per 150 lb. body weight, adjusted for degree of exponential build-up if on diet less than 16 months.

Circled points for persons who ate significant amounts of swordfish.

In all categories, the diet group showed significantly higher concentrations of mercury than the control group, e.g., five times higher in blood concentrations. Furthermore, in the diet group there was a positive correlation between blood concentrations and estimated adjusted daily intake of mercury. This correlation can be seen in the plot of Figure 1, which also shows that the statistically best correlation line has a slope only about half that expected for a 70-day body half-life.* There was also a rough correlation of hair concentrations with dosage rate, but no correlation for urine samples. (This latter fact may reflect the irregularity to be expected from spot urine specimens, as well as the fact that only a small fraction of excreted mercury exists via the urine.)

The blood and hair correlations are particularly evident if the top 40 dieters are divided into quartile groups according to estimated adjusted daily intake, and averaged:

TABLE II. QUARTILE RANKINGS OF TOP FORTY DIETERS

	Estimated dosage range	Average blood concentration	Average hair concentration
	μg./day/150 lb.	μg./100 ml.	μg./g.
1st quartile	9 to 16	0.60	5.3
2d quartile	17 to 26	0.64	4.9
3d quartile	27 to 38	1.20	9.4
4th quartile	40 to 75	1.73	14.4

*From recent systematic studies on the method for mercury in blood, it appears that higher values (and thus a slope in better agreement with the theoretical) are obtained if the calibration factor is based on recovery studies with spiked samples instead of on recovery studies with spiked reagent blanks. Thus, the results presented here are relatively correct, but the blood levels actually may be *higher* than those shown.

The increases in concentration are seen to be highly significant in the 3rd and 4th quartiles of the group tested.

Ten of the diet group (24%) had blood levels above 1.5 μg/100 ml; four had levels above 2.0 μg/100 ml, which is a level equivalent to 0.019 ppm (the specific gravity of whole blood is around 1.06.) The highest blood concentration found in these samples was 3.9 μg/100 ml, i.e., 0.037 ppm of mercury. [See, however, earlier footnote; also follow-up study.]

The build-up of mercury concentrations found in the diet group is in general accord with results on fish-eaters in Sweden, where persons ingesting an estimated 56 μg/day had blood concentrations about 6 times higher than the "normal" for Swedish non-fish eaters. (Miller and Berg, "Chemical Fallout", C. C. Thomas, 1969, p. 427.)

SAFE LEVEL NOT PRECISELY KNOWN

There is of course insufficient knowledge today to describe with precision the effect on humans of small continued dosages of methylmercury. In a report on "Maximum Allowable Concentrations of Mercury Compounds" published by an international committee in 1969 (*Arch. Environ. Health 19*, 891 (1969), it is stated that the range 50 to 100 μg/100 ml blood is likely to be associated with toxic symptoms. Recently, the Swedish Commission on Evaluating the Toxicity of Mercury in Fish took note of the fact that in Niigata, Japan, toxic symptoms were observed at a blood concentration as low as 0.20 ppm. (See report entitled "Hazards of Mercury", N. Nelson, Chairman, to the Secretary's Pesticide Advisory Committee of HEW, November 1970, p. 20–22.) Adopting this level (0.20 ppm) as a tentative symptom level, and using a safety factor of 10, the Swedish Commission arrived at a "safe" level of 0.020 ppm of mercury (as methylmercury) in blood; they further recommended that Sweden adopt the Allowable Daily Intake (ADI) concept, and that the ADI be set at 30 μg/day/70–kg person, so that the mercury level in blood would not be likely to exceed the "safe" level. Prudence suggests that the United States also adopt the tentative "safe" level of 0.020 ppm, and a maximum ADI of 30 μg/day/150 lb person, i.e., 0.2 μg/day/lb of body weight. (A person would ingest about 30 micrograms of mercury in 2 ounces of tuna @ 0.5 ppm, or in 10 ounces of tuna @ 0.10 ppm; to adhere to the ADI principle, the analysis must be known.)

FOLLOW-UP STUDY

After our initial tests on people, and distribution of the results to them, five dieters with elevated mercury levels volunteered for further testing. The results of subsequent blood analyses are shown in Figure 2, which is a logarithmic plot of the mercury concentraitons found *vs* days elapsed from the initial sampling. (The open circles represent the average of duplicate analyses.) [See again, earlier footnote indicating that results could be significantly higher than those shown here.] Various levels are also shown on the graph: the "symptom" and "safe" levels of the Swedish Commission, and the averages of the diet group and the control (or "norm") group in the Binghamton study.

A number of observations can be made from this graph and the related diet information: (See Appendix D)

(1) Persons A and B *increased* in mercury content after the testing began, to within a factor of three or four of the "symptom" level and persons C, D, and E did not immediately decrease. This increase can readily be explained for A, who continued to eat large amounts of tuna although cutting out swordfish, but is difficult to explain for B (who swtiched from swordfish to halibut), unless in some people there is a lag in the body or blood level response.

(2) Four out of five participants continued eating fish containing some mercury (three out of five continued with some tuna), thus the experiment was not a perfect one for studying the elimination of mercury from the body; it does show, however, how firmly attached these people were to their diet, even with all the publicity about mercury in the local press and the knowledge that they had high blood levels.

(3) The increase seen for person D coincided with an increased rate of tuna consumption after 30 days.

(4) In recent testing, there is a common decreasing slope for the logarithmic plots of blood concentration, corresponding to an exponential rate of elimination with half-life of around 40 days, considerably less than the 70 days found for elimination of methylmercury in two Swedish studies. This discrepancy should be studied further, with analyses for methylmercury as well as total mercury.

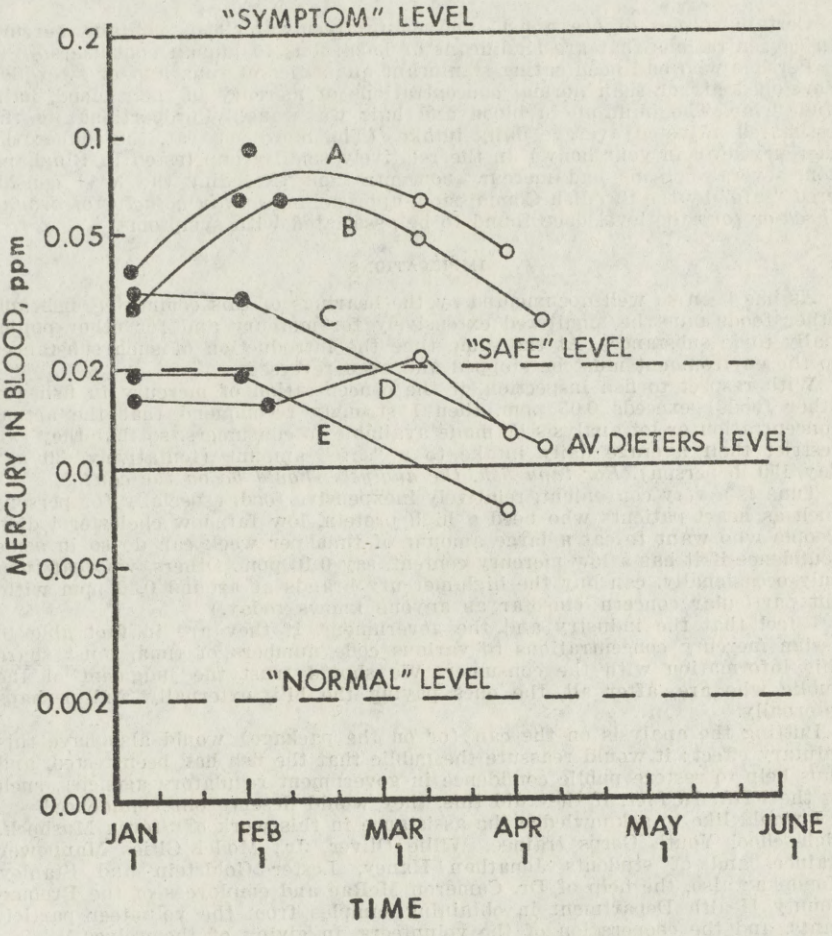


Figure 2. Logarithmic Plot of Blood Mercury Levels vs Time for Five Above-Average Dieters.

Adjusted estimated dosage rates, in μg/day/150 lb., prior to Jan. 6, 1971:

75 for A; 64 for B; 36 for C; 15 (plus mercury in 7 oz cod/day) for D; 68 for E. (See Appendix D for details.)

In February I proposed to the FDA and also to the NSF that a nationwide search be undertaken for persons with high blood levels, so that a group of several hundred persons could be identified, for possible neurological and epidemiological study. It seemed to me that this would add valuable information to the question of "How much mercury is safe?" Perhaps it is already

too late to make that search—as daily intake is reduced, blood concentrations will decrease along with the opportunity to know how high the levels were. How often does one have human guinea pigs for toxicology studies? It makes me sad to realize that the government could not seize this chance to learn more about the important sub-clinical effects of methylmercury.

CONCLUSIONS OF THE SCIENTIFIC STUDY

Certain species of ocean fish, and many fresh-water fish, contain mercury in concentrations that are significant or hazardous to human consumers.

Persons who had been eating significant quantities of tuna and/or swordfish developed higher than normal concentrations of mercury in their blood, hair, and urine. The build-up in blood and hair was roughly proportional to the estimated adjusted average daily intake. (The more you eat, the higher the mercury level in your body.) In the relatively small group tested in Binghamton, several persons had mercury concentrations exceeding the level considered "safe" by the Swedish Commission, approaching *within a factor of around three or four* the level once found to be associated with symptoms.

IMPLICATIONS

As has been so well documented by the hearings of this committee, fish and other foods must be monitored extensively for mercury and for other potentially toxic substances. At the same time the introduction of such substances to the environment must be stopped and even reversed.

With respect to fish inspection, if the concentration of mercury in fish (or other foods) exceeds 0.05 ppm, then I strongly recommend that the actual concentration or lot analysis be made available to consumers, so that they can restrict their average daily intake to a "safe" amount (tentatively, 30 μg/day/150 lb person). *For tuna fish, the analysis should be on the can!*

Tuna is a very convenient, relatively inexpensive food, especially for persons such as heart patients who need a high protein, low fat, low cholesterol diet. People who want to eat a large amount of tuna per week can do so in some confidence if it has a low mercury content, say 0.10 ppm. Others, who eat tuna only occasionally, can buy the high-mercury brands at around 0.40 ppm without particular concern (insofar as anyone knows today.)

I feel that the industry and the government, if they are in fact able to assign mercury concentrations to various code numbers of tuna, must share this information with the consumer. We should trust the judgment of the public who are, after all, the ones paying the bill, externally and perhaps internally.

Putting the analysis on the can (or on the package) would also have this salutary effect: it would reassure the public that the fish had been tested, and thus help to restore public confidence in government regulatory agencies, such as the FDA. In fact, if they did this, they would deserve our confidence!

I would like to acknowledge the assistance in this work of Steven Mushock, high-school Youth Corps trainee, Willie Oliver, Jr., Model Cities Manpower trainee, and of students Jonathan Haney, Lester Goldstein and Stanley Konopka; also, the help of Dr. Cameron McRae and employees of the Broome County Health Department in obtaining samples from the volunteer participants, and the cooperation of the volunteers, in giving of themselves.

Appendix A

STATE UNIVERSITY OF NEW YORK AT BINGHAMTON

(Department of Chemistry—Laboratory for Trace Methods and Environmental Analysis)

Fresh Water Fish—Total Mercury Analyses—Cumulative List as of February 2, 1971

Body of water	Variety and size (person), place, and date caught	Lab code	Mercury p.p.m.	Date analyzed
	SUSQUEHANNA RIVER BASIN			
Otselic River	Brock trout, small (Lynn), spring 1970		0.1	Nov. 17, 1970
Chenango River	Yellow perch, small (Andrus), Chenango Forks, Nov. 23, 1970	62	0.5	Dec. 2, 1970
	Yellow perch, small (Andrus), Chenango Forks, Nov. 23, 1970	64	0.15	Jan. 7, 1971
	Walleye pike, 11 inches (Andrus), Chenango Forks, Nov. 23, 1970	62	0.4	Dec. 2, 1970
	Walleye pike, 12 inches (Andrus), Chenango Forks, Nov. 23, 1970	62	0.45	Do.
	Bullhead (Andrus), Chenango Forks, Nov. 23, 1970	63	0.4	Dec. 4, 1970
Susquehanna River	Walleye pike, 14 inches Endwell, Dec. 3, 1970	57	0.7	Dec. 10, 1970
	Walleye pike, 15 inches (Stickles) 1 mile west of Vestal, Sept. 1968	59	1.30	Jan. 7, 1971
	Walleye pike, 3 miles west of Owego, Sept. 1969	50	0.80	Dec. 16, 1970
	Bass, Widsor	60	1.0	Dec. 12, 1970
	Bass, 15 inches, between Windsor and Oquagua	65	1.57	Dec. 16, 1970
	Bullhead, small (Stickles), 1 mile west of Vestal	59	0.12	Jan. 7, 1971
	Perch, blue, gill, small (Stickles), 1 mile west of Vestal	59	0.18	Do.
Owego Creek	Brook trout, 10 inches (Stickles), Apr. 1970	51	0.4	Dec. 4, 1970
Lake Cayuga	Rainbow trout, large, 18 inches, May 1970		0.36	Feb. 3, 1971
	Smelt	58	0.1	Dec. 10, 1970
Seneca Lake	Rainbow trout (Knowles)		0.46	Dec. 11, 1970
	Lake trout (Knowles)		0.41	Do
New Milford (Pa.)	Bullhead, small, farm pond	61	0.1	Dec. 10, 1970
Mad River (N.Y.)	Brook trout, small (Penfield), spring 1970		0.11	Dec. 13, 1970
Lake in Catskill Mountain	Brook trout, 9½ inches (Penfield), spring 1970	70b	0.04	Feb. 1, 1970
	Brook trout, 11 inches (Penfield), spring 1970	70a	0.04	Do.
Lake Ontario	Bass, small (Lynn) July 1970		0.4	Nov. 17, 1970
	Bass, medium (Lynn) July 1970		0.45	Do.
	Northern Pike (Lynn) 1968		0.7	Do.
St. Lawrence River	Northern Pike (Kerstein), Alexander Bay, Canada, 1970		0.55	Jan. 7, 1971

Appendix B

STATE UNIVERSITY OF NEW YORK AT BINGHAMTON

(Department of Chemistry—Laboratory for Trace Methods and Environmental Analysis)

Recent analyses of foods for mercury—prepared January 1, 1971 (Spot checks on individual samples, not brand averages)

Commercial Foods for Human Consumption

Fish	Mercury content p.p.m.	Date analyzed
Frozen swordfish steak, Samurai brand	1.3	Dec. 11, 1970
Frozen Halibut steak, Samurai brand	0.22	Do.
Canned tuna, light chunk in oil, Grand Union	0.75	Dec. 2, 1970
Canned tuna, light chunk in oil, Grand Union	0.3	Do.
Canned tuna, light chunk in oil, Starkist	0.3	Do.
Canned tuna, solid white in water, Empress (Japan)	0.2	Do.
Canned tuna, solid white in water, (Newing Dining Hall) (Japan)	0.53	Dec. 9, 1970
Fish sandwich (fried fillet), vendor A	[1] 0.1	Dec. 3, 1970
Fish sandwich (fried fillet), vendor B	[1] 0.1	Do.
Fried haddock (Supermarket)	0.02	Dec. 13, 1970
Frozen flounder fillet (Canada-Four Fisherman brand)	0.02	Do.
Frozen cod fillet (Canada-Four Fisherman brand)	0.02	Do.
Canned mackeral, Empress (Japan)	0.05	Do.
Canned salmon, Icy Point "Alaska Pink", Seattle, Wash	0.15	Jan. 20, 1971
Canned salmon (5-yr. old can) Grand Union "Pink"	[1] 0.02	Do.
Sardines, Brunswick (Canada)	[1] 0.1	Dec. 3, 1970
Sardines, Underwood (Norway), in mustard	0.02	Jan. 20, 1971
OTHER FOODS		
Turkey, cooked Thanksgiving 1970	[1] 0.1	Dec. 2, 1970
Chicken, piece of uncooked drumstick	[1] 0.02	Dec. 13, 1970
Beef liver (Supermarket)	[1] 0.02	Do.
Dried peas, split	0.05	Do.
	0.00	Dec. 18, 1970
Brown rice	0.05	Dec. 13, 1970
Deer No. 1	[1] 0.01	Dec. 4, 1970
Deer No. 2, heart	[1] 0.01	Do.
Deer No. 2, muscle	0.02	Dec. 16, 1970
Pet Foods:		
Cat food, tuna type, minimun 22 percent protein:		
Petburger "Tuna Treat" (Japan)	0.20	Jan. 20, 1971
Purina Tuna, Variety Menu No. 1	0.18	Do.
Three Little Kittens, with tuna (protein content unrecorded)	0.02	Do.
Cat and dog food, cereal based, minimum 10 percent protein:		
Friskies, fish flavor	0.05	Do.
Puss'N Boots, fish flavor	[1] 0.02	Dec. 13, 1970
Calo Cat Food	[1] 0.02	Do.
Ideal Dog Food, 10 percent protein (meat and poultry)	0.01	Jan. 20, 1970

[1] Or less.

Appendix C

RESULTS OF MERCURY ANALYSES ON DIET GROUP AND CONTROL GROUP

A. Diet Group (in order of increasing adjusted estimated dosage rate)

	Dosage rate [1] μg. Hg.day	Code number	Mercury concentrations found: Blood [2] μg./100 ml.	Hair μg./g.	Urine μg./liter
1	2.6	51	0.7	1.2	14.0
2	7.0	11	0.5	4.1	2.6
3	9.0	15	0.2	(?)31.4	2.0
4	10.0	18	0.6	6.7	3.2
5	10.2	19	0.7	8.5	2.2
6	11.6	23	0.5	2.6	3.2
7	12.1	5	0.2		1.4
8	12.6	39	0.1	4.1	3.0
9	14.1	7	0.5	4.9	5.7
10	14.6	3	1.6	7.1	17.8
11	16.1	30	0.6	3.8	2.0
12	16.4	25	1.0	8.8	4.0
13	16.7	6	0.2	4.6	3.4
14	18.2	20	0.7	4.9	4.6
15	18.9	31	0.4	0.8	1.0
16	22.0	57	0.0	4.9	5.8
17	22.5	43	0.6	3.5	3.4
18	23.7	4	0.4	5.7	3.0
19	24.8	45	1.6	10.6	1.8
20	25.2	28	0.3	4.3	0.6
21	25.7	9	0.6	7.2	4.4
22	[3] 26.1	46	1.6	2.5	13.2
23	26.6	2	0.7	6.8	4.2
24	26.6	8	1.4	8.2	4.6
25	28.0	1	1.2	4.6	11.0
26	28.5	10	1.3	1.8	4.0
27	[3] 29.9	24	0.4	6.6	0.2
28	[3] 32.6	33	1.8	17.3	4.6
29	[3] 34.2	44	0.7	2.0	0.8
30	35.6	13	3.3	4.6	1.4
31	[3] 36.7	29	0.9	27.9	5.8
32	[3] 37.8	21	0.6	14.1	1.6
33	[3] 39.6	26	1.4	5.2	3.4
34	[3] 42.4	60	1.0	6.3	6.2
35	[3] 42.9	40	0.9	3.5	3.2
36	[3] 48.3	47	1.6	6.2	1.0
37	52.8	61	2.1	25.6	4.8
38	53.7	12	0.4	1.6	6.2
39	57.3	62	1.1	14.6	80.0
40	[3] 63.8	42	3.0	19.6	19.0
41	[3] 68.3	37	1.9	40.7	1.0
42	[3] 74.6	58	3.9	10.9	2.2
Mean	29.1		1.0	8.8	6.4
Median	25.9		0.7	5.7	6.2

[1] Average daily intake rate, from Hg in tuna unless otherwise noted, assuming all tuna at 0.25 p.p.m. Hg, all swordfish at 1 p.p.m. Hg, per 150 lb. body weight, adjusted for degree of exponential build-up if on diet less than 16 months.

[2] Subsequent studies have shown that these results, while relatively correct, may be significantly lower than the actual values.

[3] Diet contained large percentage of swordfish.

RESULTS OF MERCURY ANALYSES

B. Control Group—Mercury Concentrations Found

Code Number	Blood μg./100 ml.	Hair μg./g.	Urine μg./liter
14	0.3	1.1	1.6
16	0.2	3.9	1.6
17	0.0	0.9	1.6
22	0.0	(35.8)	0.0
27	0.0	2.6	1.4
32	0.4	1.1	1.0
34	0.0	3.3	----
35	0.0	4.4	----
36	0.0	2.4	----
38	0.0	1.6	----
41	0.0	1.3	----
48	0.4	12.8	----
49	0.6	3.5	----
50	0.9	2.2	----
52	0.4	3.9	----
53	0.2	2.5	2.0
54	0.1	2.2	1.4
55	----	4.3	0.0
56	----	1.5	2.0
59	0.0	2.9	2.0
Mean (18)	0.2	(19) 3.1	(11) 1.3
Median	0.1	2.6	1.6

C. Characteristics of the two groups

	Diet group	Control group
Time on diet:		
Mean	12 months	
Median	8 months	
Median age	50 years	44 years.
Median body weight	147 lb.	150 lb.
Number of males	5	9.
Number of females	37	11.

DIET INFORMATION FOR PERSONS IN MERCURY FOLLOWUP STUDY

(Keyed to Letters of Figure 2) (T=tuna; SF=swordfish

Subject A, male, age 52, 168 lbs.; adj. daily intake *75 μg/day (1/6/71)*
12 months prior to Jan. 1971; 56 oz/wk T; 8 oz/wk SF
Jan. to Mar. 1971: continued eating T; cut out SF
Mar. to Apr. 1971: cut down to 25 oz/wk T; 4 oz/wk Flounder

Subject B, female, age 42, 134 lbs.; adj. daily intake *64 μg/day (1/6/71)*
8–12 months prior to Jan. 1971: 25 oz/wk SF; no T
Jan. to Apr. 1971: cut out SF; subst. 8 oz/wk Halibut and 15–20 oz/wk Turbot

Subject C, female, age 54, 147 lbs; adj. daily intake *36 μg/day (1/6/71)*
5–6 months prior to Jan. 1971: 42 oz/wk T; no SF; considerable amount of fresh (river) fish
Jan. to Mar. 1971: still eating some T
Mar. to Apr. 1971: 15 oz/wk Salmon and Halibut

Subject D, female, age 42, 124 lbs; adj. daily intake *15 μg/day (+Hg in Cod) (1/6/71)*
28 months prior to Jan. 1971: 12 oz/wk T; no SF; 48 oz/wk Cod
Feb. to Mar. 1971: *increased* to 30 oz/wk T; less Cod
Mar. to Apr. 1971: cut back down to 12 oz/wk T; 45 oz/wk Cod

Subject E, female, age 37, 115 lbs; adj. daily intake *68 μg/day (1/6/71)*
7 months prior to Dec. 10, 1971: avg. 6 oz/wk T; 13 oz/wk SF; *Stopped all fish on* Dec. 10, 1971.

Senator HART. Now we shall hear from Dr. John Wood, associate professor of biochemistry at the University of Illinois. As I indi-

cated in my opening statement, it was Dr. Wood who first established conclusively that organic mercury could come from methyl—have I got that right?

STATEMENT OF DR. JOHN WOOD, ASSOCIATE PROFESSOR OF BIOCHEMISTRY, UNIVERSITY OF ILLINOIS

Dr. Wood. First of all, I would like to thank you, Senator Hart, and your committee for giving me the opportunity to tell you about some of the recent research which we have been doing on this problem. I have been working fairly closely in the last 12 months with the government of Ontario looking at the Great Lakes system, so I can give you some more up to date information on some of the problems.

I would like to address myself to two specific elements this morning. I would like to continue the discussion with mercury, and I would like to tell you about the potential problem which would come from arsenic pollution.

I would like to point out to you exactly why we have the problem. I don't think this has been defined, why we have the problem. And after pointing this out I would like to tell you what might happen in the future, and furthermore, what we might do about it, what sort of analytical methods and what solutions there might be.

It has been known, of course, for centuries that both mercury and arsenic are poisoning elements. And first of all, I would like to show you how these compounds get into the environment as a result of industrialization: 26,000 tons of chlorine is manufactured daily in the United States, and 25 percent of this is manufactured by using mercury metal as an electrode. This gives ample opportunity to the chlorine industry for large losses of mercury metal and inorganic salts into lakes and rivers, in inland and coastal waterways.

I would like to give you two examples of this. The first significant example is in the St. Clair River system where one chemical company deposited 200,000 pounds of mercury into the St. Clair River system over a period of about 20 years.

A second example, which I think is more interesting from the scientific point of view because it gives us more information, is a chemical company which is situated in Saskatoon, Saskatchewan deposited 55,000 pounds of mercury into the Saskatchewan River system between 1963 and 1970.

Of course, in these two areas we find that these are the high places in North America. These are areas where methyl mercury concentrations in fish are exceedingly high.

In addition to the chlorine industry the plastics industry uses mercury as a catalyst, and, of course, it is the plastics industry which caused serious problems in Japan.

The electronics industry uses more and more mercury each year. In fact the long life alkaline batteries which you throw away contain 8 percent mercury, and these usually get combusted in municipal incinerators.

Powerplants are also responsible for significant losses.

Hospitals are responsible for significant losses because mercury salts are used in histology laboratories.

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And so, as you can see, there has been ample opportunity for literally hundreds of thousands of pounds of inorganic mercury to be spread around.

It turns out that microorganisms which live naturally in the sediment of lakes and rivers have the ability to convert inorganic mercury into two compounds principally. The first one is methyl mercury, and this is the compound which accumulates in fish. And the second compound is dimethyl mercury. This compound is volatile. It comes up through the water and into the atmosphere. Once it gets into the atmosphere it is oxidized, photolyzed by the sunlight, and comes back down again with the rainfall to pollute other areas.

So one of the things that must be recognized is there is a mechanism for distribution of this particular problem through the atmosphere around local areas of pollution.

A third species of mercury which has not even been looked at in the United States carefully is methylmercury thiomethyl. This is a volatile mercury compound which is synthesized in shellfish. And shellfish, of course, were consumed in the Minamata disaster in Japan. Unfortunately, methylmercury thiomethyl is so volatile it would never be detected by the analytical methods which are currently being used in Government laboratories not only in the United States, but also in Europe. So this is a problem which we have to look at.

Now the mercury problem by definition is a problem which has been caused by two things. The first thing is the concentration of mercury which we put in sediments. And the second thing is the population of microorganisms which are present in sediments. You can't separate the two, you see, because the rate of formation of methylmercury in sediments is very much dependent on both the concentration of mercury and the population of microorganisms.

Well, over the years we have been feeding microorganisms extremely well. We have been giving them an adequate supply of carbon and nitrogen and phosphate which speeds up metabolism, and in this way we have increased the rate of formation of this deadly poisonous compound methylmercury so that it is far in excess of the rate of excretion of mercury in fish. This is why we have a problem.

I have been working very closely with the government of Ontario looking at the St. Clair River system, and I think that I can put this problem in the right perspective by telling you what we know about this system: Two hundred thousand pounds of mercury was deposited in that particular St. Clair River system by the Dow Chemical plant. Just up the river from Dow, sewage in various forms has been put into the river system, and a combination of feces and organic material which is swept down the St. Clair River system mixed together with the mercury has caused a particularly hazardous problem in that area. So it is the combination of these two things which causes the problem.

Extensive analyses have been done of sediments of the St. Clair River system. We can show very nicely that in sediments which are polluted from 0.3 of a part per million all the way up to

greater than 250 parts per million microorganisms survive very well in these sediments, and at the moment they are rapidly synthesizing methylmercury.

The most remarkable thing about microorganisms is that they are very adaptable to poisonous compounds, and we are selecting for those microorganisms which can tolerate high levels of mercury, and so the future for microorganisms looks tremendous at the moment in this regard. Microorganisms have worked out the mechanism to detoxify their environment and put the methylmercury into the aqueous environment.

If you sit down and calculate approximately the total methylmercury concentration in fish in the St. Clair River system a conservative estimate is about 100 pounds. So this means that less than 0.2 of a percent of the mercury deposited in this system has gone through food chains to make this particular area very dangerous in terms of fish consumption from that area.

So you can see we are only beginning the problem, and we can actually make calculations on predictions now what the situation will be like 5 years from now and what it will be like 10 years from now, and we can say fairly definitely that we can look forward to increasing concentrations of methylmercury in fish.

The Saskatchewan River system is somewhat higher. In one particular lake, Lake Wabigoon in Manitoba, walleye pike have been caught which contain 25 to 30 parts per million of methylmercury. This is close to the point where fish start to die. If a person consumed about two fish from this area a week for about 10 weeks he would probably die from methylmercury poisoning, although there is some variation from one individual to the next.

We can anticipate that this particular problem, for which Lake Wabigoon sets the record for on the North American Continent, will continue in the Great Lakes area because of the large reservoir of mercury which has already been deposited.

This problem, as you know, is also familiar to about 33 States in the United States and through widespread areas of Canada.

One of the things which really concerns me as a research chemist is the approach to the methodology which is being used to look at mercury. The analytical methods which are employed at the moment are methods which are used to analyze the total mercury, and this involves trying to remove the total mercury from the fish protein, converting it to inorganic mercury, and analyzing the inorganic mercury.

Two methods are in common use for this, two principal methods. One is called the flamless atomic absorption and the other is called neutron activation analysis. Atomic absorption is a very good analytical technique for inorganic mercury, but it has a serious number of major defects when you apply it to analysis of organic mercury compounds. Neutron activation analysis is a better method, but it is more expensive and you can only analyze about 40 samples a day, so this restricts the number of samples which you can analyze. But it strikes me it would be better to have accurate analyses rather than rapid analyses in this problem so that one can really assess where we are at the moment.

As far as the museum specimens of fish are concerned, I have two comments to make in this area.

A large number of fish taken from the St. Clair River system in 1935, or between 1935 and 1940, have been analyzed, and it has been shown that in this area fish, the same species, size—in size of fish from this area even though there is some variability—contain anything from 50 to 100 times more methylmercury than they did in 1935.

There is a problem with the analysis of just single specimens of fish from museums because mercuric chloride is still used in the preservation of animals. It could be that for some of these museum specimens that sometimes give very high results that this could be caused because mercuric chloride was used as a method to preserve fish in these samples.

I would like to now address myself to some of the approaches which might be used to solve this problem because quite a lot of research is being done, particularly in Canada and in Sweden.

First of all, one suggestion is to dredge out polluted waterways, and it is a fact in the St. Clair River system the mercury content of sediment is much higher now than mercury ores presently being mined. So it might be commercially beneficial to remove the mercury that way. However, a number of attempts have been made to remove mercury from sediments by dredging. In the Minamata tragedy the Minamata Bay was dredged out. This caused a more even distribution of the inorganic mercury throughout the bay, caused increased activity by microorganisms in these sediments, and at the moment the levels of methylmercury in fish from Minamata Bay are much higher than they were in 1953 when we had the beginning of the disaster.

It is my professional opinion that if we can remove 95 percent of the mercury from the St. Clair River system, which will be quite an engineering project, the remaining 5 percent would be distributed throughout Lake St. Clair down the Detroit River into Lake Erie, and could be responsible for the removal of commercial fishing in that whole area for about 100 years while we wait for the problem to settle down.

A second approach which has been used is to cover the sediments with finely divided gravel, and this allows for the reestablishment of a new microbial population in the sediments.

These experiments have been conducted by Dr. Jernelov at the University of Stockholm, and he has been able to show that in these situations you can show decreases of methylmercury in fish if you use this approach. But this approach is restricted to those sediments where you don't have any turnover. You can't apply this methodology to a river or to a lake which has ship traffic. It must be a situation where the sediments are quite stable.

I think the best solution to the problem is to leave the mercury there and to concentrate on reducing the microbial populations in sediments. Because the problem depends on the rate of formation of methylmercury, if we starved the microorganisms—starved the bugs—then the rate of formation of methylmercury will be decreased significantly and we won't have a problem in fish any more.

So I think the latter suggestion is probably the most practical in the long run because it will also address itself to a number of other problems.

The arsenic problem is a relatively new one as far as we are concerned. Large quantities of arsenic presently find their way into sediments in lakes and rivers and coastal waters because arsenic is an impurity of phosphate. Large quantities of phosphate are used in agriculture and in detergents. Consequently arsenic finds its way into sediments in lakes and rivers, and the micro-organisms in these sediments convert the arsenic into the deadly poisonous dimethylarsine. This methyl arsenic compound will go through into the water just the same as the methylmercury does, and we would anticipate—and I would call for much more research in this area—that methyl arsenic compounds are likely to accumulate in fish and cause another problem which is a relatively new problem compared with the mercury problem.

Well, I would like to just conclude by apologizing for giving such a gigantic document as my statement. I didn't know that I was going to come here until 2 days ago, and so I thought it was probably better if I presented you with everything that I know about this particular problem at the moment.

Senator HART. Doctor, certainly no apology is needed. On the contrary, your giving the committee about everything you know means that the committee is now in receipt of everything that anybody knows about the subject, and we are grateful to you.

You always get up in the morning hoping you will get some good news during the day, but I don't find it in here in your description of what the future holds for us as far as the mercury crisis.

Dr. WOOD. Well, I think it is a problem that can be solved, but I think it is about time we got started.

Senator HART. Well, let me tell you why I thought we might hear better sounds, and it shows how we are subject to the oversimplification of figures. The committee staff learned just yesterday that 38 pounds of mercury per day are still being dumped by industry into U.S. waters. This represents a 91 percent reduction over discharges of mercury just last summer. Now that sounds very impressive, but when it is measured against your testimony——

Dr. WOOD. Yes, I think the best thing to do is to once again give you the system that we know the most about. If we waited for the micro-organisms to convert the 200,000 pounds of inorganic mercury in the St. Clair River into methylmercury and put it in the water and eventually wait for the river system to empty out in the ocean a conservative estimate of the time required for the micro-organisms to do this completely, to clear the thing out by themselves, is about 5,000 years.

When you consider that after 20 years of industrial development in this area that the total concentration of methylmercury in fish is of the order of 100 pounds, 38 pounds a day is a significant amount of mercury to deposit into sediments at the moment. I would say that we have to get this down to zero.

Senator HART. Another disturbing note which you sound: You tell us that arsenic can be converted in the way you first established that mercury converts. Does this mean we are now going to be saddled with arsenic rises on the order of what we are now aware of in the mercury area?

Dr. Wood. All I can tell you about that is that from 1935—some research done at the University of Leeds, in the north of England, by Professor Challenger established that molds could give you a synthesis of methyl arsenic compounds; and Dr. McBride, a graduate student at the University of Illinois, has just shown that micro-organisms which live in sediments are capable of the synthesis of dimethylarsine very rapidly under the same conditions we have the synthesis of methylmercury.

What I can say now is what I said in 1967, and that is that we recognize that both methylmercury and methyl arsenic are some of the most deadly poisoning nerve toxins known to mankind. We know that both mercury and arsenic can go into metabolism. This has been known for centuries.

So what I would say at the moment as far as the arsenic problem is concerned, we should start looking, we should do research and look for methyl arsenic compounds in fish. And I would predict, without having any information on fish at this time, that we would probably find methyl arsenic compounds in fish.

Senator Hart. As far as you are aware, has the FDA or anyone else been testing for arsenic?

Dr. Wood. The government of Ontario and some of the fishing agencies in Canada at the moment are beginning an approach to test for arsenic in fish. So this is a program which has only just really begun.

Senator Hart. Too early to have any results?

Dr. Wood. It is really too early to have any results. I was in Saskatoon 2 weeks ago talking about the Saskatchewan River system, and this is where I was given the information the Canadians were starting to look at the problem.

Senator Hart. As far as you know, the Americans haven't?

Dr. Wood. Well, there is a bit of difference between the approach to environmental problems in Canada and the United States. I have more experience in Canada. The Canadians have a Center for Inland Waterways, which is a very large research operation which looks totally at problems in the Great Lakes system. They have a system of vessels which go out to do a complete survey of the Great Lakes system, and they look at the whole lake and they can pinpoint areas where we have problems.

For example, they can say at the moment about 80 percent of the phosphate going into Lake Ontario comes from the U.S. side, and this is by looking at the total system. And I don't think we have the sort of research facilities and opportunities to study systems to the extent that the Canadians have developed.

Senator Hart. One last question for me. You told us that the present methods of detecting mercury might be missing quantities of mercury in fish. Now, do accepted methods of detecting arsenic discriminate between the more dangerous methyl arsenic, if that is what it is, and the less dangerous compounds?

Dr. Wood. That's right. There is really a serious problem here, and that is from analytical work we have done, and other laboratories internationally, as far as the mercury problem is concerned, 95 to 100 percent of the total mercury which you can abstract from fish is methylmercury, and methylmercury, of course, is much more

poisonous than inorganic mercury. Well, the analytical methods which are being developed have been developed to look at total inorganic mercury and similarly total inorganic arsenic. And the standards which we talk about in the analytical methods we use for inorganic versus organic compounds should be very different because the organic ones are more poisonous.

The methodology has been worked out to analyze quite nicely quantitatively methylmercury in fish. This is being developed in Sweden using electron captone gas chromatography. We would be much better off analyzing for the really poisonous compounds because of the levels of these compounds which are present in fish at the moment. If that happened to be inorganic mercury, and not methylmercury, we wouldn't even bother having hearings today on this particular problem, because the levels of inorganic mercury would be quite insignificant.

Senator HART. Whether it is to evaluate for mercury or for arsenic you are suggesting that current methods are deficient?

Dr. WOOD. Well, the atomic absorption method which is being currently used is a cheap method. It is a rapid method and it is a very good method for inorganic mercury. But all the analytical data which I have seen on total mercury where an atomic absorption analysis is made you always find the atomic absorption analysis is low, consistently low, and in fact I have seen results where the results have been as much as 100 percent low and also where they have been only a few percent low.

There is only one laboratory which I am familiar with in the United States which has managed to develop atomic absorption to a level of sophistication where it is almost as good as the neutron activation analytical method, and that is the Dow Chemical Co. at Midland, Mich.

Senator HART. Well, a feature in one of the bills that we are considering, S. 1528, and really the only new element in the series of legislation before us, would obligate the FDA to use the best available methods of detecting dangerous materials, obligate them to seek to identify elements which may present the danger, then to test for them, and to do it constantly. Do you support this feature of the legislation?

Dr. WOOD. Yes, I support this feature very strongly. There is one thing, one criticism, if I may, of the bill which I have, and that is I think, as usual, you are looking at the problem from the wrong end, because as I pointed out, we are going to have increasing concentrations in fish, and, of course, the consumer needs to be protected against fish which contain dangerous levels of these neurotoxins, but I think the real approach to the problem is to tackle the problem from the source, from the cause, look at the preventive aspects of it rather than to look at every batch of commercial fish and fish products that come through the system.

I think you have to do what your bill calls for now, it is very important because of the seriousness of the problem. But I still think it is looking at the wrong end of the problem.

Senator HART. Well, there is legislation before the committee that looks at the problem from the other end, the ultimate end, and you would agree we have to do both?

Dr. Wood. I think you have to do both, yes.

Senator Hart. Mr. Bickwit.

Mr. Bickwit. I take it you would like to see the FDA at this time begin testing for the more poisonous form of arsenic that you fear may be in fish at the present time.

Dr. Wood. Well, I think much more research has to be done. You see, we have been able to demonstrate synthesis of methyl arsenic compounds, Dr. McBride has, and this is a potential problem. And I think research has to be done to look at this particular problem in more detail.

As far as the mercury problem is concerned, we know in detail now exactly how the reaction goes, exactly what happens. To give you one interesting side issue which is pertinent, the effect that you get with one pollutant on the other. It turns out that chlorinated hydrochlorines such as DDT and other pesticides inhibit or prevent the enzymes from synthesizing methylmercury. So in areas where you have DDT pollution you don't have a methylmercury problem. This is interesting. There is a very interesting interaction between these two problems, and it could be that DDT might become essential in order to solve the mercury problem in the Great Lakes system.

But we have to do a lot more research in this particular area, and I think the FDA needs a lot of support, and we should be using the best methods and using the best people to solve the problem.

Mr. Bickwit. The bill prescribes that the FDA should carry out screening for dangerous materials. It then defines dangerous material to mean any material which can be expected to reach toxic levels in fish. If you were to go to the FDA tomorrow if this bill were law and attempt to establish that methyl arsenic could be expected to reach dangerous levels in fish or fish products—I suspect you would have a pretty hard time doing that at this time. Do you agree?

Dr. Wood. Well, I can only think about my experience with the methylmercury problem. We knew the extent of the problem in 1967, and we published a paper pointing out the significance of the problem in 1968. And unfortunately, working at an academic institution, or working outside a government agency, it is difficult to know which mechanisms we should use to get our information across, and as far as I was aware at that time, there was no obvious route where I could get this information across to the FDA.

As far as the methylmercury problem is concerned, it was frustrating for me because I told the chairman of the National Research Council, the president of the American Chemical Society, and all the people I thought who might be able to influence developments in this area in Washington, and this communication, the normal communication route in universities simply didn't work. And if I had to go back to 1967, with some reluctance I would probably call the press and tell them about it.

Mr. Bickwit. Well, we do want to facilitate your route into the regulatory agency, and that has been the purpose of the bill as drafted. However, I think we could facilitate that route to a

greater extent if all you were required to show was that there was reason to believe a given dangerous material could be expected to reach toxic levels in significant quantities of fish, and then what was required as the Food and Drug Administration's response was not merely screening, but sufficient research to enable us to detect the true extent of the problem.

Dr. WOOD. I think that this mechanism has to be made available, but I would also say that the support for the FDA will have to be at such a level so that they can conduct a program like this.

Mr. BICKWIT. I think that is a very serious problem and one that we have to take into consideration as we move forward on this bill.

Thank you very much.

Senator HART. Doctor, you commented that if you had to do it over you would probably go to the press. On Tuesday, day before yesterday, in another committee hearing there was an academician who was describing his efforts to attract the system's attention to the inequity, and he said he had concluded that the way to reach the man was by draping scandal—in a sense the academicians that you reflect upon now are considering that as the best course to get a message through.

Dr. WOOD. I think this is unfortunate.

Senator HART. Thank you very much.

(The statement follows:)

STATEMENT OF DR. JOHN WOOD, ASSOCIATE PROFESSOR OF BIOCHEMISTRY, UNIVERSITY OF ILLINOIS

(I) INTRODUCTION

About a decade ago two independent large-scale incidences of poisoning were observed in Japan and Sweden, respectively. In Japan a large number of people belonging to the fishing population around Minamata Bay were seriously affected by what is ow called Minamata disease, and which is characterized by sometimes irreversible and sometimes fatal neurological disorders. In Sweden certain bird populations decreased drastically, and at the same time many birds in obvious states of cramps could be found. Eventually, these two unrelated incidents were traced back to the same origin: poinsoning by ingestion of methyl-mercury compounds.

The poisoning of Swedish birds was finally correlated with (a) unusually high mercury levels in dead birds (1), (b) relatively high mercury content of some Swedish agricultural products (especially eggs) compared with those of other European countries (2), and (c) the extensive use of methyl-mercury-dicyanodiamide (Panogen) as a fungicide in Swedish agriculture (3).

Alkyl-mercury generally gives rise to very characteristic neurotoxic symptoms, and in contrast to other organic mercury compounds alkyl-mercury is metabolized slowly in the mammalian body (4). Therefore, cumulative alkyl-mercury poisoning results as small quantities are sequentially ingested. The use of methyl-mercury as a fungicide is now banned in Sweden (February, 1966), and since this legislation mercury content, in birds and eggs, has dropped drastically.

Minamata disease was traced back to the mercury-containing effluent of a large chemical plant (5). The neurologic syndrome of the disease was identical to that described previously for alkyl-mercury poisoning, and CH_3-HG-S-CH_3 was isolated from shellfish in the Minamata Bay area (6). The Minamata factory was using inorganic mercury salts or mercury metal as catalysts, and when spoiled these catalysts were partially deposited in a factory dump and partially lost into the sewage system. It has been suggested by Kurland that inorganic mercury issued with sewage effluent into the sea may be alkylated by "plankton or other marine life" (5). However, when it was discovered that the spent catalyst of an acetaldehyde reactor in the plant contained approximately 1%

methylmercury it was concluded that biological methylation of mercury did not make any significant contribution to the total methyl-mercury ingested by shellfish in the bay.

In Sweden much interest has been focused on the occurrence of mercury in various organisms. These studies were prompted because of the disastrous effects of the use of methyl-mercury as a fungicide, and they were facilitated by the supersensitive analytical methods for mercury developed in another context by Westermark and Sjöstrand (7, 8). Extensive investigations have been made on the mercury content of fish (9). Fish from inland and coastal waters were shown to contain much higher levels of mercury than those caught in the ocean (i.e., several p.p.m. to 0.01-0.1 p.p.m., respectively). In some cases, but not all, this rise in mercury content may be correlated with industrial water pollution. It is evident that air-borne mercury from industrial areas may pollute waters quite a significant distance away (10). The most disturbing aspect of mercury content in fish is that mercury exists predominately as recalcitrant methylmercury (11, 12); even in areas where inorganic mercury or phenylmercury are shown to be predominant in sewage effluent. Clearly, inorganic mercury and phenyl-mercury, (which is readily degraded to $Hg^{2}+$), must have been methylated either in the aquatic environment or in the fish themselves.

With methyl-mercury compounds, groups occupying the cationic coordination positions are of minor importance for in biological systems exchanges of the type:

$$RHgX + Y^{\ominus} = RHgY + X^{\ominus}$$

take place. A good example of this general reaction is the use of organomercurials to titrate free cysteine sulfhydryl groups in purified enzymes. Similarly, organomercurials are often used to establish the involvement of sulfur as the catalytic site of some enzymes by the use of enzyme kinetics.

After Westöö demonstrated that liver homogenates can methylate inorganic mercury (13), Jensen and Jernlöv demonstrated that mercury is methylated in sludge taken from aquaria (14). Whether this alkylation reaction was chemical or enzymatic in nature was difficult to establish. In methanogenic bacteria alkyl-B_{12} compounds serve as alkylating agents for inorganic mercury (15), arsenic (16), selenium and tellurium (17). Clearly, methylcobalamin (methyl-B_{12}) may serve as a chemical alkylating agent in the aquarium sludge ecosystem, in N^{5} methyltetrahydrofolate-homocysteine transmethylase (B_{12}-dependent) in liver (18), and in all microorganisms capable of synthesizing methylcobalamin (19). It should be pointed out that the synthesis of methylcobalamin in the microbial ecosystems is enzymatic in origin, and in order for this synthesis to progress mercury levels must be low enough not to seriously inhibit these enzymes.

(II) THE MAJOR SOURCES OF MERCURY POLLUTION OF THE ENVIRONMENT

In medieval England mercury metal was used as an agent to procure abortion and to commit suicide. In some countries in the far east small doses of mercury metal are used as a potent diuretic. A perfect example of a person suffering from chronic mercurial poisoning is depicted in Alice in Wonderland where we have the charming character of the Mad Hatter. The Hatters in London would use mercuric oxide in the treatment of velvet, and constant contact with this mercury salt would allow its passage through the skin into the bloodstream. After a number of years the mercury would accumulate to a level where the "Hatter" would become a mental defective. The tragedy of the Mad Hatter also applied to some members of the dental profession who succumb to mercury poisoning as a result of constant exposure to mercury vapor when mixing the mercury-silver amalgam for fillings. These two classical examples of mercury poisoning are restricted to symptoms developed due to excessive contact with *inorganic* mercury (mercury metal or mercury salts), which does *not* pose a threat to the health and welfare of the general public.

With the discovery that *inorganic* mercury is converted to deadly poisonous *methylmercury* by microorganisms which use *methyl-Vitamin* B_{12}, it was realized that this methylmercury in the environment adds to the methylmercury used as a fungicide in agriculture to pose a serious threat to the health and welfare of the general public. It has now been established that methylmercury is beginning to accumulate in a number of foods common to the diet of U.S. citizens.

Mercury pollution can be conveniently divided into two categories: (1) intentional pollution, and (2) unintentional pollution. Intentional pollution is concerned with the widespread distribution of methylmercury in agriculture, and this represents about 10% of the total mercury used in the U.S.A.

Unintentional pollution involves mercury losses in a variety of forms by industry, hospitals, power plants and institutional research laboratories.

Industrial chemists did not realize that mercury losses in industrial effluents would lead to the formation of methylmercury by microorganisms to establish a food chain for the accumulation of this deadly poisonous compound in fish. Twenty six thousand tons of chlorine is manufactured daily in the U.S., and 25% of this chlorine is manufactured by the electrolysis of brine by using mercury metal as an electrode. Consequently significant quantities of mercury metal and mercury salts have been widely distributed in inland and coastal waterways in the U.S. and Canada. To give an example of the extent of mercury losses; 200,000 lbs. of inorganic mercury has been deposited in the St. Clair River System in the last 20 years. The chlorine industry is not the only negligent body in this respect since significant quantities of mercury compounds are lost in the following processes:

1. Plastics industry in the manufacture of vinyl chloride—losses of both mercury salts and a small amount of methylmercury by-product.
2. Paper Industry—losses of mercury metal and mercury salts as impurities in the caustic soda used in bleaching. Also, phenylmercuric acetate (PMA) was used as a slimicide by the paper industry. This practice has now been stopped, but significant levels of PMA still pollute waterways owing to the large quantities used.
3. Electronics Industry—losses due to the increased use of mercury metal. e.g. The "long life" alkaline batteries have a total mercury content of 8% (we usually throw them away).
4. Hospitals—losses due to the use of mercury salts in histology laboratories.
5. Power Companies—losses of mercury metal from coal.

Organomercurials are still used as potent diuretics and as bactericidal agents in ointments (e.g. mercurochrome). However, with increased emphasis on the use of pesticides and insecticides to increase crop productivity, vast quantities of organomercurials are in widespread use in advanced agricultural systems, particularly in the U.S.A. The result of this usage allows mercury to find its way into a variety of crops, meats and eggs, through food chains in the environment. Seeds are particularly vulnerable to fungus deterioration, and treatment with liquid alkyl-mercury compounds provides a very effective method to prevent seeds from rotting when planted. Methylmercury dicyandiamide (Panogen) is one of the most popular seed dressings. It is very toxic to humans, and was banned in Sweden in 1966 for this reason. Large amounts of Panogen were exported to the U.S.A. from Sweden each year where its sale competed effectively with U.S. manufacturers of the same compound. In 1970 the export of Panogen was banned in Sweden. In addition to treatment of seeds, alkylmercury compounds are used on potato, tomato and apple crops extensively. In a survey of mercury levels in plants in Britain, Canada, New Zealand and Scandinavia, evidence has accumulated to show that translocation of mercury does occur, providing accumulation in harvested crops from pretreated seeds and plants (20). It is of interest to note that at the time Sweden banned the use of methylmercury compounds the U.S. was using two hundred times the amount sold in Sweden (21).

(III) INTERCONVERSIONS OF ORGANOMERCURIALS IN BIOLOGICAL SYSTEMS

Bioconversions of alkyl-mercury compounds are limited by their toxicity although exchanges of a variety of anions at the cationic coordination site probably occurs. Since these compounds are usually uncharged, membrane transport presents no problems, and so alkyl-mercury is readily assimilated and concentrated in a variety of animals including man.

One example of how alkyl-mercury is assimilated was provided by Dr. Carl Rosen (3). Seed dressings treated with Panogen yielded crops in which alkylmercury accumulated via translocation. Hens fed on grain from pretreated crops concentrated mercury in the liver and in their eggs. People, who were particularly partial to eggs, in turn concentrated mercury in the liver where it has a biological half-life of about 70 days (22). Hence, over a period of time mercury levels were concentrating exponentially in tissues including the brain

(10–15%). Excretion of mercury is mainly in the faeces, and so low levels of mercury would be returned to ecosystems containing anaerobic bacteria (in sewage) where it could be methylated to methylmercury and to volatile dimethyl mercury to allow recycling.

Bioconversions of inorganic mercury to organomercurials definitely occurs, and provides a most interesting and challenging problem for biologists and chemists. Jensen and Jernlöv reported that anaerobes in sludge from aquaria can methylate inorganic mercury (14). They postulated that this reaction could happen in one of two ways:

(a) Hg^{2+} $\xrightarrow[2R-CH_3\ 2R-CH_3\ X]{(CH_3)_2Hg}$ $CH_3Hg^+ + XCH_3$

or

(b) Hg^{2+} $\xrightarrow[R-CH_3\ R-CH_3]{CH_3Hg^+}$ $(CH_3)_2Hg$

Using cell extracts of a methanogenic bacterium (15), Wood *et al.*, were able to give some support for a combination of both (a) and (b). The formation of monomethyl-mercury from dimethyl-mercury is dependent on the pH of the environment, because under mild acidic conditions the following general reaction occurred:

$$R-Hg-R' + HX$$
$$R-Hg-X + R'H$$

The methanogenic organism used in this study was isolated by Bryant, *et al.*, (23) from the symbiotic mixed culture known as *Methanobacillus omelianskii*. This original symbiotic mixed culture was isolated from canal mud at Delft, Holland (24), and was grown with ethanol and carbon dioxide. The role of the first organism (called S. organism (25)) was to provide H_2, which in turn provides the 8 electrons necessary for the reduction of CO_2 to CH_4 by the second organism (called M.O.H.) e.g.

'S.' organism

$$CH_3CH_2OH + H_2O$$
$$CH_3COOH + 2H_2$$

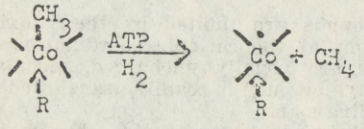
M.O.H. organism

$$4H_2 + CO_2$$
$$CH_4 + 2H_2O$$

Symbiotic relationships between H_2 evolvers and H_2 utilizers are abundant in anaerobic ecosystems such as lake sediments and in the rumen.

Cell extracts of M.O.H. grown with 80% H_2 and 20% CO_2 catalyze the formation of CH_4 from a variety of substances which include in addition to CO_2, C_3 of serine (26), C_1 of pyruvate (27) N^5 methyltetrahydrofolate monoglutamate (28) methylcobalamin (29), methyl-factor B and methyl-factor III (30) and (31). The last three substrates are excellent methyl-donors in CH_4 formation. The overall reaction requires ATP, and H_2 as the source of electrons.

e.g.

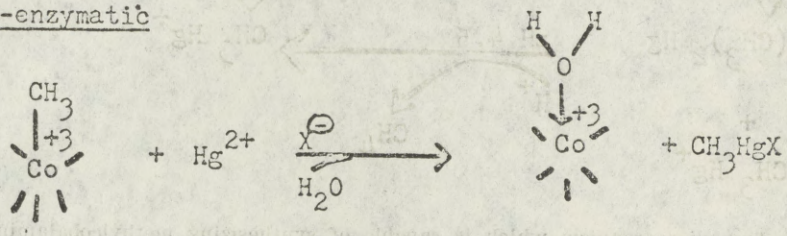


R = 5,6 Dimethylbenzimidazole
or 5 hydroxybenzimidazole
or water

This reaction is inhibited by mercuric acetate, sodium arsenate, tellurate or selenate. During this inhibition methyl groups are still transferred from methyl cobalamin as can be observed by the conversion of the (Co III) methylcobalamin (red) to paramagnetic (Co II) B_{12}-r (brown. This methyl-transfer leads to the synthesis of methyl or dimethyl-mercury, (depending on the concentration of Hg^{2+} used as inhibitor); dimethylarsine, and judging by odor, methyl selenide and telluride respectively (17).

More recent studies in our laboratory have confirmed the non-enzymatic and enzymatic methylation of mercury, but furthermore we have elucidated the reaction mechanism for these two reactions (32). Hill *et al.*, (33) studied the non-enzymatic methylation of mercuric ions by methylcobalamin, and concluded that this reaction proceeds by electrophilic attack by $Hg^{2}+$ on methylcobalmin. We have confirmed this mechanism and have been able to demonstrate that CH_3^- is transferred by using a spin-label to determine the valency of the cobalt atom during catalysis (34). This non-enzymatic mechanism will only occur in the presence of Hg^{2+}, reduction of Hg^{2+} to Hg_2^{2+} or to Hg^0 results in inhibition of catalysis. The following general reaction occurs:

non-enzymatic

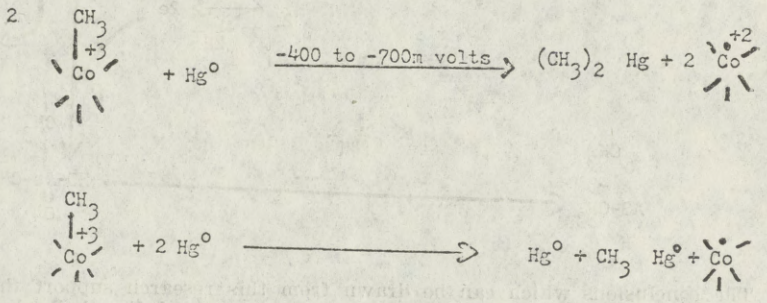


$X^{\ominus}$ = anion

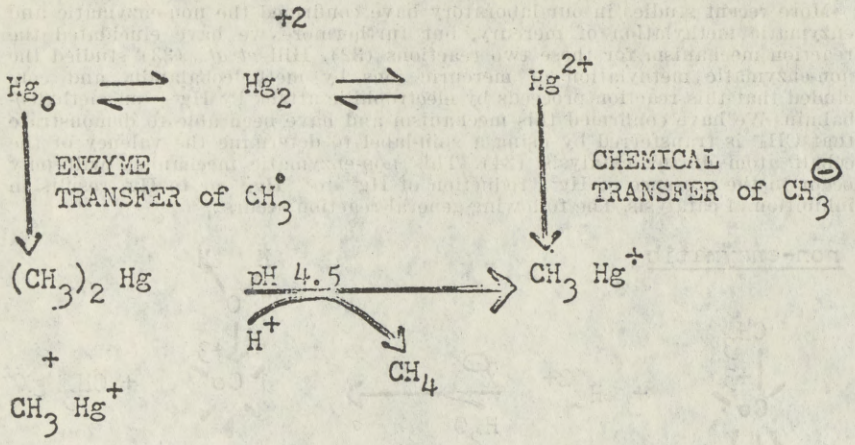
Since methylcobalamin is a common coenzyme in both anaerobic and aerobic bacteria significant quantities of this coenzyme are present in sediments (35). The amount of methylcobalamin present in sediments will depend on the microbial population in sediments, and this relationship regulates the rate of synthesis of methylmercury by this mechanism.

Under anaerobic conditions Hg^{2+} is reduced to Hg^0, and depending on the concentration of Hg^0 dimethyl and monomethyl mercury are formed as products. In this reaction, studies with isotopes (36) and with spin-labeled methylcobinamide (37) indicates that methyl groups are transferred as radicals (CH_3^0).

enzymatic reaction



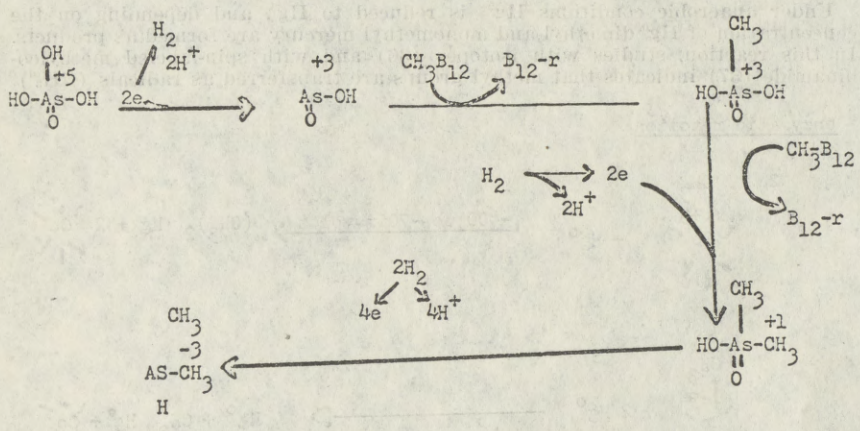
The results summarized in this section provide us with a general scheme for the synthesis of methylmercury compounds in the environment.



Any microorganism which is capable of synthesizing methylcobalamin will have the potentiality to synthesize methylmercury.

Also, if sediments are polluted with arsenic salts, then methylcobalamin utilizing bacteria provide conditions for the synthesis of the deadly poisonous nerve gas dimethylarsine.

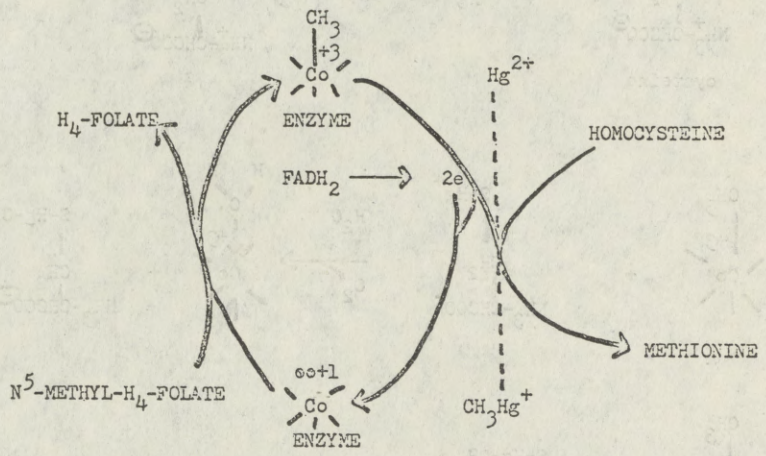
PATHWAY FOR THE FORMATION OF DIMETHYL-ARSINE



The conclusions which can be drawn from this research support the view of Johnels *et al.*, (9), that volatile dimethyl-mercury (and dimethylarsine) may pollute the atmosphere as the result of inorganic contamination of anaerobic ecosystems. Depending on the pH of the environment dimethyl-mercury, which is quite soluble in water, may be converted to the non-volatile methyl-mercury which can be concentrated through food chains to fish living in both fresh water and marine environments.

Methylation of inorganic mercury in the liver has been demonstrated by Westöö (13) and may be accomplished by methyl-transfer from bound methylcobalamin in the enzyme N_5-methyltetrahydrofolate-homocysteine transmethylase (38) (Brodie *et al.*). A mechanism for his reaction is proposed in Scheme III.

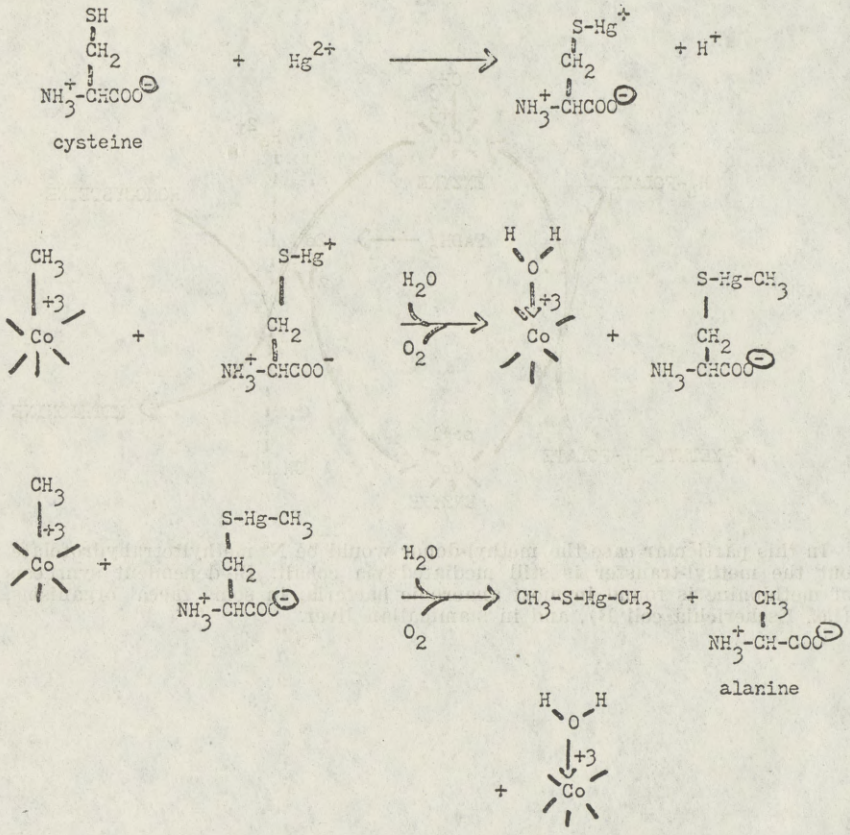
Scheme III PROPOSED MECHANISM FOR THE METHYLATION OF MERCURY IN THE LIVER



In this particular case the methyl-donor would be N^5 methyltetrahydrofolate, but the methyl-transfer is still mediated via cobalt. B_{12}-dependent synthesis of methionine is found in most anaerobic bacteria, in some faecal organisms, (i.e., Escherichia coli B), and in mammalian liver.

The synthesis of methylmercury thiomethyl (CH_3–Hg–S–CH_3) by shellfish is easily explained by the following sequence of reactions:

PROPOSED MECHANISM FOR THE FORMATION OF METHYLMERCURY THIOMETHYL



In this reaction sequence Hg^{2+} reacts with cysteine to give the cysteine–Hg^{+} complex, this complex is an analog for homocysteine and would be methylated by the methionine enzyme (39). A second methylation step for the methylmercury cysteine complex would result in the formation of methylmercury thiomethyl. In numerous experiments designed to look for the methylation of lead by the enzyme systems have failed to yield positive results. Both Pb^{2+} and Pb^{4+} salts were tested and all results were negative.

(IV) THE MAGNITUDE OF MERCURY POISONING IN JAPAN

The first major incident of methylmercury poisoning, as a result of industrial effluent, occurred in the town of Minamata, Japan. In 1953 it was noticed that cats became terribly ill, screaming incessantly, and some of them committed hari kari by diving from the cliffs into the ocean. Shortly afterwards a number of fishermen and their families became seriously ill. It was thought initially that this epidemic was caused by an infectious agent (bacteria or virus) which was transmitted from cats to humans, and so this syndrome was called Minamata Disease. An investigation made by the Japanese Health Au-

thorities established a link between the quantities of fish eaten by affected families and their cats. Subsequently it was discovered that the effluent from a vinyl chloride plant contained high levels of mercury salts and small contaminating levels of methylmercury. When cats were fed on the factory effluent, they developed exactly the same symptoms as the cats fed on Minamata Bay fish. Therefore, it was concluded that methylmercury was concentrating through food chains which ultimately led to high concentrations in Minamata Bay fish. However, the vinyl chloride plant at Minamata called in its own expert to investigate Minamata Disease, and the results of the industry survey indicated that methylmercury could not be the causative agent since fish caught in other coastal areas of Japan contained equally high levels of mercury to those taken from the Minamata Bay area. As a result of the factory study, the Minamata case was closed. Between 1953 and 1960, 116 people were irreversibly poisoned (43 died) by Minamata Disease. Irreversible mercury poisoning is defined as the point where brain cell damage is extensive and the victim remains a mental defective for the rest of his life. The pollution in Minamata Bay was so great that fishing in Minamata Bay was banned in the winter of 1956 because 42 cases of mercury poisoning were reported that year (40). Two years later shellfish were taken which contained 27 to 102 ppm Hg on a dry weight basis. During 1958 the effluent was diverted into the Minamata River, and one year later shellfish in the river showed 9 to 24 ppm Hg, on a wet weight basis, but most fish were found dead (41).

In 1965 a second incident occurred at the coastal town of Niigata (40). Once again a vinyl chloride plant was implicated. Cats committed hari kari, and 120 people were affected (26 irreversibly and 5 died). It was established that mercury levels were high in the factory effluent, and a connection between fish location, consumption and affliction was established. Further scrutiny of the Minamata factory report to the Japanese Health Authorities revealed that for their survey of methylmercury levels in fish they only analyzed fish caught close to vinyl chloride and chlorine plants. Therefore this industrial report was not exactly honest.

The Niigata disaster provided experimental data which clearly demonstrated that the consumption of fish containing 5 to 6 ppm daily would probably be lethal (42).

Mercury pollution is still a serious problem in Japan, but these disasters have provided significant-pressure to cut back on the use of organomercurials, and to carefully monitor industrial effluents. Even so, pollution has been discovered in the Omata and Oyabe Rivers recently. Organomercurials have been replaced by other fungicides in rice crop treatment in Japan during 1968.

(V) THE BATTLE FOR LEGISLATION AGAINST THE USE OF ORGANOMERCURIALS IN SWEDEN

The problem in Sweden began about 1950 when severe poisonings were noticed in seed eating birds, carrion, and predators. This was shown to be largely the result of Panogen treatment of seeds. From that time the battle against the chemical industry and agricultural users began. Three young Swedish scientists from the department of Radiobiology at the University of Stockholm called Ackerfors, Nilsson and Rosen began the long battle risking libel and other personal hardships to finally win their case with legislation in February, 1966. In 1964 the first step was taken by the plant protection institute who demanded that the amount of mercury seed dressing used be cut in half. In the fall of 1965 bird populations still continued to be hard hit by mercury poisoning. It is interesting to note that the drastic decrease in the use of methylmercury in 1965 had no effect on crop yields in Sweden that year.

In the heat of public debate concerning the concentration of mercury in eggs, by the food-chain mentioned earlier in this chapter, (Rosen *et al.*, (3)), it was discovered by intensive research that high levels of methylmercury (11,12,43–47) accumulated in fish both in inland and coastal waters. Mercury content in fish was found to be dependent on the age or weight, species, and the amount of biological activity in the environment. For example, fish in the ocean were shown to accumulate much less mercury than those from coastal waters and some lakes and rivers.

There is still no control of mercury pollution from industrial wastes in Sweden, and the release of inorganic mercury into the environment followed by its alkylation and accumulation in fish still poses a serious threat to this fish-eating nation.

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(VI) THE MAGNITUDE OF MERCURY POLLUTION IN THE UNITED STATES AND CANADA

This year (1970) U.S. waterways in 33 states have been shown to contain elevated levels of methylmercury, and many areas have been closed to fishing indefinitely. The Department of Justice is taking legal action against a number of factories in the U.S. for indiscriminate dumping of mercury. A good illustration of the impact of industrial pollution of the St. Clair River System is the observation that the mercury concentration in fish caught in Lake St. Clair in 1935 gives 0.07 to 0.11 p.p.m. These data are to be compared with fish taken from the same area in 1970 which have 7.0 p.p.m. During this 35 year period of industrial growth as much as 100 fold increase in the methylating levels in fish has occurred rendering them totally unfit for human consumption. Our inland and coastal waterways are so polluted that elevated levels of mercury are found in tuna and swordfish. Although, the industrial practice of deep sea dumping of wastes may have contributed greatly to this problem.

Probably the most serious threat to the health of the general public in the North American Continent exists in the Saskatchewan River System. Fish have been taken from LakeWabigoon which contain 24 p.p.m. methylmercury, and the consumption of only a few fish polluted at this level would be fatal. It is amazing that fatalities have not been recorded from such a dangerous situation.

The increase in the use of methylmercury compounds in agriculture in the U.S. and Canada has caused the hunting season for pheasant and hungarian partridge to be cancelled in Alberta in 1969, and elevated methylmercury levels have been reported in California, Montana and Ohio. In 1970 judges in Chicago and Washington overturned restrictions placed by USDA on the further distribution of these deadly compounds by Noram. The basis for the two judges to support continued use of methylmercury was that the only recorded human fatalities came as the result of improper usage of these fungicides. It is true that the levels of methylmercury compounds applied to date have not yet had time to enter sufficient food chains to wipe out the human race. How long will it be before this happens?

(VII) PATHOLOGICAL AND CLINICAL FEATURES OF MERCURY POISONING IN MAN

Owing to their non-polar nature alkyl-mercury compounds are quite uniformly distributed throughout the body because membranes cause no special barrier. The symptoms of alkyl-mercury poisoning are fatigue, headache and irritability followed by tremors, loss of feeling in the fingers and toes, blurred vision, and poor muscular coordination. Difficulties with speech and hearing are followed by a tendency for the victim to become an introvert, reaching a point where he may well be admitted to a mental hospital. Muscular wasting and further neurological disorders ensue. Significant amounts of alkyl-mercury passes brain membranes and accumulates causing disintegration of brain cells.

Passage of organomercurials across the placenta and concentration in the foetus causes a special problem. A widow of one of the Minamata victims gave birth to a seemingly healthy child which was fed on mother's milk, and never given polluted fish.

At three months of age the child suffered a convulsion, all four limbs became spastic, and up until 2½ years, when the child died, its mental development was zero (48).

It is obvious that the most noticeable cases of mercury poisoning come from areas where people have been exposed to quite large doses. In the U.S. statistics indicate that from 3 to 11 cases of death from mercury poisoning have occurred each year since 1957. No data is available on the effect of prolonged exposure to lower-levels of mercury or the level of mercury which humans can

tolerate before it begins to cause permanent damage. It seems remarkable that no standards were established for the mercury content in the U.S.A. until 1970. The only evidence which is available comes from experiments with animals which indicate that greater than 8 p.p.m. in brain tissue cannot safely be tolerated.

(VIII) ANALYTICAL METHODS EMPLOYED FOR THE DETECTION AND QUANTITATION OF MERCURY IN TISSUES AND SEDIMENTS

A variety of analytical methods have been used to determine total mercury concentrations in foods, water, and tissues. Many of the methods that are used suffer from serious defects, since analytical chemists have not recognized that methylmercury is the dangerous poison, and it is this compound which represents 95 to 100% of accumulated total mercury in foods in most cases. Flameless Atomic Absorption Analysis is the most popular method used by FDA, FWQA and USDA. This method is accurate for *inorganic* mercury, but for methylmercury analysis it can be as much as 100% low. The neutron activation analysis technique developed by Jervis (50) has proved to be the most reliable method available at this time, but it is seldom used because it is time consuming and expensive. It is difficult for me to understand why *time* should be given preference over *accuracy* when the health and welfare of the general public is concerned.

(IX) POSSIBLE SOLUTIONS FOR THE MERCURY POLLUTION PROBLEM

Large quantities of mercury in various forms have been deposited in our environment. Only a small percentage of the total mercury deposited has been converted to methylmercury by microorganisms. For example, in the St. Clair River System it is estimated that the total concentration of mercury in the total fish population is approximately 100 lbs. Since 200,000 lbs. of mercury has been deposited in that area then it is clear that the mercury pollution problem has only just started. f 95% of this mercury could be removed from the sediments in this system it will still take many years before fish will be fit for human consumption in this area. We face two alternative situations:

(1) Find a good way to remove mercury compounds from sediments.

(2) Find a good method to remove methylmercury from fish protein.

1 (a) Dredging

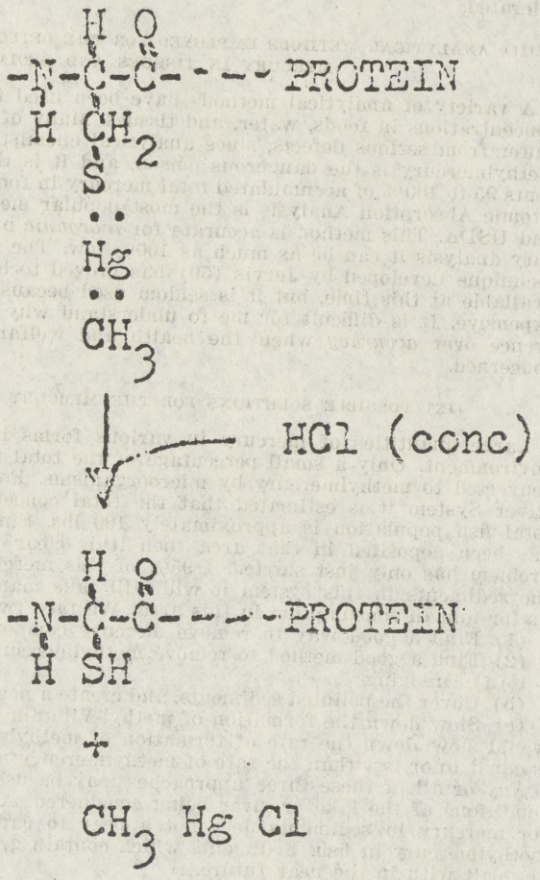
(b) Cover the polluted sediments, and create a new layer of biological activity.

(c) Slow down the formation of methyl-Vitamin B_{12} by microorganisms. This would slow down the rate of formation of methylmercury to a point where it is equal to or less than the rate of methylmercury metabolism in fish.

Any or all of these three approaches may be used depending on the specific conditions of the lake or river being considered. A concentration of 0.3 p.p.m. for mercury in sediments does not appear to cause significant increases for methylmercury in fish. Sediments which contain greater than 0.3 p.p.m. should be dealt with in the near future.

2 The removal of methylmercury from fish protein poses an extremely difficult problem. Methylmercury does not form good coordination complexes with nitrogen containing bases. The methylmercury pyridine complex is very unstable (49), and therefore it is unlikely that coordination complexes will be formed with lysine, histidine or arginine. Attempts to remove methylmercury from protein by lyophilization, frying, boiling or drying at high temperatures have proved to be unsuccessful. The only way to quantitatively remove methylmercury from protein is by treatment with concentrated acids. Undoubtedly the major complex formed between methylmercury and protein is the covalent complex with cysteine residues.

e.g.



Clearly, the removal of methylmercury from protein is not very practical.

(x) DISCUSSION

Fortunately for us methylmercury has a biological half-life in humans of 70 to 74 days, but as little as 6 p.p.m. in brain cells can cause irreversible brain damage. Nobody knows what the subclinical effects of lower levels may do to the nervous system.

Unintentional pollution by mercury must be controlled by checking the effluent wastes from factories daily, and by carefully recording the quantities of mercury used and lost each year. However, recycling of solvents and careful regeneration of catalysts by the Chemical Industry must come eventually.

In conclusion, it is true that the increased addition of carbon, nitrogen and phosphorus compounds to our waterways has increased microbial activity. When these microorganisms are confronted with mercury they have the ability to detoxify their own environment at the expense of ours. The future for microorganisms looks good. It is time for us to take inventory on this problem before the situation passes beyond repair.

Pollution hazards exist when arsenic and its derivatives are introduced into an environment where anaerobic organisms are growing. Arsenic pesticides (sodium methyl arsenate and calcium and lead arsenate) may be applied over

large areas and eventually find their way into anaerobic aquatic or terrestrial environments where they can be converted to arsine derivatives. The small amounts of arsenic in high phosphate detergents might even be significant in the anaerobic sewage sludge digester. Biological methylation of metals is not limited to arsenic, but selenium and tellurium are readily methylated by microorganisms and fungi. Methylmercury and methylarsenic compounds are potent neurotoxins, and therefore these compounds are much more dangerous than the corresponding inorganic mercury and arsenic salts. Methylmercury accumulates in fish, and studies with methylarsenic compounds are in progress to determine the extent of this problem. Current methods for determining mercury concentrations in fish do not distinguish between the different forms of mercury present. Since in our hands 95–100% of the total mercury in fish is methylmercury, then we should be concerned with analysis of this more potent toxin.

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Senator HART. Not for the first time, the committee welcomes as our next witness, the concluding one for today, the legislative representative of the Amalgamated Meat Cutters and Butcher Workmen, Arnold Mayer. Arnold Mayer has been reasonably patient with this committee and Congress. This is the fourth occasion on which his voice, speaking for men and women engaged in the handling and processing of fish, has urged this committee and this Congress to protect the consumers of America by enacting legislation such as we have before us here.

Mr. Mayer, we welcome you back.

STATEMENT OF ARNOLD MAYER, LEGISLATIVE REPRESENTATIVE, AMALGAMATED MEAT CUTTERS AND BUTCHER WORKMEN OF NORTH AMERICA

Mr. MAYER. Thank you, Mr. Chairman.

Mr. Chairman, because this is the fourth time we are appearing, our statement is briefer than in the past. Very frankly, we don't have very much to add to our last three statements. We are going to testify on the overall inspection situation, not just the heavy metals problems because there are additional difficulties that fish inspection legislation must solve. These include the unwholesomeness and adulteration of fish from which the consumer must be protected.

So I am afraid we are going back to the old stuff that was involved in the hearings you held over the last 4 years, and some old parts of the legislation which you have introduced.

My name is Arnold Mayer. I am the legislative representative of the Amalgamated Meat Cutters and Butcher Workmen of North America—AFL–CIO.

The Amalgamated is a labor union with 550,000 members organized in about 700 local unions throughout the United States and Canada. The Amalgamated and its local unions have contracts with thousands of employers in the meat, retail, poultry, egg, canning, leather, and fur industries.

Our union also includes some 10,000 members in the fish industry. They are workers who catch fish and who handle and process fish and shellfish.

REPEAT PERFORMANCE

As I have said, since this is the fourth time in 4 years that we have testified before a Senate Commerce subcommittee on the need for strong fish inspection legislation, we shall be brief today. Frankly, we have little to add to the many statements we have made on this subject in the past.

Real and meaningful fish inspection has been and still is absolutely essential for both the protection of the consumer and the seafood industry. The various well-publicized problems of the industry in recent years emphasize that point.

Consumers need the protection which inspection will provide against adulteration and other health hazards. The industry even more badly needs the increase in consumer confidence which inspection would give to its products.

Unfortunately, a real chance to enact fish inspection legislation came to naught in the 91st Congress when the Nixon administration, together with major parts of the industry, urged a weak bill in place of the effective measure which had been introduced by the chairman, Senator Philip A. Hart.

Since the administration made no real effort to pass its own bill, we can only assume that it intended to stalemate fish inspection legislation. It succeeded.

This year, Senator Hart has introduced a revised version of his 1969 bill, S. 1528. And the administration has again underbid his measure with its 1969 proposal, S. 700. A stalemate is again possible.

CONSUMER FRAUD

Some individuals and groups urged our union last year to support the administration bill, so that some legislation might result. We refused. We shall refuse such requests again in this Congress. We strongly feel that inadequate inspection legislation is worse than none at all. In fact, our union believes that a weak bill will actually be a consumer fraud and will eventually have disastrous results.

Once fish inspection legislation—any kind of fish inspection legislation—passes, the communication media will report the event widely as a new public safeguard. Neither the media nor consumers can go into the intricacies of the newly passed measure. Consumers will assume that they are now fully protected. But after a while, the loopholes and the dangers posed by a weak bill will become evident as exposes and outbreaks of illness occur. Consumers will feel that they have been tricked again. More frustration, more cynicism about protective programs will set in.

We shall not become a party to a consumer fraud and its consequences. We shall not let fish inspection become another activity of the FDA in which consumers believed as a safeguard and then found their trust had been misplaced.

LOSS OF PRIORITY

Organized consumers, in fact, no longer consider fish inspection legislation to be a top-priority legislative goal—as it was in 1969. Many organizations believe that consumers now know about the

conditions and lack of inspection in the seafood industry and have made their individual decisions on how to deal with these factors.

Some consumer leaders to whom we have talked about support for this legislation have told us that they consider the inspection more needed by the industry now than by consumers.

We regret the existence of this attitude because some 10,000 of our members work in this industry. They are adversely affected by any consumer disaffection with fish as a food. Also, as a major supporter of fish inspection, our union is not exactly helped by the downgrading of this legislation. But we must recognize this fact of life about the measure.

To make the record clear, our union fully supports S. 1528, which was introduced by Senator Hart. We believe it would provide strong and effective inspection. While it would not be panacea for all consumer ills involving the seafood industry, it would deal effectively with many of the basic problems. It would provide an inspection system which the consumer could trust.

We applaud the measure's provisions to deal with the mercury, arsenic and other dangerous materials. The procedures proposed in section 410(j) seem logical and helpful. We hope it will end the danger of fish containing harmful amounts of heavy metals reaching the consumer.

FULL-TIME INSPECTION

In past years—and probably in this one—the major issue before Congress concerning fish inspection has been whether the legislation should require that a government inspector be stationed in plants at all times of processing. This requirement used to be called continuous inspection, but the administration termed it generally spot check proposal "continuous supervision" and parts of the industry refer to the periodic checks it supports as "continual inspection," so we have a consumer labeling problem. We shall attempt to pierce this confusion by referring to the requirement for the inspector's presence at all times of plant operation as "full-time inspection."

We believe full-time inspection to be absolutely essential for consumer protection. We shall oppose legislation which does not require it.

In past testimony, we argued at great length for full-time inspection. We shall not tax your patience by going over this ground again other than to summarize our previous arguments:

FUNDAMENTAL PROTECTION

1. Full-time inspection is fundamental to consumer protection. A spot inspection—no matter how frequent—simply will not assure product wholesomeness. In this highly competitive and difficult industry, the temptation to cut corners, to get ahead of another firm, is very great. The policeman must be on the beat at all times to drive off temptation.

2. If inspectors must be in the plants in order for the plants to be able to operate, then the industry will have to use its political power to assure adequate appropriations for inspection. If full-time inspection is not required, and industry or parts of an industry can lobby at will to starve the inspection program.

This factor is even more important than the immediate budgetary results. For an agency which must continuously fear whether an angered industry or fraction of the industry will threaten its appropriation will not be able to protect consumers adequately. It will worry about the political consequences of each of its consumer-protective actions. It will be a scared, and often ineffective, agency. The FDA is a good case in point.

3. Other inspection programs find full-time inspection necessary. Meat and poultry inspection requires it. Even the present voluntary fish inspection program which must be hired and paid for by processors, uses full-time inspection. And FDA told the Consumer Subcommittee in the 1968 hearings that Canada, Denmark, Iceland, and Norway require full-time inspection in their programs.

4. Each of the Government agencies involved with fish argued the essentiality of full-time inspection in their testimony in 1968 when the Johnson administration supported this requirement. We quoted many of their statements at length in our 1969 testimony. (We must admit, however, that when the Nixon administration decided against full-time inspection, these very same agencies suddenly found it unnecessary.)

5. In its daily operation, many plants process fish which come from a variety of sources—from different boats and imported frozen fish blocks. Spot checking cannot work under these conditions.

6. If spot checking is in effect, the product may already be sold in the supermarket by the time violations or health dangers are found. Mad chases after dangerous products—as now occur—will continue to the great harm of consumers. Only a fraction of the dangerous product will eventually be recovered from consumer channels.

Full-time inspection, on the other hand, is likely to discover problems while the product is in the plant and permit condemnation before it reaches consumers.

SUPPORT FOR S. 1528

We could go on. In fact, there are many other major differences in consumer protection between S. 1528 and the administration bill. But you have heard all of this before.

We do want to repeat that effective and strong fish inspection is necessary not only for consumer protection, but also to bring back economic health to a sick industry. Full-time inspection is a very basic cornerstone of effective fish inspection.

We, therefore, urge the enactment of S. 1528 as a truly effective consumer safeguard. Cutrate measures, such as the administration's bill, can only be of use as a means to fool, confuse and make cynics of consumers.

Senator HART. Thank you, Mr. Mayer. I would say that your brief summary of the history of the efforts to get a fish inspection bill through here is accurate. I think that if we had been able to reach agreement on the degree of inspection that would be required we would have had one.

When you describe how consumers and indeed consumer interest groups have lost interest or have reduced fish inspection bills on their list of priority legislation, you are suggesting that, given the

press coverage of incidents where fish has been found to be harmful, consumers have decided on their own what to do. And yet we heard this morning of a woman who because of mercury accumulation in her body from fish is probably in some grave difficulty physically. And we heard this morning how other pollutants may cause very serious health problems.

I would voice the hope that given this kind of notice consumer groups will stay with us to renew their concern, increase their effort, because the passage of a worthwhile bill remains just as important now, so long as anybody is eating fish, as it did 3 years ago, where the publicity may have caused fewer people to eat fish. Don't you agree?

Mr. MAYER. Mr. Chairman, I do agree. Let me say that we consider this legislation of utmost importance. Also I hope I didn't give the impression that consumers don't consider it important. They do, but I think organized groups have now put their priority on other consumer legislation. Whereas in 1969 this was a top priority item, I think I am correct in saying it no longer is a priority item.

I also want to say this, Mr. Chairman. I think you are to be congratulated not only for your pioneering in this area, but also for your determination and your patience to stick with it. Lesser men than you would have given up on this fight. But you have stuck with this campaign and your patience is extremely commendable.

Senator HART. Well, we will see whether your patience or the patience of others will manage to produce a worthwhile bill.

The key phraseology that you give us now in terms of getting away from continued inspection and the other variation of that concept—you say the legislation is adequate in terms of inspection if the inspector's presence is required at all times of plant operation. That is the way you want us to understand continuous inspection, is that right?

Mr. MAYER. Yes, sir; and that is the requirement I understand S. 1528 contains.

Senator HART. Now I should know this and don't. Do the meat and poultry bills require this kind of presence at all times by an inspector?

Mr. MAYER. They have a requirement for mandatory ante and post-mortem inspection of all animals. Regulations spell it out.

Now, Mr. Chairman, there has been some controversy about what happens in meat and poultry inspection because there are certain types of meat operation, such as slicing bacon and work on certain types of operation of meat products, which do not have full-time inspection. These are operations after the actual production of the meat and the meat products.

What happens in even these plants is still a different thing than the spot inspection proposed by the administration. What those plants have is a patrol system whereby inspectors go to plants of this type in an area several times during each day to look things over.

There are two points to be made: No. 1, inspection other than full-time occurs only in very specialized types of plants. We

went into detail on that point and listed the types in our testimony in 1969 in answer to the administration's testimony. I don't have that list with me, but they involve subsidiary operations, like bacon slicing, and so forth.

The second point is that this inspection is worked on a patrol where the inspector comes in several times a day. In slaughtering, in processing, full-time inspection is required. Not only is one inspector there at all times, but several inspectors may be there.

There is one plant in Wisconsin where I heard they had 30 inspectors, and it is a very large plant.

Actually in slaughtering both the meat and poultry law require that the inspector look at each carcass. In meat, that isn't too difficult because the carcass obviously is rather large. However, in poultry where they have very fast lines and the product is small, the inspector is also required by law to look at each carcass. Your legislation obviously does not require that, because in fish, that probably would be an impossibility.

Senator HART. Give me your judgment as to what the FDA could do under the existing legislative authority without any of these three bills becoming law. Now I know that the Food and Drug Act authorizes the FDA to issue good manufacturing practice regulations. They can inspect plants. They can seize products which are adulterated. In their inspection checks they can look for dangerous materials. Have I stated correctly up to this point your understanding of what existing authority can do?

Mr. MAYER. Yes.

Senator HART. Well, then in S. 700, the administration bill, they spell out some of these things, suggesting that without this kind of legislation they are handcuffed.

Would it not be more logical for the administration, and me for that matter, if this is all we can get, to be in front of the Appropriations Committee asking for the kind of budget that would enable you to inspect fish?

Mr. MAYER. I don't know, Mr. Chairman. The Administration 2 years ago sent to you a statement which was made part of the record of how many plants they intended to do full-time inspection and how many plants they expected to check once a season, how many plants they expected to check twice a season, and I think up to four times a season.

I don't know whether the FDA under its current authority could do the full-time inspection that the administration plans under its bill.

But we are talking about theory, what the FDA can do in theory. We actually have to deal with what it can do in practice.

We are dealing with a badly battered agency, a shell shocked agency, an agency that is overwhelmed by the industries, an agency that is continuously under effective industry attack. In practical terms, I don't think we could expect very much from that agency without new congressional authorization, or without Congress saying "thou shall do this." In fact, assuming this legislation passes, I think you and your committee will have to keep a sharp eye on how the FDA administers it because the problems of the Food and Drug Administration leave questions of how effectively it can handle this sort of program.

We are truly concerned about the effectiveness of FDA.

Senator HART. Thank you, Mr. Mayer.

Mr. BICKWIT. I have no questions. Thank you very much.

Senator HART. I hope there will not be a fifth occasion.

Mr. MAYER. I hope so, too. Thank you.

Senator HART. And I think I should state on the record our sympathy for our reporter this morning. Some of that testimony involved words which I couldn't understand and I can't imagine how you can spell. So put this on the record in case the home office wonders.

We adjourn, to resume in this room at 10 a.m. tomorrow.

(Whereupon, at 1:40 p.m., the subcommittee adjourned, to reconvene at 10 a.m. the following day.)

FISH INSPECTION LEGISLATION

FRIDAY, MAY 21, 1971

U.S. SENATE
COMMITTEE ON COMMERCE,
SUBCOMMITTEE ON THE ENVIRONMENT,
Washington, D.C.

The subcommittee met, pursuant to recess, at 10:10 a.m. in room 1318, New Senate Office Building, Hon. Philip A. Hart (chairman of the subcommittee) presiding.

Present: Senators Hart, Hatfield, and Stevens.

Senator HART. The committee will be in order.

Our first witness this morning is the associate professor of medicine at Washington University at St. Louis, Dr. Mitchell Perry. We welcome him.

Doctor, your statement, which we appreciate having had in advance, will be printed in the record, so you may proceed if there is any summation or extension. Feel free to proceed.

STATEMENT OF DR. MITCHELL PERRY, ASSOCIATE PROFESSOR OF MEDICINE, WASHINGTON UNIVERSITY, ST. LOUIS, MO.

Dr. PERRY. What I would like to do is to try to summarize and simplify what I have been told is an excessively complex and technical statement that I submitted.

For 40 years cadmium has been known to cause toxic manifestations in man after exposure to really large amounts of the metal, but it has only been recently that the possible dangers of long-term low-level exposure to the metal has been recognized. I would like to emphasize at the outset that such exposure has not been conclusively proven to be harmful, but it is possible that some of the hypertension that occurs in the United States is related to the cadmium that all Americans have accumulated in their kidneys. Since at least 20 million Americans have hypertension and for 80 percent of them the cause is unknown, the subject really does deserve some study.

In discussing the problem I would like to consider four topics: (1) Cadmium balance in man; (2) Cadmium toxicity; (3) Some unusual aspects of the biology of cadmium; and (4) Current reasons for suspecting that cadmium may be involved in hypertension.

Most foods have less than 50 parts per billion of cadmium in them. That is less than 50 micrograms per kilogram. A microgram is a millionth part of a gram. Thus to eat 50 micrograms of cadmium more than 1 kilogram of ordinary food has to be ingested. There are exceptional foods that are high in cadmium. Such ex-

ceptional foods include shellfish and the livers and kidneys of domestic animals.

The average American intake of cadmium is said to approximate 50 micrograms per day. That is really a pretty soft figure and it may be several times that much. Most of this is in food. There is a little bit in drinking water but probably less than 1 microgram per day, a little bit in inhaled air, but again except in situations of bad contamination less than 1 microgram per day. There is some in cigarette smoke, 2 to 4 micrograms per pack.

This means that there are perhaps 50 to 60 micrograms of cadmium that enter the body. Out of this only 2 to 10 percent is absorbed. Once it is absorbed, however, very little of it gets out of the body, that is, is excreted. This means that 2 micrograms or more are accumulated every day and that means that after 30 years, after some 10,000 days, the average American has accumulated some 20 milligrams of cadmium. Half of this is deposited in his kidneys, a quarter of it in his liver.

Cadmium absorption from food probably represents a very significant variable and there are two reasons for this. One is that foods vary considerably as do their cadmium content. The other is that the percentage absorption of ingested cadmium probably can vary considerably.

Under unusual circumstances, specifically when calcium or when protein is low in the diet, a lot more cadmium than usual—10 percent instead of 2 percent—can be absorbed.

CADMIUM TOXICITY

There are three types of poisoning from unusually heavy exposure to cadmium that are recognized. Large industrial exposures have resulted in emphysema when the metal was inhaled and kidney damage when it was ingested. In addition, there is an actual disease apparently associated with massive environmental poisoning in Japan known as itai-itai.

To get this in perspective, kidney and liver in massive poisoning of 100 to 200 milligrams of cadmium per kilogram of tissue. This is three to six times what is found in the ordinary, normal American adult.

In addition to these obvious poisonings from large amounts of cadmium, there is an intriguing and very important problem of the significance of the ordinary, smaller intakes of cadmium. These result in the impressive accumulations of renal cadmium found in the general population, that is, in people with no particular exposure to cadmium.

Five toxic effects of cadmium have been suggested: Cancer of the prostate, testicular damage, anemia, emphysema, and hypertension. There simply are not enough data to discuss the first three meaningfully. What that means is that nobody has really looked at this. We just do not have the information.

The possible relationship of emphysema to ordinary environmental cadmium is not appropriately discussed here since in this situation the metal is presumably inhaled, not ingested. This leaves only the possible relationship of hypertension to cadmium, a subject I want to discuss.

But before I do I would like to comment about the unusual aspects of the biology of cadmium, and there are several of these. There are some 18 chemical elements which have specific biologic function in living tissue. These are designated "essential elements." Many other elements are currently designated nonessential because they are not now known to be required for any biologic function. Yet they are constantly present in small but measurable concentrations. Cadmium is one of these.

Cadmium differs from the other nonessential elements in several important ways: (1) It is strikingly concentrated in one tissue, the kidney. (2) Its concentration is very low in the newborn baby and it accumulates with age. (3) There are marked differences in kidney cadmium, depending on an individual's geographic origin. (4) Finally, cadmium in the body is bound to an unusual protein which binds both cadmium and zinc.

A word about each of these, First, the distribution of cadmium is certainly unique. Its concentration in the kidney is more than 10 times its concentration in the liver and that in turn is at least several times its concentration in other organs.

Second, concentrations of renal cadmium vary with the geographic origin of the subject. White subjects from the United States, Switzerland, and India have more cadmium than black subjects from Africa, but they have less cadmium than Mongoloid subjects from Asia.

At present the World Health Organization is involved in extending these preliminary observations and in more precisely mapping the geographical differences in kidney cadmium. It is their hope to correlate their results with blood pressures in these people.

Third, little cadmium is present in the newborn—only about a tenth of a percent of the adult concentration. Thus the metal accumulates during an individual's whole life, particularly during the first two decades.

Finally, the chemical form of kidney cadmium is very unusual. It is combined with a particular protein which at the moment has no known function.

THE POSSIBLE RELATIONSHIP OF CADMIUM TO HYPERTENSION

What is the real significance of this renal cadmium? Is it merely an inert contaminant in the human body or does it have some subtle but significant effect even in concentrations well below those where it produces the unequivocal toxic effects that I mentioned previously?

The answer to this question simply is not known, but there is some season to wonder whether average concentrations of cadmium might increase blood pressure and so be responsible for some part of human hypertension. It must be reemphasized that there is no proof of this, but such a relationship has been suspected on the basis of several observations.

The most important of these is that chronically fed cadmium induces hypertension in rats and the kidney cadmium concentration of such rats approximates that which is found in the average American adult.

In 1962 hypertension was observed in rats following long-term cadmium feeding. From the time of weaning these rats received a diet containing 5 parts per million of cadmium. At 17 months—and that is about half a lifetime for a rat—half of the cadmium-fed animals were hypertensive. At 30 months two-thirds of the cadmium-fed animals had become hypertensive, although by that time one-eighth of the untreated rats had also become hypertensive. The difference between the two groups, however, was still highly statistically significant.

Recently we have observed an early but significant elevation in the blood pressure of rats given from 2½ to 25 parts per million of cadmium in their drinking water for 6 months. Our experiments are still early and we are just beginning to see hypertension, but it looks as though as little as 2½ parts per million of cadmium may cause difficulty.

The story really has to be left at this point incomplete and uncertain of significance, but it seems very likely that hypertension occurs in animals following long-term ingestion of cadmium. The significance of such cadmium-induced increases in blood pressure and their relationship, if any, to essential human hypertension will probably not be known until we have much more information about the mechanism of the animal hypertension and more information on the biologic effects of accumulated cadmium in man.

At present the most disturbing fact from the point of view of establishing such a relationship is the failure to observe hypertension in patients with known industrial exposure to cadmium or with itai-itai. Although this requires explanation, it is not necessarily fatal to the hypothesis since animals exposed to excessive doses have become sick but not hypertensive.

At present there is no conclusive evidence that cadmium accumulation resulting from long term, low-level exposure is harmful, but I think that there is enough suspicion to warrant an attempt to limit the cadmium exposure of the American people.

Thank you.

Senator HART. Thank you, Doctor.

I get the feeling as we learn more and more from experts that all of us will be on peanut butter until they discover something wrong with that. This is not to discount in the least your caution but I suppose just to voice the wonder that many people are, I suspect, voicing about when we will reach the day when we are cautioned to eat nothing.

You are saying that cadmium, ingested, would possibly cause hypertension in a human being. Let me see if I can paraphrase what you are really saying. You are saying that you base that conclusion on data which, among other things, showed hypertension in rats with cadmium levels in their kidneys similar to levels which are currently found in the average human body.

Dr. PERRY. That is correct.

Senator HART. I suppose all of us ought to be watching the levels of cadmium-containing foods that we take in. Everybody would agree on that based on your statement. Do we know what foods do contain these excessive amounts of cadmium?

Dr. PERRY. Not nearly as well as we should, Senator. The trouble is that some isolated experiments have been done and we know the situation in two oysters and three apples and so on, but to say that these are representative of all oysters or all apples is much too big an extrapolation. Yet quite obviously, as you point out, the problems of trying to collect the sort of information that you need are horrendous just for one potentially toxic material; and for all such materials the problem really does get out of hand.

It might be reasonable to think in terms of looking for the likely major sources of cadmium we are not going to learn much by studying foods with less than 50 parts per billion of cadmium in them. We should really study those things with much higher concentrations so that we could at least warn people of what sorts of things would constitute big hazards as far as this particular element goes.

Senator HART. Is that a manageable proposal?

Dr. PERRY. I suspect that it is and that we have enough information to begin now. As you look at the gamut of foods most things do run less than 50 parts per billion. I am really only aware of two sorts of things that run much higher than this. One is shellfish and the other is the livers and kidneys of domestic animals. This excludes a few areas where there is a great deal of cadmium in the air or where there is a great deal of cadmium in the water or soil, and it also excludes cigarettes which have a fair amount of cadmium in them.

Senator HART. I will ask Mr. Bickwit to pursue with you the shellfish and the other more likely sources. You have described 20 million Americans suffering from hypertension. You say that 80 percent of the hypertension defies diagnosis. Are you suggesting that all—or what part—of the 80 percent of undiagnosed hypertensive people are suffering from cadmium-caused hypertension?

Dr. PERRY. Senator, I fancy that as a scientist I am trying to avoid giving a flat-out answer to a question like that. I don't know the answer. I am saying that something like essential human hypertension can be induced in a rat by chronically feeding a small amount of cadmium. But I am adding one more thing. Because under present conditions cadmium is accumulated over a lifetime and because once it has been accumulated one doesn't ever get rid of it, it might be well worthwhile to try to prevent this sort of accumulation. We have enough evidence to suspect—but not to prove—a relationship. Therefore as long as preventing an accumulation of cadmium doesn't work undue hardship, it seems a reasonably prudent thing to do.

Senator HART. It surely does.

Senator Hatfield?

Senator HATFIELD. Dr. Perry, perhaps I missed it in your testimony, but would you tell us where this cadmium comes from? Give us sources. Could you do that?

Dr. PERRY. Senator, you didn't miss it. It is not really known. All we do is suspect. Our studies really only tell us that the average adult American has accumulated 10 mg. of cadmium in his kidneys. This works out to a few micrograms, that is a millionth of a gram, accumulated per day. Obviously under these circumstances we do not know the precise source of the accumulated material.

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We have been able to point to reasonable or possible sources of cadmium. These are the foods that I mentioned, shellfish and livers and kidneys of domestic animals—but people don't eat large amounts of these and it is hard to think that the average American has done this everyday.

Senator HATFIELD. Cigarettes?

Dr. PERRY. Cigarettes. Two to four micrograms per pack. But most of the cadmium accumulation occurs before the age of 20. I doubt that we have that much cigarette smoking going on before the age of 20.

Senator HATFIELD. You are saying, then, if I understand this correctly, that the major sources as you now find them come from shellfish and kidney and liver parts of certain animals; is that correct?

Dr. PERRY. Although I seem to have said that, I didn't really mean it. Those are the items with the highest concentrations. But since they are rarely eaten, they are probably not the major sources. I suspect that smaller amounts of cadmium in other foods and in water and in inhaled air are probably the major sources.

Senator HATFIELD. I am glad you clarified this because we have had in these hearings thus far a tremendous emphasis, as you know, on the mercury problem, and it has been identified almost solely and exclusively as a fish source. As a fish eater, I just want you to know that I am a little concerned about that. Also I think it gives a rather distorted picture because is it not true that, as in the case of cadmium, mercury can come from other sources besides fish?

We seem to have put so much emphasis on fish here because of the dramatic evidence, I suppose, found in swordfish. We assume that is the only way in which it can be ingested. Would that be a fair observation?

Dr. PERRY. I think that is a very fair way of putting it.

Senator HATFIELD. So as the Chairman said a while ago, we have to look at the possibility, as far as cadmium and perhaps to a lesser degree mercury and other such metals that we are talking about, that there are many sources of intake, nor just shellfish, not just swordfish, but perhaps many other sources of which we are taking either consciously or unconsciously in such quantities.

Has there been scientific exploration and scientific discovery completed to give us a more accurate identification of the sources and the way in which we come to take in this cadmium? Is it a question of technology or is it a question of just not having enough knowledge about this particular method?

Dr. PERRY. It is really twofold. One has to do with the technological difficulties. It is a solvable problem with present technology, but a difficultly solvable one. It is simply a question of whether the requisite energy should be invested. Certainly up until recently few people have felt that the problem required this kind of an expenditure of energy.

Senator HATFIELD. There is nothing at the present time that would indicate, other than these references you have made to experiments with rats, that we could get a better picture than we have now?

Dr. PERRY. There are a considerable number of other things that are going on in the field. Many are highly technical in nature, and they do not really come to any certain conclusion. With every possible proviso, I have mentioned what I believe is a genuine possi-

bility; that is, that cadmium can induce hypertension; but no one, least of all myself, would say that this is proven. Nor can I easily envision getting the proof to settle this question in the next short space of time. It is a difficult problem and it will be difficult to get the answer.

Senator HATFIELD. Dr. Perry, you indicate that the primary intake comes before the age of 20; is that correct?

Dr. PERRY. That is correct. The primary accumulation occurs before 20.

Senator HATFIELD. Is part of your problem in coming forth with more specific data and information at this time due to the problem of a controlled population to carry on such experiments?

Dr. PERRY. Yes, this is a major part of the difficulty.

Senator HATFIELD. Have they used in any of these experiments going on or anticipated, the primate centers, the 12 regional primate centers? Would this lend itself to some of this better controlled population experiment?

Dr. PERRY. It might lend itself to appropriate studies. To my knowledge no work of this sort has been done in any of these centers.

Senator HATFIELD. As you are aware, one of the reasons that these 12 primate centers were established was to be able to do far more effective experimental work in controlled populations to that which is the highest of the lower primates. We happen to have such a primate center in Portland which has been more or less focusing on reproductive physiology. I know that there is capability at this one primate center far greater than that which is being utilized at the present time. I have sat on the Small Business Committee dealing with the problems of drugs and, at the same time, the efficacy and the long-term impact of the use of certain drugs. I found in that committee again evidence that we are not using to the full capacity of these very primate centers that were set up for these controlled population experiments.

I just wanted to make that as part of the record here today, that if the Government spends millions of dollars as we have to establish these, and goes as far as Japan and other nations to buy up colonies of these rhesus monkeys and other such primates, I would think we ought to be utilizing these centers to the fullest capability.

I am glad to get your statement that they would be helpful in this kind of experimental work necessary to complete our knowledge about this cadmium intake problem.

Thank you very much.

Senator HART. Mr. Bickwit?

Mr. BICKWIT. You said studies that show hypertension in rats show the rats to have been exposed to the amount of cadmium which humans are exposed to at this point in their kidneys?

Dr. PERRY. Yes. This is a tricky point and I have worded around it very carefully. What I tried to say was that the rats have in their kidneys, after they have been chronically exposed to cadmium, an amount of cadmium which is very similar to the amount found in the average American adult, and that these rats are hypertensive. I tried to avoid the problems of exposure.

From 2.5 to 25 parts of cadmium per million parts of drinking water seems to cause hypertension in our rats. This is a concentra-

tion that seems to be comparable to that found in foods with the highest cadmium contents. However, the rats are getting it all the time. Rats aren't people and so it is difficult to extrapolate to man from our rat data.

Mr. BICKWIT. So this by no means would establish conclusively that the concentrations in humans which are comparable to concentrations in rat kidneys would cause the same kind of damage to humans.

Dr. PERRY. That is correct.

Mr. BICKWIT. However, isn't the normal responsibility of the regulatory authority in this country to determine what level of concentration will establish deleterious use effects in test animals and then to attempt to insure that humans are exposed to no more than, say, one-hundredth of that amount?

Dr. PERRY. Yes, I think this is probably right. I am not sure about the one-hundredth factor. Of course, it does depend somewhat on practicalities. Certainly, you would like to hold exposure down. I am no expert when it comes to what are practical levels, but certainly one might use a test animal to establish that a substance was dangerous and to give some idea of what the danger level was. Ohe would then like to get the usual exposure well below that level.

Mr. BICKWIT. I am not suggesting that this is something that we practically ought to do in this case. I am just suggesting that we appear to be running a risk in this case that we are unwilling to run in other cases.

Dr. PERRY. Yes. I think that is certainly true.

Mr. BICKWIT. Recently the staff collected some data on the analysis of fish products by the Food and Drug Administration for trace metals, including cadmium.

Recognizing that FDA has completed a substantial number of tests for cadmium in shellfish and some tests in the total diet study, and also recognizing that fish need not be the prime danger in this case, our data nonetheless show only three fish other than shellfish which were tested for cadmium during the period April 1970 through April 1971.

Since Dr. McDuffie discovered mercury in tunafish in December 1970, FDA, I understand, has tested about 4,000 samples of tuna. I am sure that no one could deny that tuna testing was necessary, but shouldn't we be doing more looking for cadmium than these data indicate.

As a matter of information, it would have made sense to analyze cadmium when you were taking a sample for mercury testing. Could you do it?

Dr. PERRY. Yes. I think it would have made sense to do this. Actually cadmium and mercury are closely associated. Chemically they are very similar. There is no reason why both of them should not have been tested for, and I, in my retrospective wisdom, think it would have been a wise thing to test more of these fish than three for cadmium. I think it deserves that much energy.

Mr. BICKWIT. As a practical matter can they run the same tests for mercury and cadmium without too much expense?

Dr. PERRY. I can't give you that answer because it depends upon the exact chemical technique that was used.

Mr. BICKWIT. Yesterday we discussed with our witnesses our need for additional research to increase our knowledge about the dangers of fish. You have raised some rather alarming questions concerning the possibilities that cadmium causes diseases in human beings. At the same time we recognize the scarcity of knowledge concerning the problem.

Section 410(j) is unclear at this point as to what research would be required of the Food and Drug Administration to confirm or deny the dangers of a dangerous material if a minimal amount of evidence is presented. It has been suggested that section 410(j) should be modified to require the Food and Drug Administration to research a dangerous material which reasonably could be expected to reach toxic levels to enable FDA to discover and eliminate the threat to human health. From your experience would you think this is a worthwhile clarification?

Dr. PERRY. Yes, I certainly think this is a very worthwhile goal. I think you have to realize that a tremendous amount of energy has gone into this problem over many years. It hasn't been solved yet. Perhaps it is unreasonable to expect FDA to be able to do this very rapidly, but certainly the effort and the idea is a thoroughly valid one. No one could quarrel with that.

Mr. BICKWIT. Thank you very much.

Senator HATFIELD. Dr. Perry, just one last question. What is cadmium used for in industry? What are its uses, generally speaking?

Dr. PERRY. Senator, I am not nearly as cognizant of this sort of thing as I should be. It does have various industrial uses. Our worry, however, has been about the general exposure of the many rather than the industrial exposure of the few. Galvanizing grade zinc has 1 or 2 percent cadmium in it; that cadmium may be differentially leached out, particularly by any acidic liquids.

Tomatoes, for instance, which might be stored in large galvanized containers may leach out the cadmium. It has been said that acid water running through galvanized pipes will leach out cadmium. But I ask you to remember that I am speculating and nothing more. This is simply an idea in answer to your question. I don't know. I don't have real information.

Senator HATFIELD. But wouldn't there be a tie between these? When you say you find it in shellfish and liver and other parts of certain animals, wouldn't that lead you to some sort of an inquiry as to where either the animals or the shellfish might have picked it up?

Dr. PERRY. Yes, it does cause some interesting speculation. As far as the animal goes, I suspect that the animal is very like the human being and that whatever cadmium is ingested will tend to concentrate in his liver and in his kidneys. Animals like man, then would simply serve as filters for cadmium.

There is one interesting source of animal cadmium, or there used to be, in that cadmium was used for worming pigs. They were exposed to it regularly and picked up considerable amounts in their livers.

As far as shellfishing, it is my thought—again not based on hard data—that a good deal of this comes from industrial wastes which are high in cadmium and which come in contact with the shellfish beds.

Senator HATFIELD. What kinds of industrial wastes? Would you go further?

Dr. PERRY. I can't go very much further than that, Senator, and even this is speculation. There must be people who know this. I do not.

Senator HATFIELD. I appreciate your frankness, but again emphasize it could be from other sources as well as those you enumerated.

Dr. PERRY. It certainly could.

Senator HATFIELD. So we don't expect the people to rush down and start boycotting shellfish and liver and kidney tomorrow. I don't know how many people would take to boycotting liver and kidney. As far as I am concerned, it would not cause too great a distress. It should not cause the public to get up in arms as was the case when we heard about cranberries a few years ago. Is that correct?

Dr. PERRY. That is quite correct. I think it is necessary to make the point that you have made. It would be very unfortunate if my comments would cause a sudden boycott of a particular food. I would like to hope, however, that somehow that 1 percent of a particular food that is very heavily contaminated, if that is the right word, could be removed from the market without causing undue and destructive concern about a whole class of foods.

Senator HATFIELD. Actually, we could lead on to find certain other contaminations, as the Chairman said a while ago, until we wind up only with peanut butter. I hope in addition to that jelly is all right, because I like both. But we could end up with applying this in some manner or other to just about any food.

Dr. PERRY. That is correct.

Senator HATFIELD. This is a call for calm appraisal and calm analysis and not a lot of emotional rushing higher and higher as you would advise as a professional man, as a highly trained and respected man of your profession.

Dr. PERRY. I certainly would advise that.

(The statement follows:)

STATEMENT OF DR. MITCHELL PERRY, ASSOCIATE PROFESSOR OF MEDICINE, WASHINGTON UNIVERSITY, AND CHIEF, MEDICAL SERVICE, VA HOSPITAL, ST. LOUIS, MO.

For 40 years cadmium has been known to cause toxic manifestations in man after industrial or accidental exposure to large amounts of the metal. It is only recently that possible dangers of long-term, low-level exposure have been recognized. It must be emphasized that such exposure has not been conclusively shown to be harmful; however, since turnover of the metal after it enters the body is very slow and since it concentrates in a vital organ, the kidney, there is good reason to worry about deleterious effects, and it seems appropriate to set reasonable levels for the cadmium content of foodstuffs, water and air.

In discussing the problem, I would like to consider four topics: (1) cadmium balance in man; (2) an overview of cadmium toxicity in man; (3) unusual aspects of the biology of cadmium; and (4) the current reasons for suspecting a relationship between cadmium and hypertension.

appear in Table 1 are only educated guesses, and of course, there is no such thing as an average man; most people will be above or below the figures cited. The average American intake of cadmium approximates 50 μg per day in food (1). To this must be added the cadmium intake from drinking water

which is usually less than 1 μg per day, the amount inhaled from air which is also less than 1 μg daily and from cigarette smoke (2–4 μg/pack (2,3). Of this 50–60 μg entering the body, from 2 to 10 μg are absorbed and perhaps 1 μg of this is excreted in urine (4). This means that 2 μg and perhaps more are accumulated every day. Thus, after 30 years the average American has accumulated some 20 mg of cadmium, half of which is deposited in the kidneys, and a quarter of which is deposited in the liver (5). The metabolism of cadmium is such that cadmium which is absorbed from the gastrointestinal tract goes first to the liver (6). Over the long term, however, it moves, perhaps after being bound to a specific protein, to the kidney, where it tends to localize in the cortex, and particularly in the proximal third of the proximal convoluted tubule (7,8).

In addition to the oral portal of entry, cadmium can enter the body with inspired air, and as much as 40 percent of the cadmium which enters the lungs can be absorbed; half of this can eventually find its way to the renal cortex (9). Obviously the various environmental sources of cadmium have to be considered together; a high level of airborne cadmium diminishes the permissible exposure by ingestion. Cadmium intake from food probably represents one of the most significant variables in the scheme presented in Table 1. Under unusual circumstances—specifically in situations where the calcium or protein intakes are low, the absorption of ingested cadmium might be increased from the usual 2 to as much as 10 percent (10,11). A further complexity is presented by the renal excretion of cadmium. Until considerable renal cadmium has accumulated, and in fact, until significant renal dysfunction has been produced, urinary cadmium levels remain low, in the range of 0.5 to 2 μg per liter. When the level of cadmium in the renal cortex reaches a value approximating 200 mg/kg (wet weight), the situation changes abruptly; marked proteinuria ensues and with it an outpouring of cadmium which may result in negative cadmium balance (12,13).

Cadmium Toxicity.—Various deleterious effects of cadmium have been described in human beings exposed to unusually large concentrations of the metal. Large industrial exposures have resulted in emphysema and renal dysfunction (14,15). In addition, a disease apparently associated with massive environmental cadmium poisoning in Japan, known as "itai-itai", has been reported (16,17,18). Although it is difficult to get hard data indicating the amount of cadmium accumulation associated with each of these entities, the second table gives some orders of magnitude. Animal studies indicate that from 10 to 40 percent of inhaled cadmium can be absorbed, and after potentially lethal doses as much as 5 mg of cadmium per kg of tissue (½ mg/gm tissue ash) have been found in both the kidney and the lung (19,14). The renal dysfunction with industrial cadmium exposure is not evident until 100 to 200 mg of cadmium have accumulated per kg of kidney (13,20); this is from three to six times the usual amount of renal cadmium found in the average American adult (5) and is rarely, if ever, seen in patients without a recognized unusual exposure and without symptoms therefrom. In "itai-itai", there is much less renal cadmium than in industrial exposure; perhaps prior to death, the destruction of renal tissue results in a loss of accumulated cadimum (See comment on negative cadmium balance above). There is instead a very marked elevation of hepatic cadmium in "itai-itai."

In addition to these obvious poisonings from large amounts of cadmium, there is the intriguing and very important problem of the significance of smaller intakes of cadmium, resulting in the smaller but still impressive accumulations of renal cadmium found in the general population, i.e. in people with no particular known exposure to cadmium. Five toxic effects of cadmium have been suggested: prostatic malignancy, testicular dysfunction, anemia, emphysema and hypertension. There simply are not enough data to discuss the first three meaningfully. The possible relationship of emphysema to ordinary environmental cadmium is not appropriately discussed here since in this situation the metal would be presumably inhaled and not ingested. This leaves only the possible relationship of hypertension to cadmium. Before discussing that, however, a comment about the unusual aspects of the biology of cadmium is appropriate.

UNUSUAL ASPECTS OF THE BIOLOGY OF CADMIUM

Over 99 percent of mammalian protoplasm is composed of nine chemical elements which occur in concentrations greater than one part per thousand.

At least nine additional elements which occur in smaller concentrations also have specific biologic functions. Some 18 elements can therefore be designated "essential." Many other elements are currently designated "non-essential" because they are not now known to be required for any biologic function, yet they are consistently present in small but measurable concentrations. Cadmium is one of these.

Cadmium differs from the other non-essential elements in several important ways:

(1) It is strikingly concentrated in one tissue, the kidney.

(2) Its concentration is very low in the newborn and it accumulates with age.

(3) There are marked differences in kidney cadmium, depending on an individual's geographic origin.

(4) Finally, cadmium is bound to an unusual protein which binds both zinc and cadmium, but in a variable ratio.

If we exclude major industrial or environmental over-exposure and confine our attention to the amounts of cadmium accumulated by the average American, we do not know the biologic significance of this element. There are several possibilities: (1) it may have some as yet unrecognized normal function, or (2) it may be strictly an interloper which competes with the essential trace metal zinc in the body, presumably because of its chemical similarity to zinc. In the latter case it could be merely an unimportant contaminant without significant biological effect, or it could have a subtle but very significant effect such as raising the blood pressure with all of the secondary effects associated with hypertension. Obviously we have no answers at present, but let me outline what is known about the situation.

First, the distribution of cadmium is certainly unique. Its concentration in the kidney is more than ten times its concentration in the liver and that in turn is at least several times its concentration in other organs. Table 3 shows how unusual this pattern is. It summarizes the concentrations of seven essential trace metals and 11 non-essential trace metals in various human tissues. A total of 250 subjects, dying from many causes in various parts of the world, including the United States, were studied. The tabulated values represent the range of concentrations for the middle 80 percent of the subjects studied. The enclosed areas point out the two parts of the table where organ specificity was obvious, i.e. where a metal was strongly localized in a specific organ: (1) cadmium in kidney, and to a lesser extent liver, and (2) aluminum, titanium and perhaps vanadium in lung, and to a lesser extent aorta, where those metals seem likely to be locally fixed after being inhaled (21).

Second, using essentially these same data, concentrations of renal cadmium were found to vary with the geographic origin of the subject. Considering subjects from nine different countries, the median values for the concentration of renal cadmium ranged from 720 μg per gm of ash (approximately 7 mg/kg of tissue) for Burundians to more than seven times that much for Japanese. At the 1 percent level of significance, Caucasoid patients from the United States, Switzerland, and India differed from Negroid Burundians, on the one hand, and from four groups of Mongoloid Asiatics, on the other, having more renal cadmium than the former and less than the latter. The data are presented in Figure 1. Subsequent smaller samples from four other countries in Africa and one in Asia showed the same geographic pattern (22). The World Health Organization is presently involved in extending these observations and more precisely mapping geographical differences in renal cadmium.

Third, the newborn has only 0.02 mg of cadmium per kg of kidney; this is only about 0.1 percent of the adult concentration (22). Thus, there is very little cadmium in the kidney at birth, and the metal accumulates during the individual's life, particularly during the first two decades.

Finally, the chemical form of renal cadmium is a very unusual one. In 1960, a cadmium-binding protein was purified from equine kidneys and characterized. This protein, which has been called metallothionein, has a molecular weight of approximately 10,000. Just over 8 percent of its weight is cadmium and zinc. The total number of atoms of these two metals per molecule of metallothionein is constant, but their ratio is variable. Metallothionein is unusual in that about a third of its amino acid residues are cysteine, the sulfhydryl groups of which are responsible for the metal binding (23,24). More recently, metallothionein has been found in human kidney and

liver, apparently in sufficient amounts to account for all of the cadmium in these organs (25).

POSSIBLE RELATIONSHIP OF CADMIUM TO HYPERTENSION

What is the significance of this renal cadmium? Is it merely an inert contaminant in the human body or does it have some subtle but significant effect even in concentrations well below those where it produces the unequivocal toxic effects that have been mentioned as accompanying overexposure. The answer to this question is not known, but there is some reason to wonder whether "average" concentrations of cadmium might increase blood pressure and so be responsible for some part of human hypertension. It must be reemphasized that there is no proof of this. Furthermore, subtle toxicity of this type has not been recognized for other similar agents. Any such effect would be very hard to recognize by virtue of its chronicity and minimal overt effect. It would represent a minimum malfunction in the body machinery which would produce no symptoms and which would take decades to produce morbidity, largely in the form of the secondary arteriosclerotic complications which accompany hypertension.

Having tried to indicate the complexity of the problem and its present uncertain state, let me set forth the data which have led to the idea that the ordinary cadmium exposure might be related to human hypertension. Such a relationship has been suspected on the basis of the following: (1) certain drugs used in the treatment of human hypertension are strong metal-binding agents; (2) in rats, the metal-binding agent EDTA can lower elevated blood pressure to normal; (3) patients with very severe hypertension have increased urinary cadmium; (4) in the United States, hypertensive patients have more renal cadmium than do normotensive controls; (5) in rats, injected cadmium induces acute hypertension; (6) in rats chronically fed cadmium induces hypertension, and finally (7) the renal cadmium concentration of rats with cadmium-induced hypertension approximates that of the average adult American.

The suspicion that a metal might be related to human hypertension began in the early 1950's, soon after effective antihypertensive drugs first became available. It was recognized that ability to bind transition and related trace metals was a common characteristic of several of these drugs which seemed to have a direct relaxing effect on blood vessels. The drugs in question included substituted hydrazines (26), nitroprusside (27), azide (28), thiocyanate (29), and some experimentally effective mercaptans (30).

As a test of the viability of this hypothesis, the effects of other metal-binding agents on blood pressure were studied. Ethylenediamine tetraacetate (EDTA) seemed an ideal compound to study; it was a powerful chelating agent, and its antihypertensive potency had not been examined. Moreover, it apparently had no pharmacologic effects beyond its ability to bind metal. Finally, it had the added advantage of not being metabolized; hence, there was no problem of possible pharmacologic effects from its breakdown products. As is shown in Figure 2, EDTA rapidly lowered the diastolic pressure of a hypertensive, but not of a normotensive rat. The pressure of the hypertensive animal was lowered to normal, but not below normal. In addition, the effect was both temporary and reversible: the pressure returned to its original high level after several hours. It should be emphasized that the neutral calcium disodium salt of EDTA was used in order to avoid binding sodium, potassium, magnesium, or calcium. Thus, the only change in the concentration of any of these four metals came from whatever small amount of calcium was released at the time it was displaced from the administered EDTA by some more tightly bound tissue metal (31).

Since EDTA presumably lowered blood pressure by binding some metal for which it had a greater affinity than it had for calcium, an attempt was made to approximate the binding strength for this unknown metal by treating hypertensive animals with a series of increasingly tightly bound EDTA chelates of divalent transition metals. The results of these experiments were compatible with copper, zinc, or cadmium being the metal in question (32).

The obvious next step, which was to determine whether EDTA had any effect on human hypertension, was not supportive of the hypothesis. No marked or consistent effect was observed, although in some individuals there was a slight fall in pressure. This result could mean that the hypothesis was invalid or that in man EDTA cannot differentially remove fixed cadmium in the presence of an excess of zinc.

The trace-metal content of urine from normal volunteers was then compared to that of hypertensive patients. In addition to a slight, seemingly generalized increase in the urinary excretion of many metals by hypertensive patients, there was a major difference in urinary cadmium concentrations. On the average there was less than 1 μg per liter for the 15 normotensive subjects studied as compared with almost 50 μg per liter for 15 hypertensive patients (33). It must be emphasized that most of the hypertensive patients in this series had severe disease with marked renal involvement; hence, it is possible that metal bound to renal protein appeared in the urine as kidney tissue was destroyed.

The final bit of evidence involving human beings was a report that hypertensive Americans had significantly more renal cadmium than similar normotensive subjects. One-hundred and seventeen patients without hypertension who died sudden accidental deaths had an average of 2940 μg of cadmium per gm of kidney ash (approximately 30 mg/kg of kidney); 17 hypertensive patients who died similar deaths had 4220 μg per gm of ash. The difference is highly significant; $p<0.005$ (34). A subsequent similar study, however, reported no significant difference in renal cadmium concentration between normal individuals and those with hypertensive cardiovascular disease (35).

Our animal studies involving the effects of cadmium on blood pressure began more than 10 years ago. We started by chronically feeding rats small doses of cadmium in an attempt to produce hypertension. Weanling animals were fed Purina rat chow to which cadmium had been added to make the final concentration 25 parts per million. Striking hypertension appeared in almost all of the cadmium-treated animals within three months; control animals without cadmium remained normotensive. Because of methodologic difficulties which may well have caused subsequent confirmatory experiments to be inconclusive, these results have not been published.

Although the slowly appearing chronic hypertension induced by cadmium-feeding has proved difficult to reproduce and even more difficult to study, it was observed that small amounts of the metal given intra-arterially were acutely hypertensive. From 10 to 40 μg of cadmium per 100 gm of rat had striking pressor effects, raising the diastolic pressure an average of nearly 30 mm Hg, but only for a few minutes (36). Further investigation of parenterally administered cadmium revealed: (1) the hypertension induced by intra-arterial cadmium was related to increased cardiac output (37); (2) intravenous cadmium was less effective than intra-arterial cadmium in inducing hypertension (38); but intraperitoneal cadmium induced an equally marked and much more protracted hypertension (39); (3) there was a marked and prolonged increase in renin activity in the peripheral blood following intraperitoneal cadmium (40).

In 1962 Schroeder reported hypertension in rats following long-term cadmium feeding (41). His experiment, done in specially constructed animal care facilities, resembled our earlier one, except that he put the cadmium in drinking water instead of in food; he used a lower dose of cadmium, 5 parts per million instead of 25; and he followed his rats for much longer periods of time, 30 months instead of three. At 17 months he found that half of his cadmium-fed animals were hypertensive, i.e. had systolic pressures more than 35 mm Hg above the mean value for rats of comparable age. At 30 months, two-thirds of the cadmium-fed animals had become hypertensive, although by that time one-eighth of the untreated rats had also become hypertensive. The difference between the two groups, however, remained highly statistically significant. This experiment is only one of several in which Schroeder has induced hypertension by feeding cadmium (42). Lener, et al have failed to find hypertension when rats were given 5 parts per million cadmium in drinking water for 16 months (44); however, no data on control pressures are available and Schroeder has pointed out that inadvertent exposure of control rats to low doses of cadmium raises the control pressure and lessens or eliminates the difference between cadmium-treated and control animals. Recently we have observed an early but significant elevation in the blood pressure of Long-Evans rats given from 2.5 to 25 parts per million of cadmium in drinking water for six months. It is noteworthy that although all cadmium-treated rats were hypertensive to approximately the same extent, those control rats that were kept in plastic rather than stainless steel cages showed lower blood pressures (Table 4).

Although the real significance of this hypertension will remain uncertain until more is known about its mechanism, survival among Schroeder's rats given 5 parts per million of cadmium from the time of weaning was signifi-

cantly less than survival among control animals (45). Schroeder has subsequently shown that his cadmium-fed rats had renal cadmium concentrations approximating those of normal American adults. He has recently come to relate the presence of hypertension to renal cadmium/zinc ratios, rather than to absolute values of cadmium. Moreover, he has reported reversal of cadmium-induced hypertension by feeding a chelating agent specific for cadmium (46).

The story must be left at this point, incomplete and of uncertain significance. It seems very likely that hypertension occurs in animals following long-term ingestion of cadmium. The significance of such cadmium-induced increases in blood pressure and their relationship, if any, to "essential" human hypertension will probably not be known until we have much more information about the mechanism of the animal hypertension and information on the biological effects of the accumulated renal cadmium in man. At present the most disturbing fact from the point of view of establishing a relationship is the failure to observe hypertension in patients with known industrial exposure to cadmium or with "itai-itai." Although this requires explanation, it is not necessarily fatal to the hypothesis, since animals exposed to excessive doses have become sick but not hypertensive.

Even though there is presently no conclusive evidence that cadmium accumulation resulting from long-term low-level exposure is harmful, its potential for damage to the body may be irreversible. As mounting evidence suggests its involvement in disease processes, it would then certainly seem appropriate to attempt to limit the cadmium exposure of the American people.

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TABLE 1.—ROUGH APPROXIMATION OF CADMIUM BALANCE IN THE AVERAGE AMERICAN ADULT

A. Mean amount ingested daily	50 micrograms.
Usual concentration in food	<50 p.p.b.[1]
Usual concentration in water	<1 p.p.b.
B. Mean daily absorption of ingested dose	3 micrograms.
Usual range	2–4 percent.
When protein and calcium intake are low	10 percent.
C. Mean amount inhaled daily	<1 microgram.
Usual concentration in air	<1 p.p.b.
Amount in pack of cigarettes	2–4 μg.
D. Mean daily absorption of inhaled dose	<1 μg. + 1 μg./pack.
Usual range	10–40 percent.
Usual amount sequestered in kidney	5–20 percent.
E. Mean daily excretion (of absorbed cadmium)	1 microgram.
Usual urine concentration	1 p.p.b.
Usual total in sweat, hair, nails	<1/10 μg.
F. Total accumulated daily (B+D−E)	2 micrograms.
G. Total body burden at 30 years	20 milligrams.
H. Kidney burden at 30 years	10 milligrams.

[1] p.p.b. = parts per billion.

TABLE 2.—SUMMARY OF CADMIUM TOXICITY

Recognized Overexposure

Toxic effect	Tissue concentration
Emphysema	5 mg./kg. of lung.
Renal failure	100 to 200 mg./kg. of kidney.
Itai-itai	100 to 200 mg./kg. of liver.

No Recognized Unusual Exposure

Possible toxic effect	Normal tissue concentration
Emphysema	0.3 to 1 mg./kg. of lung.
Hypertension	30 to 50 mg./kg. of kidney.

COMMENT

Malignancy, anemia, and gonadal effects can be demonstrated in animals, but there is no suggestion that casual exposure in man can lead to any of these problems. Moreover, except for two equivocal references to possible increases in prostatic carcinoma among cadmium workers (47,48), a significant increase in malignancy has only been suspected following injections of cadmium into animals.

TABLE 3.—RANGES OF METAL CONCENTRATIONS IN ORGANS OF 100 ADULTS

Part I: 10th and 90th Percentiles for Seven Essential Metals

	Liver	Kidney	Lung	Aorta	Heart	Spleen	Brain
Mg	390–820	450–720	300–600	230–600	430–860	270–590	260–490
Ca	62–250	160–450	170–600	360–1900	75–350	67–290	67–290
Mn	1.5–4.2	0.73–2.0	0.25–1.3	0.11–0.69	0.27–0.086	0.19–0.74	0.26–0.62
Fe	95–570	68–200	200–680	29–260	61–200	130–1300	47–94
Cu	7.7–32	3.1–16	1.6–8.5	1.9–12	3.4–8.5	1.2–3.8	4.7–10
Zn	44–230	35–175	13–36	15–54	26–49	15–36	8.7–27
Mo	0.53–1.7	0.14–0.42					

Part II: 10th & 90th Percentiles for 11 "Non-Essential" Metals

Sr	0.018–0.075	0.047–0.16	0.073–0.16	0.12–0.87	0.014–0.19	0.013–0.11	0.0064–0.096
Ba	<0.001–0.12	0.018–0.17	0.068–0.34	0.036–0.50	0.017–0.24	0.009–0.18	0.015–0.19
Al	1.3–18	1.1–31	49–330	0.94–51	0.87–20	0.95–18	0.38–10
Ti	<0.1–0.49	<0.1–0.84	0.72–21	<0.1–2.3	<0.1–0.52	<0.1–0.59	<0.1–0.42
V			<0.02–0.27	<0.02–0.065			
Cr	0.0039–0.16	0.010–0.27	0.10–1.1	<0.002–0.59	0.0058–0.38	<0.002–0.14	0.003–0.12
Ni	<0.09–0.39	<0.09–0.46	<0.09–0.68	<0.09–0.85	<0.09–0.38	<0.09–0.31	<0.09–0.24
Ag	<0.0009–0.033	<0.0009–0.0092	<0.0009–0.0069	<0.0009–0.032	<0.0009–0.011	<0.0009–0.012	<0.0009–0.022
Cd	<0.4–6.7	5.2–62	<0.4–1.3	<0.4–1.3	<0.4–1.3	<0.4–1.1	
Sn	<0.04–0.24	<0.04–0	<0.04–0.62	<0.04–0.21	<0.04–0.13	<0.04–0.11	
Pb	0.14–1.4	0.077–0.72	0.077–0.75	<0.02–0.16	<0.02–0.26	0.023–0.48	<0.02–0.20

Legend: Metal concentrations in human organs, as micromoles of metal per gram of tissue ash, determined by spectrography. Values cited are the 10th and 90th percentiles for the 100 samples; a "<" indicates that less than 90 percent of the values equalled the limit of detectability and a blank space indicates that less than 10 percent of the values equalled the limit of detectability (21).

RENAL CADMIUM AND ZINC CONCENTRATIONS IN SEVERAL GEOGRAPHIC GROUPS

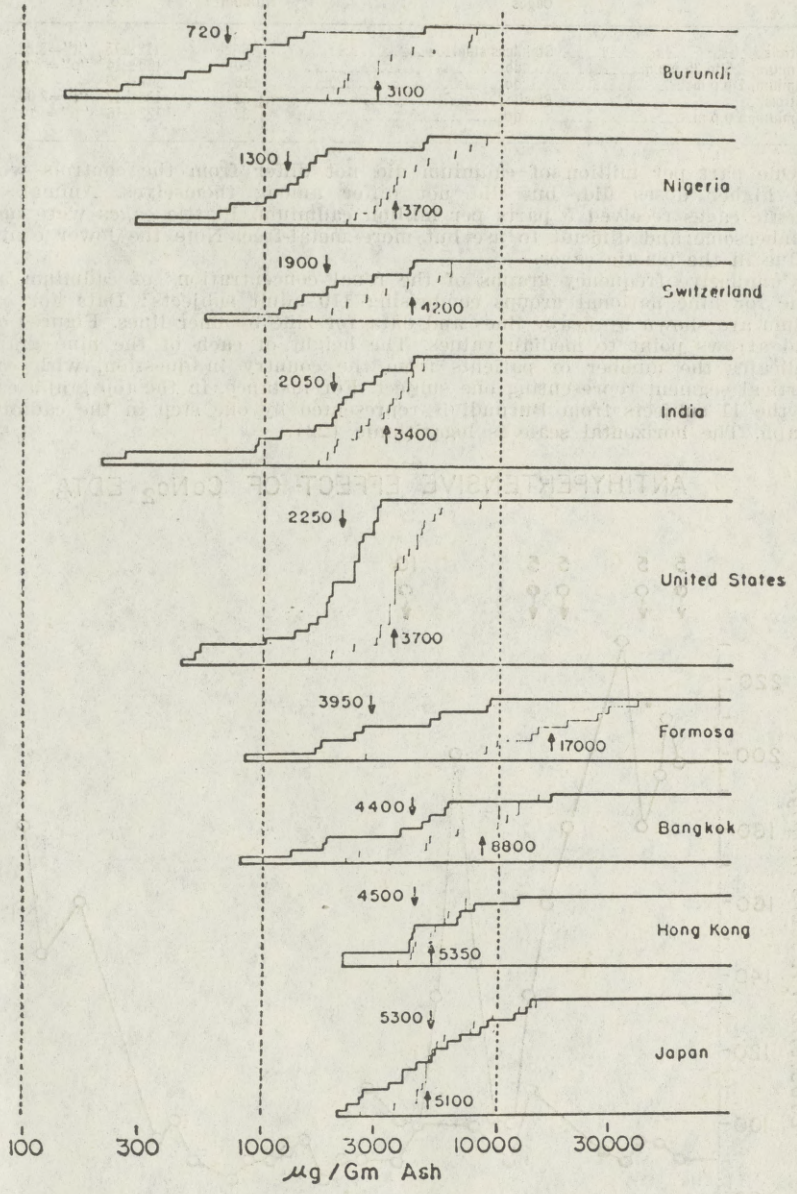
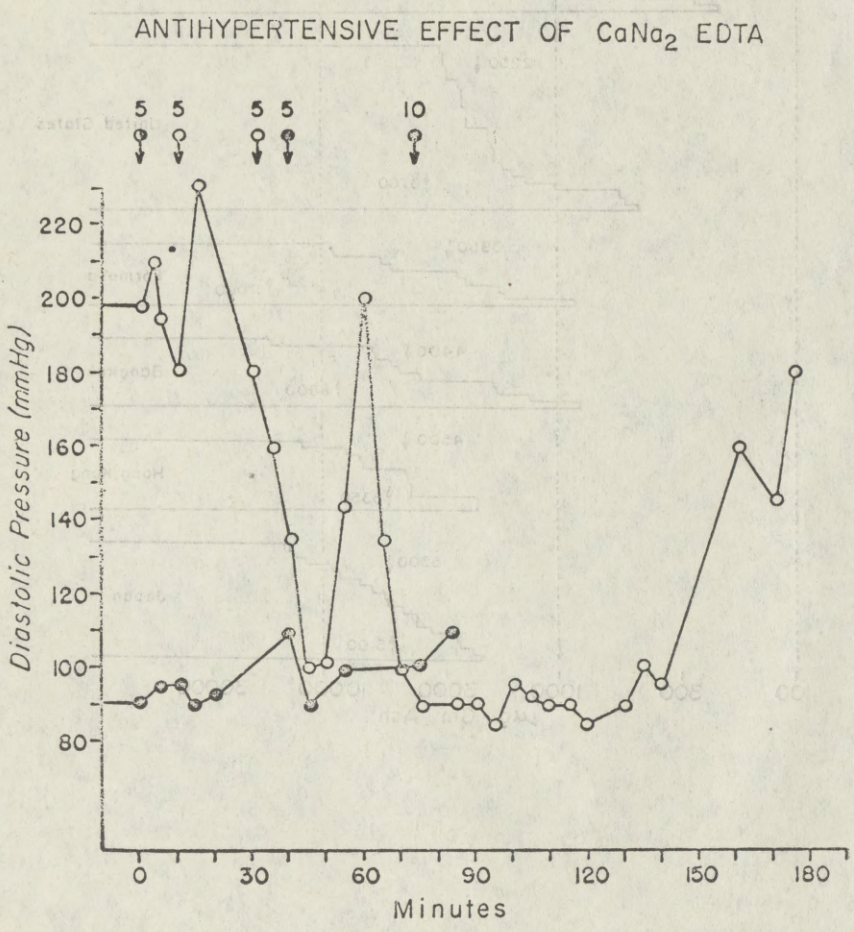


TABLE 4.—HYPERTENSION IN RATS AFTER 6 MONTHS FEEDING WITH SMALL DOSES OF CADMIUM

Cages		Number	Mean systolic pressure ± S.D.	"t" and "p" values
Controls	Stainless steel	64	112±15	"t"=3.82.
Cadmium, 2.5 to 25 p.p.m.	do	80	125±14	"p"=<0.001.
Cadmium, 1 p.p.m	do	16	112±20	
Controls	Plastic	32	106±17	"t"=2.06.
Cadmium, 5 p.p m	do	32	122±16	"p"=<0.05.

One part per million of cadmium did not differ from the controls while all higher doses did, but did not differ among themselves. Animals in plastic cages received 5 parts per million cadmium. Plastic cages were more cumbersome and difficult to use but more metal-free. Note the lower control value in the plastic cages.

Cumulative frequency graphs of the renal concentrations of cadmium and zinc for nine national groups comprising 119 adult subjects; Data for cadmium are shown by heavy lines and data for zinc by finer lines. Figures cite and arrows point to median values. The height of each of the nine graphs indicates the number of patients from the country in question, with each vertical segment representing one subject. For instance, in the top graph each of the 11 subjects from Burundi is represented by one step in the cadmium graph. The horizontal scale is logarithmic (22).



Effects on two typical anesthetized 200 gm rats: Open circles indicate a renal hypertensive rat which received a total of 15 mg and solid circles a normotensive rat which received 20 mg of intravenously injected $CaNa_2$ EDTA (31).

Senator HATFIELD (presiding). Dr. Charles C. Edwards, Commissioner of the FDA.

Dr. Edwards, we are in the process of answering a live quorum. Senator Hart has gone to the floor to make his presence known. As soon as he returns, I shall depart for a few moments. In the meantime he asked me to welcome you to the committee and to proceed with your testimony as you care to. You may either summarize or you may present it in any other manner. It will be printed in the record in full.

STATEMENT OF DR. CHARLES C. EDWARDS, COMMISSIONER, FOOD AND DRUG ADMINISTRATION; ACCOMPANIED BY WILLIAM GOODRICH, GENERAL COUNSEL; TAYLOR QUINN; DR. VIRGIL O. WODICKA, DIRECTOR, BUREAU OF FOODS; AND RICHARD RONK

Dr. EDWARDS. Thank you, Senator.

I would like to introduce my colleagues. On my left is Mr. William Goodrich, our general counsel, and Mr. Taylor Quinn. On my right is Dr. Virgil O. Wodicka, Director of our Bureau of Foods, and Mr. Richard Ronk.

I would like, Senator, to read at least part of our prepared text because I think it is organized so that you might better understand our position on this particular subject.

Mr. Chairman, I appreciate this opportunity to appear before this committee today to discuss the legislation you have under consideration to establish greater controls over fish and fishery products to assure that they are safe and wholesome.

The issue of the need for new legislation to provide greater consumer protection in the area of fish and fishery products has been under review by the Congress for several years. As you know, Mr. Chairman, spokesmen for the Department of Health, Education, and Welfare have appeared before your committee for 3 successive years to discuss several legislative proposals which have been advanced to afford this added protection for consumers. We believe the record of these hearings has clearly established the need for additional protection in their field, and the principal issue yet to be resolved is the method and extent of additional inspection authority to be provided by new legislation.

S. 700, one of the bills that you now have under consideration, embodies a comprehensive administration proposal which was resubmitted to Congress this year. This Department appeared before your committee when fish inspection legislation hearings were held in the 91st Congress, and we supported this approach to the inspection of fish and fishery products. In our testimony today, we wish to reaffirm our support of the continuous surveillance inspectional system which is contemplated in S. 700.

The present degree of surveillance of the fish processing industry is not acceptable by today's standards. Fish and fishery products represent an important source of protein in our national diet; yet

these foods are highly perishable and very susceptible to contamination during handling and processing because they offer an excellent medium for bacterial growth.

As previous witnesses from the Department have testified, we know of several foodborne outbreaks attributed to fish—botulism from smoked lake fish resulted in nine deaths in 1963; 400 cases of Salmonella poisonings, again from smoked fish, occurred during one weekend in 1966. Shrimp resulted in 250 food poisonings in one city in 1966. Fortunately, such outbreaks do not happen annually or with any degree of regularity.

Food poisonings alone and the threat of outbreaks are sufficient to justify the administration's bill, S. 700. However, a general upgrading of sanitary practices in fish processing establishments and of the quality of fish are prime objectives of this legislation. Quality and greater assurance against poisonings and unsanitary processing can only be achieved through a concerted regulatory program.

In 1969, during the last Congress, and again this year, we have conducted an informal review of the industry's conditions by surveying the inspection records of the FDA's 17 district offices. The results are the same. Again we find grossly inadequate processing conditions, improper equipment, the absence of essential equipment and a general lack of quality control.

Only about one-third of the 2,200 interstate establishments processing fish are inspected annually, and then only on a modest basis. The 2,000 establishments operating only in intrastate commerce, an area beyond FDA's jurisdiction, receive even less attention by any health agency.

S. 1528 would require continuous inspection of all fish processing plants during all periods of operation. In our judgment, this is not the most efficient or effective method of dealing with the difficulties of the fish and fishery products industry. Such inspectional requirements are too rigid for such a diverse industry and would, we believe, present serious management problems that would ultimately result in higher program costs without a commensurate increase in consumer protection.

Some plants in the fishing industry are extremely small, others operate only seasonally, and other processing takes place on vessels. The harvest and processing of salmon and oysters are examples of segments of this industry where personnel recruited and trained for continuous fishery inspection duty would not be required on an around-the-year basis. Assuming those inspectors will be qualified by education and training for other inspectional work of the FDA, these field personnel would have to be reassigned and, in some cases, moved to other geographical areas during the off season.

A system of continuous inspection as presently provided in the meat and poultry inspection legislation is, we believe, inappropriate for the fishing industry and could result in wastefulness and would be detrimental to the overall consumer protection activities of the Department. Flexibility, not rigidity, is needed to effectively regulate this food product.

It should be understood that such a flexible approach encompasses continuous inspection in those cases where it is necessary.

We would indeed intend to employ this method of control when indicated, and the administration's legislation clearly requests this authority. But the manpower and resources needed to provide continuous inspection of all plants regardless of size, current practices, history of compliance, or nature of the product, would be an improper utilization of our manpower and resources without comparable public benefit.

The administration's bill, S. 700, by amending the Federal Food, Drug, and Cosmetic Act, would provide that the Secretary of the Department of Health, Education, and Welfare will promulgate regulations setting the necessary standards of sanitation and quality control, including plant construction and the character of materials used in processing and handling fish; the examination of raw materials and finished products; the handling, transportation, and storage of finished products; and product specifications as to quality and identity.

All interested persons would be afforded an opportunity to comment on the proposed regulations through the application of the Administrative Procedures Act. Amendments to the regulations would be made when necessary.

A mandatory basis is provided by this bill for the present voluntary shellfish sanitation program. Thus, the present procedures for guaranteeing that shellfish are harvested from unpolluted areas and processed and handled under sanitary conditions would be continued and strengthened.

All establishments or vessels which handle fish and fishery products for interstate commerce would be required annually to obtain a certificate of registration from the Secretary. The first certificate would be required within 60 days after the effective date of the regulations. An initial, intense inspection of each of the establishments or vessels applying for such a certificate would be made to determine compliance with the law and regulations.

Any material deviations from the law or regulations found during that inspection would have to be corrected before a certificate would be issued, and these certificates would be issued only upon assurance that such establishments or vessels would be maintained in accordance with the applicable regulations.

Renewal of certificates would be based on evaluation of surveillance data, accumulated from laboratory analysis of samples of products, and plant inspections. Finally, after being certified, processing establishments would be subject to a system of continuous surveillance, including continuous in-plant inspection when deemed necessary.

Specifically, the proposed program under S. 700 involves an initial, intense inspection of establishments to be certified, to assure that the firms can and will produce fish and fishery products which fully comply with this proposed legislation.

Next, we would institute a continuous surveillance system which would include provisions for chemical, bacteriological, organoleptic examination of products and physical inspection of plant or vessel facilities. We believe such a procedure will serve to substantially reduce the distribution of adulterated or misbranded fish products. It will also minimize the possibility of outbreaks of disease and illness.

Beyond that, the Secretary of HEW would be authorized to carry out continuous in-plant inspection where that is needed, once-a-day inspection where that is all that is required, and less frequent inspections for those plants whose equipment, personnel, including personnel specifically assigned to quality control, production practices and product performance would make the constant presence of a Federal inspector unnecessary.

We would, of course, have flexibility to shift from one kind of inspection to another as conditions change. And here I would emphasize again that we propose to use that flexibility to provide just as much inspection as necessary—no more, no less.

Implementation of the administration's bill would be considerably less costly than a plan calling for universal continuous inspection throughout the fishing industry. However, the basic question of how to better protect consumers from the marketing of unwholesome fish and fishery products is not one of budgeting. The provisions of S. 700 would, we believe, establish an inspectional system wherein a maximum of consumer benefits can be derived at less cost in terms of tax dollars to be borne by the consumer.

Another issue posed by S. 1528 involves its applicability to the recent difficulties associated with high levels of mercury detected in fish. Again this is a problem which demonstrates the necessity for flexibility.

The legislation would require that the Secretary, within 90 days after enactment, propose regulations specifying all dangerous materials that can be expected to reach toxic levels in significant quantities of fish or fishery products, and to indicate the intensive screening procedures which are to be used for surveillance in discovering and eliminating the threat to human health caused by the presence of such dangerous materials in these food products.

This Department is vitally concerned with the potential threat to human health which dangerous materials such as certain heavy metals—mercury, lead, cadmium, et cetera—may pose when present in fish or fishery products and, indeed, in any food.

However, the requirement of S. 1528 that the identification of any such dangerous material, as defined by the bill, and intensive surveillance techniques for the detection thereof, be specified by regulations promulgated within 90 days after enactment of the legislation, would impose a difficult, if not impossible, mandate within that given time frame.

The principal problem, beyond that of the initial identification of all such potentially dangerous materials, is the fact that analytical methodology has neither been developed nor perfected to a point where it can be effectively utilized as routine laboratory procedure on a mass sampling basis for detecting many of the dangerous materials that may fall within the purview of this provision of S. 1528. In addition to being time-consuming, some of the existing analytical techniques do not yield results which clearly identify the specific chemical form or combination in which the dangerous material occurs in the fish. For instance, mercury is known to be present in fish as methyl mercury, a form of mercury more toxic than uncombined or metallic mercury. Current routine analytical procedures, however, detect this contaminant as metallic mercury.

The Food and Drug Administration is, however, acutely aware of this problem and is developing an active research program to develop needed methodology for more efficient detection and identification of heavy metals, including mercury, and other dangerous materials which may be present in fish or fishery products and other foods in general. This work is being given high priority by FDA and is being pursued on an urgent basis.

Our long experience in developing methodology for detecting harmful substances in foods has made it abundantly clear, however, that the development of new knowledge may not conform to administrative deadlines. For these reasons, we believe that the specific provisions of S. 1528 regarding the surveillance of dangerous materials would impose an unrealistic time table for completing the stated objectives for fish and fishery products.

S. 1528 also provides that any regulations proposed or issued for good manufacturing practices and other regulatory controls over products, establishments, and vessels shall be subject to the formal rulemaking provisions of section 701(e), (f), and (g) of the Federal Food, Drug, and Cosmetic Act.

These formal rulemaking procedures tend to be very lengthy and involve considerable expense to both the Government and the affected parties. As I have already pointed out, the administration's bill, S. 700 provides the procedure for public participation in the promulgation of all proposed regulations through the application of the Administrative Procedures Act (sec. 553, title 5, United States Code). This procedure provides adequate safeguards for industry and has been followed for many years in issuing regulations under the act administered by this Department.

Moreover, it is the procedure prescribed under the Federal Meat Inspection Act, the Poultry Products Inspection Act, and the Egg Products Inspection Act. We see no reason for imposing a different, more cumbersome procedural system for regulation of fish and fishery products.

We have also included in our prepared text the comments on Senate bill S. 296 which I will not bother to read into the record this morning but which I would like to submit for the record.

Senator HATFIELD. They will be printed in the record.

(The statement follows:)

Mr. Chairman, we also wish to comment on S. 296, the other proposal you have under consideration. This bill would establish a regulatory scheme for fish to be administered by the Secretary of Interior, acting through the Bureau of Commercial Fisheries. This Bureau has, as you know, been transferred by Reorganization Plan No. 4 of 1970 to the National Oceanic and Atmospheric Administration in the Department of Commerce. Additionally, S. 296 would amend the Fish and Wildlife Act of 1956 to provide for technical and financial assistance to the commercial fishing industry in meeting the requirements of the regulatory scheme.

We are in full accord with the bill's objective to afford added protection for consumers. However, S. 296 has several fundamental flaws which would deter optimum consumer protection and would result in undesirable duplication of responsibilities of this Department.

We believe that additional legislation to impose stricter regulation of the fish processing industry should be accomplished by way of amendments to the Federal Food, Drug, and Cosmetic Act. That Act, which this Department administers, already provides for a considerable degree of surveillance and regulation of fish and fishery products through inspections, seizures, injunc-

tions, and where necessary, prosecutions under the penalty provisions of the Act. This Department is also responsible for the regulation of food additives and color additives used in the preparation or packaging of such products, and for the enforcement of tolerances for pesticide residues on raw fish established by the Environmental Protection Agency. To combat false and misleading labeling or deceptive packaging of fish and fishery products has traditionally been our responsibility under the Act, and in 1966 this authority was expanded by the Fair Packaging and Labeling Act. An extensive field force of our Food and Drug Administration would readily be available as an enforcement adjunct to increased regulation of the commercial fishing industry. Administrative machinery for hearings, prosecutions, and registration is well established in FDA. Duplication of these resources and FDA's expertise would not be justified.

This Department is also responsible for the promulgation of standards of identity, quality, and fill of container for virtually all foods, and many standards issued by FDA are in effect for fish and fishery products. Increased consumer protection in the fish and fishery products area should be initiated in harmony with these standards and such standards should be promulgated by the Agency possessing the primary responsibility for controlling fish sanitation. Under the President's proposals for reorganization of the Executive Branch, all food regulatory programs would be unified in the Department of Human Resources of which the Department of Health, Education, and Welfare is the core Agency.

S. 296 would completely exempt from its scope all establishments engaged in the handling, storing, preparation, production, manufacture, preservation, packing, transportation, and holding of fish or fishery products if such establishments are located in a State (or equivalent domestic jurisdiction) which in the opinion of the Secretary of the Interior provides an adequate system of regulation, certification, and inspection. These establishments would be exempt even if they ship fish and fishery products in *interstate commerce.* Although there is a provision authorizing the Secretary to reassert Federal jurisdiction in such States, "if he determines that such action is in the public interest," the very sweep of this power vis-a-vis a State, unaccompanied by any statutory standard other than the "public interest," is such as to make its exercise most doubtful, however justifiable in a given case it might be.

Under the Federal Food, Drug, and Cosmetic Act, we can and do utilize State and local health and food regulatory personnel, commissioning them as officers of this Department; however, we cannot and do not divest ourselves of responsibility for the aspect of the program in which such personnel are utilized. The above-mentioned provisions of the bill should not be confused with those in the Administration's bill (S. 700) which would exempt only plants operating wholly within *intrastate commerce* and then only if the State establishes and enforces a system of control at least equal to the Federal system.

Additionally, S. 296 would completely exempt wholesale establishments where the only processing involved is the cutting up of fish and fishery products for sale to retail outlets. We do not believe that this broad exemption is desirable. Likewise, we believe the bill's exemption for establishments primarily engaged in retail sales, which would seem to include large chain enterprises conducting their own processing operations, is too broad. In this connection, we invite attention to the carefully circumscribed exemptions contained in S. 700 which, moreover, authorizes revocation of any exemption when such action would further consumer protection.

S. 296 would specifically authorize the Secretary of State, in consultation with the Secretary of the Interior, to encourage foreign countries exporting fish and fishery products to this country to establish sanitary standards and practices consistent with those that will be promulgated for domestic production. As an inducement to foreign countries to adopt such standards and practices, the Secretary of the Interior would be authorized to permit such countries to use the Secretary's official inspection mark. We believe that products imported into the United States should have to meet standards that are not merely consistent with, but at least equal to those applicable to products of domestic origin. Moreover, fish and fishery products not actually inspected by the United States should not be permitted to bear an official U.S. mark, particularly in cases where they have not been produced under a governmental sanitation and inspection system at least equal to that enacted for our domestic products.

Of the bills presently before the Committee, we believe the Administration's proposal, S. 700, will best serve the protection needs of consumers without the imposition of unnecessary burdens upon the fishing industry. We feel strongly that this measure would provide a maximum benefit to the consumer with the most reasonable allocation of his tax dollars. We urge its favorable consideration by this Committee and its enactment by the Congress.

This concludes our formal statement. We will be glad to answer any questions which you or other members of the Committee may have.

Dr. EDWARDS. In conclusion, Mr. Chairman, of the bills presently before the committee, we believe the administration's proposed S. 700 will best serve the protection needs of consumers without the imposition of unnecessary burdens upon the industry involved.

We feel strongly that this measure would provide a maximum benefit to the consumer with the most reasonable allocation of his tax dollars. We urge its favorable consideration by the committee and its enactment by Congress.

Mr. Chairman, we would be delighted to attempt to answer any questions that you or the other members of the committee might have.

Senator HATFIELD. Thank you very much, Dr. Edwards. I do have a number of questions that I would like to ask you.

Am I correct in summarizing your position that, of the three basic general proposals before this committee that have to do with sampling, as one philosophical approach, the continuous surveillance as another basic approach, and continuous inspection as the third, you feel that from a practical point of view, an economic point of view, and protecting the public's interest, that a continuous surveillance is preferable to any of the other two approaches.

Dr. EDWARDS. That is right, sir.

Senator HATFIELD. Do you feel that under appropriate economic considerations, that continuous inspection could become a feasible program?

Dr. EDWARDS. We would prefer continuous surveillance for several reasons.

Senator HATFIELD. The reason the administration and your statement this morning supports the surveillance approach then is basically an economic one.

Dr. EDWARDS. No; I wouldn't say that. I think the economic considerations are certainly important but certainly not of maximum importance. I think that we can do really the same kind of quality job as continuous inspection programs such as you are suggesting by the other method that we have suggested.

In our other inspection activities, it becomes very obvious that there are plants which do need round-the-clock inspection. There are other plants that need only minimal inspection, and I think this flexibility is really important in coming to grips with this total problem of inspection of all food products.

Senator HATFIELD. Could you, Dr. Edwards, provide for this committee the estimate of what would be an annual cost to carry out the provisions of each of these three bills as they touch on different philosophies?

In other words, sampling, surveillance, and continuous inspection. Could you give the committee an opportunity to make comparisons here.

Dr. EDWARDS. We have that information, Senator, and we will provide it for the record.

(The following information was subsequently received for the record:)

The following materials provide five-year manpower and cost projections for S. 700 and S. 1528. As S. 296 would vest authority with the Bureau of Commercial Fisheries, we would have to defer to the National Marine Fisheries Service, Department of Commerce, concerning the implementation of that bill. Reorganizaiton Plan No. 4 of 1970 abolished the Bureau of Commercial Fisheries and transferred their functions to the Marine Fisheries Service.

EXPLANATION OF THE ESTIMATED COST OF THE WHOLESOME FISH AND FISHERY PRODUCTS ACT OF 1971

Attached are the five-year cost projections for S. 700 and S. 1528. The bills differ primarily in inspectional coverage. S. 1528 requires continuous inspection, and S. 700 requires less-than-continuous inspection. If either bill is enacted, FDA expects to begin implementation on January 1, 1972. Cost projections for FY 1972, therefore, are for half of that year. Because gearing-up for implementing a new program requires some time, manyears are lapsed to 25 percent of positions for this year. Current FDA fish efforts, including shellfish, will be integrated into the new program begining in 1973. The projected resources will provide for inspectional coverage of an estimated 2,200 establishments in the industry processing for interstate commerce.

In each year after 1973 the manyears and operating funds are lapsed to 75 percent for new positions and to 95 percent for positions carried in the previous year. These are standard lapse rates. After the initial industry survey, each inspection will require 22 inspectional hours per plant. This is the average for a food inspection and sample collection.

The scheduled coverage under a less-than-continuous inspection program will include continuous inspection of 500 plants, four inspections per year for each of 900 plants, and two inspections per year for each of 800 plants. The total requirement for this coverage is over 800 inspector and inspector supervisor manyears. When the program is fully implemented, projected resources will meet that requirement with overtime and seasonal inspectors included.

Implementing the continuous inspection bill requires some adjustments. Of the 2,200 plants in the industry, about 800 are so seasonal that they would require one inspector per two plants and another 150 plants are so clustered that one inspector could cover three plants. The remaining 1,250 plants would be assigned one inspector per plant, year-round. The resulting total requirement for an inspectional effort of over 1,900 manyears is the basis for our projected rate of program build-up.

The field laboratory staff is projected to meet the requirements of analyzing the samples collected by the inspectors. Inspectors will make twelve sample collections from each of 500 plants, two collections from each of 800 plants, and four collections from each of 900 plants. The number of sample collections will be the same for both levels of inspectional coverage.

The Department of Agriculture has a program for continuous inspection of poultry that is similar in many ways to the proposed fish programs. The experience of the poultry program has been that overtime has run about 20–25 percent of the total program costs. We have calculated overtime on the basis of 20 percent of field payroll and benefits.

The contract support is to provide research to identify health hazards in fish products. This research will include studies to develop methods of detecting natural poisons and chemical contamination.

The initial equipment, especially lab equipment, needed to start a new program is extensive. Other start-up costs include initial training and office equipment. The total costs are estimated to be $8,000 per headquarters chemist, $3,000 per field chemist, $2,000 per headquarters support position, and $1,000 per other field position. Costs are included for positions that are new each year and do not include those from current FDA fish efforts.

The bills provide for the States to develop parallel programs for the estimated 2,000 intrastate establishments. FDA may provide grant funds to aid in the development and operation of State programs, with the limitation that grant funds do not exceed 50 percent of any total State program. The projected cost data includes funds for a Federal-State grant program beginning in 1973. The 1973 level of funding is low to reflect that this is the first year in which States would begin developing programs. In 1974 the funds increased because it is the first full year the States have to develop programs. The 1975 and 1976 funding level is for full State participation. FDA will provide technical assistance and most of the research efforts that will free the States from much of the cost in developing and operating their programs. Intrastate plants tend to be smaller and more seasonal in nature than those in the interstate industry. For these reasons, the States' programs may require only one half the number of inspectional manyears that FDA plans. The projected grant funding level should provide for about 50 percent of State cost for developing and operating parallel programs.

The positions and manyears for FDA's current fish and shellfish efforts were provided by the Bureau of Foods (25 positions and 24 manyears) and the Office of the Assistant Commissioner for Field Coordination (143 positions and 143 manyears). Standard modules of $20,000 (headquarters) and $17,000 (field) per manyear were used to price out the 1972 level of effort in this area. The total cost is increased by $69,000 in each succeeding year for mandatory increases. The resulting total net Federal cost reflects the impact of each proposed bill.

These cost projections exclude building and facilities requirements for housing the new program people and operations.

WHOLESOME FISH AND FISHERY PRODUCTS ACT OF 1971—(S. 700)

	1972			1973			1974			1975			1976		
	Positions	Man-years	In thousands	Positions	Man-years	In thousands	Positions	Man-years	In thousands	Positions	Man-years	In thousands	Positions	Man-years	In thousands
Headquarters administrative support and laboratory staff	135	34	$622	218	195	$3,657	218	206	$3,958	218	207	$4,016	218	207	$4,078
Field laboratory staff				168	85	1,310	291	254	3,460	291	277	3,979	291	277	4,062
Inspectors and supervisory inspectors				500	168	2,258	753	668	8,782	753	715	9,836	753	715	10,600
Seasonal inspectors							200	100	1,132	100	50	566	100	50	566
Inspection support staff (program direction and administrative assistance)				105	47	741	178	156	2,113	178	169	2,315	178	169	2,368
Overtime					50	678		161	2,733		128	2,651		128	2,824
Contract support			500			750			250			250			250
Start up cost (initial equipment, training and other 1-time expenses)			452			1,136			647						
Total operating cost	135	34	1,574	991	545	10,530	1,640	1,545	23,075	1,540	1,546	23,613	1,540	1,546	24,748
Federal-State grant programs						2,000			3,000			7,000			7,000
Total program cost	135	34	1,574	991	545	12,530	1,640	1,545	26,075	1,540	1,546	30,613	1,540	1,546	31,748
Off-set from absorbing current FDA fish efforts	[1](168)	[1](167)	[1](2,911)	−168	−167	−2,980	−168	−167	−3,049	−168	−167	−3,118	−168	−167	−3,187
Current grants (shellfish research)			[1](612)			−612			−612			−612			−612
Total new Federal cost	135	34	1,574	823	378	8,938	1,472	1,378	22,414	1,372	1,379	26,883	1,372	1,379	27,949

[1] FDA fish efforts from new program.

WHOLESOME FISH AND FISHERY PRODUCTS ACT OF 1971—(SENATOR HART) (S. 1528)

	1972			1973			1974			1975			1976		
	Positions	Man-years	In thousands	Positions	Man-years	In thousands	Positions	Man-years	In thousands	Positions	Man-years	In thousands	Positions	Man-years	In thousands
Headquarters administrative support and laboratory staff	135	34	$622	248	213	$3,994	248	235	$4,515	248	236	$4,578	248	236	$4,649
Field laboratory staff				168	85	1,310	291	254	3,460	291	277	3,979	291	277	4,062
Inspectors and supervisory inspectors				500	168	2,258	1,000	850	11,174	1,745	1,509	20,758	1,745	1,658	24,580
Seasonal inspectors							100	50	566	100	50	566	100	50	566
Inspection support staff (program direction and administrative assistance)				105	47	741	195	168	2,275	195	185	2,534	195	185	2,592
Overtime					50	678		161	2,733		252	5,219		275	6,067
Contract support			500			750			250			250			250
Start up cost (initial equipment training and other 1-time expenses)			452			1,196			894			745			
Total operating cost	135	34	1,574	1,021	563	10,927	1,834	1,718	25,867	2,579	2,509	38,629	2,579	2,681	42,766
Federal-State grant program						2,000			4,000			8,000			12,000
Total program cost	135	34	1,574	1,021	563	12,927	1,834	1,718	29,867	2,579	2,509	46,629	2,579	2,681	54,766
Off-set from absorbing current FDA fish efforts	[1] (168)	[1] (167)	[1] (2,911)	−168	−167	−2,980	−168	−167	−3,049	−168	−167	−3,118	−168	−167	−3,187
Current grants (shellfish research)			[1] (612)			−612			−612			−612			−612
Total new Federal cost	135	34	1,574	853	396	9,335	1,666	1,551	26,206	2,411	2,342	42,899	2,411	2,514	50,967

[1] FDA fish efforts from new program.

Senator HATFIELD. Thank you very much. Could you tell me as to whether or not there is an availability at this time of trained personnel and other such technical personnel requirements to carry out the surveillance approach.

Dr. EDWARDS. If I might, Mr. Chairman, I would like to ask Dr. Wodicka to answer that question. It falls under his jurisdiction.

Dr. WODICKA. There would obviously have to be a considerable scale up in our activities under any of the proposals offered. This would be feasible on different time frames depending on which of the approaches was taken. Obviously the continuous inspection approach would take the longest and impose the most serious management problems but any of them could be done from the standpoint of overall feasibility.

There is a limitation on the availability of, shall I say, trainable manpower, because trained manpower for this purpose just does not exist. This is a factor in determining our position.

Senator HATFIELD. One of the problems we face, of course, in setting up new programs of this kind is not only the qualified personnel to fulfill the various jobs and positions but also it's the interrelationships that a new program has with an existing structure.

Let me use an example to illustrate my point. FDA has been noted for its great problems of workloads. Let's take the field of drug evaluation. Shall we take, as an example, DMSO. There is a proposal made by Congressman Wyatt and myself that this responsibility be removed from FDA because we have felt that there has been a great example here of workloads that you have not been able to meet and other such problems.

I just quote a couple of statistics to show my point. In 1965, the funds allotted to the Drug Review Section of the FDA were $1.5 million in round figures. In 1970, it was almost $4 million, actually $3.9 million. These are estimates given to me in a letter from you, Dr. Edwards.

The employees in the drug application review in 1965 were 222. In 1970, there were slightly more. In the drug application area, the workload we had in 1965 was about 405 applications received and 54 approved. In 1970, it dropped to 233 received and 51 approved. The workload problem here had just about diminished by 45 percent.

The increase in funds had gone from $1.5 million to $4 million. I know that it's like trying to compare apples and oranges, but my point is that if you give us this kind of statistical data that I have just asked for on these costs, how would it relate to the utilization of personnel and your general workload?

Very frankly, we have had great problems in trying to understand this whole drug review activity of the FDA.

Are we adding another job to the FDA in fish inspection that you are not really in a position to carry out, with not only the specific people in that new program but the interrelationships with the other parts of your agency?

Dr. EDWARDS. Let me first say, Senator, that I would like to say for the record that I feel that the FDA is probably the most underfunded and understaffed agency in the Federal Government considering the total responsibilities.

Senator HATFIELD. I could not disagree with that.

Dr. EDWARDS. If given the time I could probably come pretty close to proving my point. I think the drug situation that you bring up, however, is something that can certainly be justified. First of all, let me go back. In 1962 you will recall the Kefauver-Harris amendments brought about a change in the Food, Drug, and Cosmetic Act and at that time we were given the responsibility for reviewing over some 3,000 drugs that had been approved by the agency between 1938 and 1962.

In 1966, the period that you are referring to and in which our workload in other areas relating to drugs went down, we had suddenly submitted to us by the National Academy of Science the reviews on these 3,000 drugs. I really should not say they were submitted to us but the review by the National Academy began in 1966 and a great number of our resources were given over to the National Academy for this review.

Since then this has been probably the most time-consuming activity within the Bureau of Drugs. It has been an unbelievable effort on the part of the agency and it has required an inordinate amount of our resources and it still does. As a matter of fact, the problem is going to continue certainly through the foreseeable future.

Senator HATFIELD. Dr. Edwards, this is the very reason I am raising these questions, because I know that you have given strong leadership. You have provided various committees with your workload requirements. But you are only at one level in this whole operation and it has to be something, if it is to be successful, that has the full integrated support and leadership of the whole department and other agencies of government as well.

That is why I raise the question whether we are pushing upon you an additional responsibility here and whether you feel confident that you will get the kind of support that you will have to have in additional personnel and funds in order to administer this program.

The reason I raise that is because the man ahead of you is Dr. Roger Egeberg, the Assistant Secretary of HEW, the highest medical appointee in this administration. Yet as you well know, DMSO is one of the most controversial and probably one of the most famous drugs in the country today. But as of April this year, just last month, Dr. Roger Egeberg appeared in Portland, Oreg., making an address out there to a medical organization.

Dr. Egeberg, quoted in the press, said that he was very surprised to learn about the facts of DMSO. He was also surprised to learn that DMSO had been approved as a prescription drug in other countries.

In fact, Dr. Egeberg said he had never heard of DMSO until he was preparing for his trip to Portland and was told he might be asked about it.

Dr. Edwards, as you know, I have been working for many years on this problem of DMSO and many other people have as well. To have the highest medical appointment of this administration express publicly that he had never heard of it and he was going to come back and ask Dr. Edwards to give him a full briefing—by the way, has he asked you for that briefing yet?

Dr. EDWARDS. Yes, as a matter of fact. We met with Dr. Egeberg this past week.

Senator HATFIELD. It indicates to me that you are working under some handicaps here, as well as many other agencies. I want to be reassured as one member of this committee that if we are going to assign you additional tasks and responsibilities that we have some expectation that we are going to have the total integrated support and leadership from the top command.

It's awfully easy for this committee to bring you up here and say we are going to assign you some problem or some new task, but if we don't have the support of your superiors and the hierarchy of that Department, it's not going to work, is it?

Dr. EDWARDS. No, we absolutely have to have the support and the backing of the executive branch of the government. Let me say, Senator, in regard to DMSO, I know of your very sincere concern for this drug and we did make the decision this week that we are sending it to the National Academy for a total review of all of the information we have.

Carrying on in regard to the need for support for the FDA from the other branches of government, if you will, this is absolutely a necessity and we have, unfortunately, over the past several years been given certain responsibilities without commensurate resources, both in terms of money and manpower.

But I do feel that we are entering a new phase in the history of the FDA or perhaps better called this whole subject of consumer safety. I feel that certainly we are getting the support now from the Secretary of HEW that is very vital to the operation of our agency. I am also delighted that we have a secretary who understands the problems involved in trying to administer and run a regulatory agency. I must say that I am encouraged. I haven't always been encouraged during the last 18 or 19 months.

Senator HATFIELD. I am glad to know of your encouragement. I shall certainly measure my encouragement, too, upon the same basis and also perhaps more specifically as we move ahead on DMSO.

Dr. Edwards, I have two or three additional questions. In your statement you give to the committee a number of examples of deaths that have resulted from the ingestion of certain seafoods.

Could you supply this committee with other deaths that have occurred over the last year or so, from other foods besides fish and seafoods? Perhaps another time span than a year would be convenient.[1]

I am very concerned that we not focus here upon one particular food product to the point that we may neglect other areas that present us with equal problems or equal dangers that have not been getting this kind of publicity.

Could you do that?

Dr. EDWARDS. We will provide that for the record.

Senator HATFIELD. Last Easter we had candy Easter eggs that produced quite a problem. I think in all fairness to any one industry or any one group of producers we ought to have the total picture here. We are interested primarily, of course, in protecting people.

[1] See p. 330.

I notice that you have talked about certain exemptions. If I am interpreting that wrong, please correct me. You talk about the processing of salmon and oysters as examples of segments of this industry which would not be required to be inspected on a year round basis.

Also in the area of processing taking place on vessels. These would be, then, only at the time of the licensing which you referred to later, I think. Would these be exemptions or would they merely be fewer periods of inspection?

Dr. EDWARDS. May I ask Dr. Wodicka to address himself to that.

Dr. WODICKA. I think the point here, sir, is that where the plant operates only seasonally, this presents administrative difficulties to provide resident inspection, because then you have a problem of what to do with the inspector when the plant is shut down.

It's not an exemption.

Senator HATFIELD. It's not an exemption then. What are you going to do as far as making certain the public is not exposed to some danger emanating from a seasonal processor?

Dr. WODICKA. This would obviously have to be inspected and controlled. The issue here is whether it is to be under continuous resident inspection or whether it is to be approached in some other way by, let's say, an inspector who lives in some other place and goes there during certain periods.

Senator HATFIELD. What is the percentage of our fish market that represents domestic catch and that which represents foreign imports?

Dr. WODICKA. I would prefer to submit that for the record if you don't mind, sir.

(The following information was subsequently received for the record:)

The following sheet shows three charts which compare the domestic catch against imports for total fishery products, edible fishery products and industrial fishery products for the years 1959 through 1969 (the last year for which we have data). As shown by the second chart, imported edible fishery products accounted for 59.9% of the overall total.

The charts were taken from a publication of the Bureau of Commercial Fisheries, Department of Interior, entitled "Fisheries of the United States . . . 1969."

SUPPLY OF FISHERY PRODUCTS, 1959-69

[Round weight basis]

Year	Domestic catch		Imports [1]		Total (million pounds)
	Million pounds	Percent	Million pounds	Percent	
1959	5,122	60.5	3,338	39.5	8,460
1960	4,942	60.1	3,281	39.9	8,223
1961	5,187	54.2	4,383	45.8	9,570
1962	[2] 5,354	51.4	5,054	48.5	10,408
1963	4,847	42.4	6,587	57.6	11,434
1964	4,541	37.7	7,490	62.3	12,031
1965	4,777	45.3	5,758	54.7	10,535
1966	4,366	35.0	8,103	65.0	12,469
1967	4,055	29.0	9,936	71.0	13,991
1968	4,116	23.7	[2] 13,221	76.3	[2] 17,337
1969	4,292	36.4	7,510	63.6	11,802

[1] Excludes imports of cured cod into Puerto Rico, but includes landings of foreign-caught tuna in American Samoa.
[2] Record.

SUPPLY OF EDIBLE FISHERY PRODUCTS, 1959-69

[Round weight basis]

Year	Domestic catch		Imports [1]		Total (million pounds)
	Million pounds	Percent	Million pounds	Percent	
1959	2,369	55.5	1,901	44.5	4,270
1960	2,498	58.6	1,766	41.4	4,264
1961	2,490	57.4	1,845	42.6	4,335
1962	2,540	54.6	2,115	45.4	4,655
1963	2,556	53.2	2,247	46.8	4,803
1964	2,497	51.2	2,376	48.8	4,873
1965	2,587	50.1	2,576	49.9	5,163
1966	2,573	47.4	2,859	52.6	5,432
1967	2,368	48.8	2,481	51.2	4,849
1968	2,296	41.5	3,232	58.5	5,528
1969	2,246	40.1	[2] 3,353	59.9	[2] 5,599

[1] Excludes imports of cured cod into Puerto Rico, but includes landings of foreign-caught tuna in American Samoa.
[2] Record. (The record domestic catch of edible fishery products amounting to 3,307 million pounds was landed in 1950.)

SUPPLY OF INDUSTRIAL FISHERY PRODUCTS, 1959-69

[Round weight basis]

Year	Domestic catch		Imports		Total (million pounds)
	Million pounds	Percent	Million pounds	Percent	
1959	2,753	65.7	1,437	34.3	4,190
1960	2,444	61.7	1,515	38.3	3,959
1961	2,697	51.5	2,538	48.5	5,235
1962	[1] 2,814	48.9	2,939	51.1	5,753
1963	2,291	34.5	4,340	65.5	6,631
1964	2,044	28.6	5,114	71.4	7,158
1965	2,190	40.8	3,182	59.2	5,372
1966	1,793	25.5	5,244	74.5	7,037
1967	1,687	18.5	7,455	81.5	9,142
1968	1,820	15.4	[1] 9,989	84.6	[1] 11,809
1969	2,046	33.0	4,157	67.0	6,203

[1] Record.

Note: The weights of the domestic catch and imports represent the live (round) weight of all items except univalve and bivalve mollusks (conchs, clams, oysters, scallops, etc.) which are shown in the weight of meats, excluding the shell.

Senator HATFIELD. All right. My understanding is it's around 60–40. How would we protect the consuming public here as far as it relates to the supply of the import fish?

Mr. GOODRICH. There is a provision in the bill that would require the Secretary to work out with the foreign countries assurance that they had an inspection program equivalent to the one required for domestic production and by examination and inspection of that system to assure that the foreign inspection was providing the same sort of assurance for the public that the domestic inspection was providing.

Senator HATFIELD. We would rely purely on their assurance.

Mr. GOODRICH. Plus evaluating it by an on-site visit where necessary.

Senator HATFIELD. That would be about like relying on the Russians in the matter of off-shore fishing going on now on the Oregon, Washington, and Massachusetts coasts, wouldn't it?

Dr. WODICKA. This would have to be supplemented by periodic audits at the receiving ports.

Senator HATFIELD. In order to block the importation, in other words, as you would be empowered to do?

Dr. WODICKA. Yes, sir. There would certainly have to be an audit of any procedure that depends on certification from the supplying source.

Senator HATFIELD. That really in a sense, then, is sort of after the fact, isn't it? There could still be a lot of that distributed and people consuming it before we had such an audit.

Dr. WODICKA. There wouldn't have to be. In other words, the basic distinction here as between trying to control the operation yourself and trying to see whether somebody else is controlling it. In other words, as long as you have assurance that somebody else is doing an adequate job of control, you don't have to invest as much money in doing it yourself. It's like the distinction between a bookkeeper and an auditor.

Senator HATFIELD. Is it like a preaudit or postaudit? How would you get a preaudit in there?

Dr. WODICKA. You would have to go over there and inspect the facilities and their control scheme and so forth.

Senator HATFIELD. I was not aware that the Russians had accepted any concept of on-site inspection of fish or otherwise. Have they?

Dr. WODICKA. We might have a special problem if we were accepting fish from Russia or other Iron Curtain countries.

Mr. GOODRICH. The fish would not be admissible unless there was an equivalent inspection system under this bill.

Dr. WODICKA. This would have to be inspected on receipt at the port if adequate controls were not available at the country of origin.

Senator HATFIELD. In other words, if we accept the estimate that I am using here that 60 percent of the fishery products are imports today, this bill or no other bill that we act upon can guarantee to the American public an immediate protection, as it relates to these dangers that you have raised until such assurances and treaties or arrangements have been worked out, and they don't come quickly. Even then it would not be a complete assurance, would it?

Dr. WODICKA. I will duck the question of complete assurance because this is a perfect ideal. But unquestionably any system that is generated is going to take time to implement. It's a matter of a large-scale receiving point inspection at the ports or control at the source.

Senator HATFIELD. I can appreciate that problem, but I do think it ought to be very clearly established here in the public mind as well as for the record that we are not dealing in any of this legislation with the kind of ultimate protection or even perhaps with the major protection that a lot of the public may be crying for and deserve and that we want to give.

Dr. WODICKA. A very good point, sir.

Mr. GOODRICH. I think it should be said for the record, Senator Hatfield, that on page 16 of S. 700 is the provision that no fish could be admitted in import unless it complied with all the regulations, which are the good manufacturing practice, the inspection, et cetera. Provided, however, that if the Secretary determines and maintains on an annual basis that the foreign inspection is adequate, that would be a basis for admitting the fish.

So there are mechanisms in this bill that approach the problem. If the foreign country does not want to have any business with us in inspection or in compliance with the regulations, their fish cannot be admitted.

Senator HATFIELD. Would we draw this as an analysis or corollary to the import of Argentine beef and what kind of inspection is given to Argentine beef as contrasted to the criteria for domestic beef?

Mr. GOODRICH. As a matter of fact, yes. This is patterned after the Wholesome Meat Act which was passed in 1966 or thereabouts and it provided for a great improvement in the foreign inspection system as a condition for the admission of red meat.

Senator HATFIELD. Dr. Edwards, is it possible that other than fish products may become contaminated with mercury and other such metal traces?

Dr. EDWARDS. Yes.

Senator HATFIELD. Would you submit for this committee a list of other foods besides the fishery products that could have such a metal content that would be dangerous or would create a requirement for regulation of some kind and inspection of other foods?

Dr. EDWARDS. We will.

(The following information was subsequently received for the record:)

Most foods could, under the stress of the proper environmental conditions, develop metals problems. This would be especially true of meat animals and certain grains. The literature is very incomplete as to what are background levels of metals in foods. The following list of foods was developed in anticipation of a comprehensive metals survey of the food supply.

FOOD (Fish and Shellfish Excluded)

1. Milk, fluid.
2. Potatoes, white.
3. Bread, white.
4. Chicken.
5. Eggs.
6. Sugar (cane).
7. Wheat flour, white.
8. Hamburger (ground beef).
9. Lettuce.
10. Bacon.
11. Margarine.
12. Breakfast cereals, Ready-to-eat.
13. Beans, baked, canned.
14. Frankfurters.
15. Carrots, roots, fresh.
16. Corn meal.
17. Rice, white, milled.
18. Orange juice, canned.
19. Cheese, processed American.
20. Liver, beef.
21. Soya products.

Senator STEVENS. I am also interested in the request that Senator Hatfield has just made. We read so much about mercury and fish. Has there been any announcement from FDA of the effects of mercury on any other type of food?

Dr. WODICKA. We have surveyed, as expeditiously and completely as we can within the time we have been working on it, essentially the entire food supply. In other words, we have concentrated on those substances that are consumed in the largest amounts. Substantially the only commodities in which there is any problem are water foods. We do have analytical figures on other foods and they are acceptably low in mercury.

Senator STEVENS. From my understanding, you said, Dr. Edwards, that regarding imported products you would support the provision of the bill stating that if a foreign country has an adequate system of inspection, regulation, and total control, that would be sufficient as far as the imported products are concerned. Did I understand you correctly?

Dr. EDWARDS. Yes, with the provision that we were in fact the ones that made this decision. In other words, we would have to have the audit authority or opportunity before we would make this recommendation.

Senator STEVENS. In that case, I find it difficult to understand your comments about Senator Kennedy's bill. They indicate to me that you disapprove of the exemption of putting fish and fishery products into interstate commerce if the Secretary of the Interior found that a State had an adequate system of regulation, certification, and inspection. Why is it that we would be willing to accept the certification and inspection system of Japan or Russia but you would not be willing to accept the inspection system of the State of Alaska?

Dr. EDWARDS. I think again we would accept the inspection system of any State or other territory providing we did have the opportunity to audit the system in operation.

Senator STEVENS. It is my understanding this is just what Senator Kennedy wished to put into being. I find it an interesting proposal that if the State could set up an adequate system certified by the Secretary of Commerce, and a State did carry out that system so that a fishery's product were put in interstate commerce, what would differentiate it from the system you suggest for foreign countries?

Dr. EDWARDS. I do not think basically it would. I think we would certainly accept it.

Senator STEVENS. But you have objected to S. 296 on that basis.

Mr. GOODRICH. We have objected to it in the sense of wholly exempting that kind of product from the Federal control. There is a desire here by the American people to have a reliable fish supply wherever it comes from and to have marking that would show that it was under an inspection system, either continuous or a continuous surveillance type thing. The only objection to the Kennedy bill was to totally exempt these products from the Federal act if they were produced in a State-inspected establishment. There are provisions in S. 700 that would provide for adequate cooperative work between State and Federal agencies but there should not be a blanket exemption from the Federal act simply because the fish was produced in a State-inspected establishment.

The same way for the foreign product. The foreign certification would assure that it had adequate inspection at the point of pro-

duction but it still would be subject to inspection if it came through the port of entry; it would still be subject to the Federal requirements for labeling and other things.

Senator STEVENS. But it would not be subject to the continuous surveillance concept of the bill you recommend, nor would it be subject to the other concepts concerning the same bill. It seems to me you are putting a greater burden on the domestic industry than you are on the foreign fishing industry. I think this is what is promoting an increase to 60 percent. What makes the 60 percent viable to the American public is that it is less expensive.

The reason the domestic fishing industry faces added expenses is because of our system. Yet you disagree with Senator Kennedy's provision which I think would have enabled the industry to comply with solid State requirements and as long as they met Federal standards the industry would know that would be it.

Mr. GOODRICH. And as a practical matter, if there was a good State inspection system and the fish did fully comply it would likely comply with Federal law, but it should not be exempt in the case that it did not comply and got out of that category.

Senator STEVENS. Let's back up. If our State has a system for inspection and surveillance that meets the approval of your agency or the Secretary of Commerce, what difference does it make compared to that portion of the processing and the enforcement of good systems, which we need for good systems of quality control, as opposed to the Japanese? You are willing to accept their stamp of approval, but you are not willing to accept Alaska's stamp of approval as I understand it?

Mr. GOODRICH. Not at all. We are saying that the State inspection would be satisfactory in intrastate commerce and no further question. For interstate fish it all should have a Federal stamp showing that it fully complies with uniform Federal requirements applied nationwide.

Senator STEVENS. You are not doing that for imported fish, which is the whole problem.

Mr. GOODRICH. For imported fish there is a condition that it would have to be marked with a different type of stamp and the Secretary would accept that on assurance that the foreign inspection was adequate in terms of comparison with the Federal.

Senator STEVENS. That is the point. You are willing to accept their assurance, but you are not willing to accept the Alaska State assurance. You would let their product go in interstate commerce, but you would not let ours; you would let it go in intrastate commerce, which I find very interesting. It is all right to poison Alaskans but we cannot export it to the rest of the country. As far as that is concerned you are willing to accept the Japanese stamp but you are not willing to accept the Alaska stamp in interstate commerce, isn't that right?

Mr. GOODRICH. The proposal of the bill is that there be a Federal stamp uniform throughout the United States and that it be marked that way. There is a provision in the bill to give full credence to the State inspection. As a matter of fact, we support the State inspection with grants and with other insurances, but there is one uniform stamp.

There is no reason why there could not be the same kind of cooperation between the State and the Federal inspections that now goes on and where the States were providing adequate assurance the degree of continuous surveillance would be minimal. That is the kind of flexibility that is built into this bill. But it would have one uniform stamp rather than have an Alaska stamp or a Texas stamp or a Florida stamp for interstate fish.

Senator STEVENS. I think the FDA and the Department of Commerce ought to be willing to place greater burdens upon foreign fisheries' product coming into this country, which are not subjected to the same type of surveillance for that reason if no other. Yet you seem to take the position, in regard to the Kennedy bill, which I think is a good approach, that it is not sufficient to rely upon our own people for the same type of assurance.

Mr. GOODRICH. If so, we have no such intention. We have every intention to the contrary to support State inspection if it is adequate to utilize it, and to the extent it is inadequate to impose the same kind of inspection that occurs for federally inspected shipments.

Senator STEVENS. I have one other point I want to refer to. Last year the president of our Alaska King Crab Institute testified before this committee and I quote from his statement:

> Our Port Wakefield plant is one of the about 30 fish plants on Kodiak Island. To carry out the provisions of this bill as is now written would require about 20 full-time, year-round inspectors and about 10 additional seasonal ones. Yet my town is an isolated village of some 400, and the plant has run only a couple of days a week for the last 6 months. To recruit a qualified man for such a job is not easy and to justify keeping him there all the time difficult.. Yet six or eight all-year inspectors, doubled at the busy half of the year, could be so organized that over 75 percent of the fish and seafood processed on Kodiak Island would be packed while an inspector was right there in the plant.

We have here a comparison between S. 296 and 700 and S. 1528. I am under the impression that you are supporting the surveillance section of S. 700. Yet you are saying that this would not be required on an all-year-round basis. Are you agreeing with Mrs. Wakefield or are you disagreeing with him in terms of the adequacy of local people who are inspectors and who also perform other functions?

Dr. WODICKA. We are agreeing that it is not necessary to provide a resident inspector for every plant in scattered operations of this type. This is exactly the sort of thing we had in mind in making our objection to the proposal for continuous resident inspection.

Senator STEVENS. What does continuous and effective surveillance of all segments of the industry mean? Are you qualifying it with respect to S. 700 or saying that it does not mean what it says?

Dr. WODICKA. We are distinguishing between surveillance and inspection. The monitoring of the operations of a plant does not require the continuous residence of an inspector.

Senator STEVENS. Do you intend to say that in this industry personnel who actually perform work in the industry could also be qualified inspectors as far as you are concerned?

Dr. WODICKA. Yes, definitely. In other words, if the processor himself has an adequate quality control program he will need less attention from our inspectors than a plant less well qualified to control its own operations.

Senator STEVENS. I do not think anyone is more interested in quality control today than the people who are catching the fish. They are the ones that suffer if a whole load of fish coming in from the Aleutian chain packed on board one of the floating canneries is stopped, as was the case several years ago. We could not identify which cannery it was, as I recall, and the whole shipment was stopped in Seattle. The actual processor and the fisherman are those that suffer. It does not effect the other areas.

I think they have the greatest incentive for quality control throughout the entire line of the handling of fish and fish products in this country. Yet it does not seem that that is what your bill says. Your bill implies to me, as I first read it over, that the Secretary should be in charge of the inspectors and they should be Federal people.

Dr. WODICKA. I think the point is this: Perhaps I can best illustrate it by the situation with milk. Most of the inspection of milk is handled by local jurisdictions. Other jurisdictions were unwilling to accept shipments of milk without reinspection and the only way to rationalize this whole situation was to put it under Federal surveillance, which it now is. So the FDA now audits the operations of the local jurisdictions and assures itself that they are competent in controling the quality of the milk that is shipped from region to region. In the same way we would propose to establish uniform standards of control and assure ourselves that these standards were being maintained either by the processor or by some local jurisdiction or by our resident inspectors, if that is what it takes. In other words, to adapt the control to the particular situation that is offered.

Senator STEVENS. What about the Japanese and Korean and Russian floating canneries that are off our shores? They are sitting right outside the 12-mile limit. Are you going to impose the same restrictions on them?

Dr. WODICKA. We would absolutely have to have uniform standards of quality and safety imposed on all sources. We would certainly not discriminate in favor of import sources as against our own domestic industry. If the controls were adequate from a foreign source and we were satisfied that they were adequate, we would accept their certification subject to audit. If they were not adequate, we would apply the full controls within our power.

Senator STEVENS. Correct me if I am wrong, but I do not find any mention in your statement of the provision in Senator Kennedy's bill, S. 296, which would add to the assistance that the Federal Government makes available for fishing, so that financial assistance to the industry through the fisheries loan fund would provide the capital necessary to adequately modernize to meet the standards that you have established. I came in after you read your statement, so if I am wrong, I apologize. I don't object to the imposition of inspections, I want you to understand. I think it is great. We would like to have modern canneries and we would like to have the additional facilities we need to meet this quality control.

Does the adminstration support the concept of increasing the loan fund to provide the capital to do it?

Mr. GOODRICH. There is no provision exactly like that in S. 700. The authorities for interdepartmental cooperation appear on page

33. There is authority here for the Secretary to conduct through grants or contracts, certain research and improvement matters. But there is no provision for grants to modernize the establishments.

Senator STEVENS. I assume that it would be the commerce people who would be more directed toward that.

Thank you very much, Mr. Chairman.

Senator HART (presiding). Dr. Edwards, I apologize for having to leave during the time you were testifying. As Senator Hatfield told you later, we had to go to the floor for a live quorum. I will not belabor this business of the degree of inspection which is the key. But I am grateful that there has been this exchange.

In your prepared testimony, I think you put your finger on what is the basic problem with our fish product. You say the present degree of surveillance of the fish processing industry is not excessive by today's standards. We all agree that the standards of surveillance have to be improved as to their nature. S. 700 does require one intensive inspection before certification or licensing, and after that inspection shall be conducted as the Secretary directs. In his judgment, this will reasonably assure compliance. In my book, that doesn't change very much the level of inspection which we would find under existing law. Wouldn't you be helped in terms of getting the funds which you so desperately need if we had a floor of the character nailed into S. 1528; Namely, not leaving it to his judgment, and therefore, the debate as to how much money is really needed, but nailing it to the continued presence of an inspector inplant? Then the Appropriations Committee would have a very simple problem of how many dollars would be required.

Dr. EDWARDS. Senator, I didn't hear the last part of your statement.

Senator HART. Wouldn't you be helped in the search for the money which you need if we gave you a requirement that you have an inspector in every plant? Then when we go to the Appropriations Committee, the only debate is as to how many plants there are.

Dr. EDWARDS. I think it would be certainly hard, Senator, to argue the fact that under your plan the opportunity for error would be less and that we want to control as nearly as possible 100 percent of the problems within the industry. We believe, however, as I said in my statement, that we could, with the proper support from the Secretary and the others, and with the flexibility that we have built into our suggested bill, accomplish this degree of control.

Senator HART. I am suggesting that the very flexibility which you are building in will make much more difficult your obtaining the money even to do what you, in a flexible sense, think is necessary. Specifically on the surveillance section—and you may have one of your people comment if you so desire—your comment is that it would impose a difficult and perhaps an unworkable obligation within the time cell, namely 90 days. We say not more than 90 days after the enactment, the Secretary will propose regulations specifying all dangerous materials, indicating the intensive screening procedure that will be followed. I take it that it is a fear that the technology is not at hand that would enable you to respond within 90 days. Is that correct?

Dr. EDWARDS. That's correct, yes.

Senator HART. Would it be acceptable, if we include in the definition of intensive screening research as well as testing? In other words, within 90 days after law became effective, you propose regulations on the level of surveillance required to discover and eliminate through research and testing the threat to human health. Whatever the testing technique available, it would be at hand. It might not be ideal, but at least you wouldn't have the problem of saying, "Well, we can't tell you that we have the procedures that will screen these out."

Dr. WODICKA. Mr. Chairman, there are really several problems here. One of these is that many of the materials that are in the spotlight at the current time are what you might consider cumulative poisons. The important consideration is not how much is consumed at one meal or on 1 day, but how much body burden is built up from a variety of sources over a period of time. As a consequence, the assessment of the hazard is a combination of the two factors of intake and of level of concentration. All you can say without knowing what the level of concentration is, in other words, without knowing the results of this surveillance, is that it is a suspected hazard.

Anything that would come out within a 90-day period after passage of a bill would necessarily have to be of a very tentative and preliminary nature because it would be supplemented by later information that came along identifying other hazards. We would have some misgivings on this count.

The second thing is, as you have touched upon, is that methodology in many instances is quite uncertain. We would not know how to establish the concentration of many of these materials reliably and accurately within that period.

Senator HART. I would ask that you consider your position if the additional language was added. I would react to your comment by saying that it would seem acceptable under the language I am suggesting for a regulation to be drafted that would be consistent and that would recognize the problem you have mentioned.

Dr. EDWARDS. I think we would agree with that, Senator.

Senator HART. I guess what I am really trying to find out is what at the moment the department is doing to identify metals other than mercury in food. Let me begin this way.

Earlier today, Dr. Perry told us of a potentially serious threat from cadmium. Yesterday we heard from the New York public health authorities a story of physical and perhaps emotional and psychological damage to a woman from mercury. What kind of scanning of our food is now going on for cadmium and other metals?

Dr. EDWARDS. I would like to ask this of Dr. Wodicka, since this falls under his responsibility.

Dr. WODICKA. Limited specifically with respect to cadmium, because here, again, we would like to do some further work on methodology; we have just pulled together the information that is readily available on cadmium within the bureau for intensive study.

We have an ongoing analytical methodolgy project to develop a systematic approach to the analysis of various foods for the whole gamut of metals which may or may not be hazards, and we won't know until after the analyses have been performed.

So we have, one by one, a series of literature searches on these materials to assemble what is known particularly about the toxicology.

Second, we have a methodology program afoot. Certainly, we have restructured the organization to create an organizational element to concentrate in this area of specifically looking for and identifying possible problems rising out of heavy metals and industrial chemicals generally. In other words, we are looking at organic as well as inorganic chemicals in assessing hazards.

Senator HART. Are you looking for metals to identify, or are you looking at food for cadmium?

Dr. WODICKA. Both.

Senator HART. How do you select the food?

Dr. WODICKA. Most commonly on volume of consumption. We look at the foods eaten in largest quantities because, obviously, in these the concentration has the greatest impact on total intake.

The second thing is that on the basis of what we may know about the chemistry, occurrence, and behavior of some of these elements, we look at foods where they might, on the basis of previous knowledge, be expected to occur. In other words, certainly these things are most commonly in products of animal origin, so we look selectively in those areas.

Senator HART. Dr. Perry says this cadmium was most likely to be found in shellfish and the livers and kidneys of animals. Do you inspect livers and kidneys of pork, chicken, or beef?

Dr. WODICKA. These are commodities not under our inspectional jurisdiction, but from the standpoint of assessing hazards to public health on a surveillance or study basis, as a matter of identifying problems, we do, and we are aware of the fact that the Department of Agriculture is also looking in these areas. These are under their jurisdiction, of course.

Senator HART. That is of only academic interest to the fellow who may be eating the food having the cadmium. It may not be your fault, but ours. Because of the jurisdictional problem, you do not in fact know what the Department of Agriculture may have found with respect to cadmium?

Dr. WODICKA. We are in touch with each other and are interchanging results, and methodology as well, so we are coordinating our attack on these problems.

Senator HART. What does Food and Drug tell the public with respect to cadmium and what foods, if any, ought not to be ingested?

Dr. WODICKA. We have not said anything to date because we have not identified any problems that we think are worthy of attracting to general attention.

Senator HART. I wil read the record to find that answer.

Dr. WODICKA. With respect to cadmium, we haven't issued any public notices because we have not identified any problems that warranted attracting that much attention to them.

Senator HART. Nor, to your knowledge, has the Department of Agriculture?

Dr. WODICKA. That's correct, sir.

Senator HART. Either of you would be able to seize such products that you found did reach a level threatening the public health?

Dr. EDWARDS. That's correct.

Senator HART. With regard to your pronouncements on swordfish and mercury, some suggest that you have gone too far. You are catching it from one end or the other all the time. What is your position to the consumer on swordfish? Should he buy it or should he eat it or shouldn't he?

Dr. EDWARDS. We have the recommendation until this situation is under control, if it can in fact be brought under control, that no one eat swordfish. We have particularly emphasized the urgency of women at childbearing age and young children not eating swordfish. This is a blanket recommendation.

Senator HART. So, to go to an exchange we had with a witness from the New York Health Department yesterday, you would mean that not even one swordfish meal a week should be eaten?

Dr. EDWARDS. That is our position at this point in time.

Senator HART. If one swordfish meal a week is unsafe, how many tunafish meals a week do we recommend?

Dr. EDWARDS. Again, it is not, as I know you are aware, as though one swordfish a week were necessarily, in and of itself, a danger, but as Dr. Wodicka brought out, I think, we are really talking about the total body burden of mercury. Until we know more about this and until we are satisfied regarding the total amount of mercury to which a particular individual is exposed, I think we have to be over-cautious in our recommendations to the consuming public.

Senator HART. And you have been cautioning the public as to no swordfish?

Dr. EDWARDS. In the case of tuna, however, let me say that we are convinced after, we feel, very thoroughly analysing the whole total tuna supply in this country, that the supply of tuna now available to the consumer is in fact safe. We feel that our inspection program now is identifying tuna—I say "ours," this whole thing has been a cooperative effort on the part of the Food and Drug Administration and the industry, but we feel that our system now is identifying any tuna that is over the guideline and that tuna that is on the shelf available to the consumer is all within our guideline.

Senator HART. And the guideline is what?

Dr. EDWARDS. 0.5 parts per million.

Dr. WODICKA. It generally averages around 0.3 parts per million.

Senator HART. And what did the swordfish have?

Dr. WODICKA. A little over 1 on the average.

Senator HART. Is my arithmetic right that three meals of tuna, then, or four meals of tuna, would take you to the same level of mercury as one meal of swordfish?

Dr. WODICKA. If the portions were of the same size, yes, sir. It would be somewhere between three and four.

Senator HART. I was a fish eater until this matter came up but I am not too familiar with what is the habit of fish eaters with respect to swordfish and tuna. My impression is that you eat a great deal more meals of tuna than of swordfish. If you said no to one meal of swordfish and between three and four meals of tuna could get you to the same level, why don't you say that about tuna?

Dr. WODICKA. You have touched on a problem that has concerned us a great deal. We have no mechanism available by which we can make a possibly hazardous food available with limitations on intake.

It is approaching the point of certainly that swordfish could be eaten safely if not too often, but we have no mechanism available to us to do that. Our calculations convince us that it is extremely unlikely that anyone will eat enough tuna to get in trouble.

Senator HART. One last thing. Senator Stevens has a point that I think we should get your reaction on. Let me explain first of all that I am not a weight watcher but this morning just as we began hearings, friends here in the room brought me a magazine which, as I understand it, was purchased yesterday. It is entitled "Weight Watchers," May 1971. There is an ad in it that says it has two million readers. I think they are lecturing the FDA, though you are not named.

I would like to better understand what somebody on the weight watcher's diet should or should not be concerned with. This is a question asked of Jean Nidetch, columnist in the magazine:

"Dear Jean: I have read a great deal about the fish scare. How does this affect the weight watchers food plan?

It is signed by a woman from Chicago, Ill.

It would appear that the 'fish scare' was somewhat fishy. . . . I'm sure that most of us have just about forgotten it. However, an announcement *was* made by an independent researcher earlier this year that mercury had been found in tuna and swordfish. A few days after this announcement, Federal authorities took a small amount of canned tuna and much of the swordfish off the market.

Eminent doctors and researchers from all over the country responded immediately, stating that the mercury is found in nearly *all* the foods we eat and that in none of them—including fish—are those quantities enough to be anywhere near dangerous.

Now, do you buy that statement or not?

Dr. WODICKA. Senator, I believe Dr. Herdman's testimony speaks to that in finding out the documented case of mercury poisoning from the consumption of swordfish. In previous appearances before this committee we have pointed out that we routinely apply a factor of safety of 10 to evidence derived from human study indicating unsafe levels.

Ordinarily the factor is applied to the maximum no-effect dose. In the particular instance of mercury the factor of 10 was applied to the minmum effect dose. In other words, there were clinical manifestations at the dose level which we divided by 10 in caluculating our guideline for mercury in fish. That factor of safety is predominantly to take into account variations in individual susceptibility and the possibility of interactions of the toxic agent with other materials. Implicit in such a procedure is the likelihood that a person could consume quantities of the toxic material over the guideline level without clincal manifestations. In other words, the calculations would have to be faulty if this were not the case most of the time. It would be only in the highly exceptional situation in which symptoms were observed with someone going over the guideline because all he is doing is invading the margin of safety, not going into the area where demonstrated unsafety exist.

The second point I would make, speaking specifically of the weight watcher question, is that the weight watchers' diets are obviously restricted in calories as is implied in the name. Therefore the portions are relatively small.

The second thing is that Dr. McDuffie, who precipitated much of the current excitement about mercury, has studied weight watchers in comparison with the general population, has found higher levels of mercury in their blood and hair, but has found that these levels are still within safe limits, that there is no hazard in following the weight watchers' practices in the frequent consumption of fish.

Senator HART. I am told that a typical weight watcher's diet recommends that a woman eat five fish meals per week, at the lunch meal 4 ounces and at the dinner meal 6 ounces, and that a man eat also five fish meals per week but in greater amounts, at lunch 4 ounces and at dinner 8 ounces.

Is this a small intake, in your judgment?

Dr. WODICKA. I would say so. In other words, the meat portion of a meal is commonly larger than that. I would say also that those portions are not hazardous, particularly if the species are varied. Obviously there is somewhat more risk if a person concentrates on a species that has been identified as having higher than normal mercury.

Senator HART. I have heard of another diet that is based on grapefruit. What is the health hazard in grapefruit?

Dr. EDWARDS. I don't believe there is any, is there, Dr. Wodicka?

Dr. WODICKA. Malnutrition.

Senator HART. If accompanied by bacon and eggs?

Dr. EDWARDS. No.

Senator HART. Senator Stevens wanted to raise a question.

Senator STEVENS. Yesterday Dr. McDuffie suggested that if we required the labeling of products that contained mercury, the consumer particularly weight watchers who eat concentrations of certain products, could make the judgment as to the mercury level and he suggested they can count mercury as well as they can count calories. What would you think about that?

Dr. EDWARDS. Again I don't know all of the details that Dr. McDuffie had in mind in implementing this but it would seem to me that it would be a very difficult thing to put into effect unless all you were trying to do was identify not the level of mercury but the fact that the particular species of fish had been found to contain mercury at some point in time. That wouldn't be particularly difficult. But to give the consumer any particularly meaningful information would be logistically an impossible job, I would think.

Senator STEVENS. As I understood his testimony he was saying it is the frequency of consumption rather than the incidental consumption that would lead to difficulty and that we could aid the consumer by providing him the opportunity to make the decision when he reached the danger level. Do you agree with that?

Dr. EDWARDS. There is no question that the frequency of consumption is a major factor involved. In swordfish we have said we don't believe anyone should eat swordfish now. But in tuna we feel that the situation is such that we have this massive program that is complete enough to assure the consumer that with any reasonable degree of intake there is no danger in it.

Senator STEVENS. I visited Adak recently and saw all our floating canneries out there. That is 1,200 miles from Anchorage, which is 4,500 miles from here. I found that our vessels there are justifiably

subject to health inspection. They are subject to FDA inspection. They are subject to Coast Guard safety inspection.

From the point of view of merely the sheer cost to the Federal Government, if we are going into a program like this, is there any way to combine these inspections so that one person or agency would be qualified to handle the relationship between the Federal Government and the floating vessels?

Dr. WODICKA. This is obviously possible but difficult because of the different kinds of specialties involved. Certainly the jurisdiction over foods for various aspects of safety and soundness has been much discussed and there is strong sentiment in favor of consolidating this so there would be fewer jurisdictions. I am sure that we would favor such a move.

Senator STEVENS. In that line could you give us for the record the Government departments or agencies which are engaged in inspection programs for fishery products either on a voluntary or mandatory basis and the State activities involved so we can see what the jurisdictional overlap problems are?

Dr. EDWARDS. We will.

(The following information was subsequently received for the record:)

Answer. The Food and Drug Administration, Department of Health, Education, and Welfare inspects both plants and vessels to determine the adequacy of sanitary conditions and other violations relating to adulterated or misbranded foods. FDA is also responsible for the regulation of food additives and color additives used in the preparation of fish and fish products. Although the Environmental Protection Agency does not conduct inspections, they do establish tolerances for pesticide residues; FDA enforces these tolerances. The National Shellfish Sanitation Program is a cooperative program involving the Food and Drug Administration and State health authorities. State health authorities are responsible for conducting inspections and FDA makes an annual review of each State's control program.

The National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Department of Commerce, performs voluntary inspection and grading services under authority of the Agricultural Marketing Act of 1946. The Marine Fisheries Service also develops and promulgates standards for fish and fishery products. The activities of the Marine Fisheries Service were formerly performed by the Bureau of Commercial Fisheries, Department of the Interior. This transfer of functions was effected by Reorganization Plan No. 4 of 1970.

The U.S. Coast Guard, Department of Transportation, inspects and regulates vessels and related equipment to provide for the physical protection of crew, passengers and cargo. The Coast Guard also approves plans for construction, alteration and repair of vessels.

In addition to the Federal and State activities mentioned above, State and local health authorities may inspect vessels and establishments which operate within their jurisdiction.

Mr. BICKWIT. Let me summarize my understanding of your testimony on swordfish.

You would discourage the eating of even one swordfish meal per week. However, you are convinced that if you get all tunafish containing over 0.5 parts per million off the market, the danger is so minimal as not to issue any advice to those on heavy tuna diets?

Dr. EDWARDS. I think that generally is correct, yes.

Mr. BICKWIT. If you took all the tuna with 0.5 parts per million in it off the market, nonetheless I assume you would still be left with average amounts of 0.3 parts per million of mercury in tuna.

Dr. EDWARDS. Again there is a species difference here that is rather significant, as a matter of fact. I would have to ask Dr. Wodicka about that.

Dr. WODICKA. Obviously the removal of the high levels is going to depress the average of what is left.

Mr. BICKWIT. Do you know what percentage of tuna is over 0.5 parts per million?

Dr. WODICKA. It is small, on the order of 3 or 4 percent.

Mr. BICKWIT. I take it it would not depress the average greatly.

Dr. WODICKA. Not very much. However, obviously this is not a uniform matter. There is a considerable variation with respect to size and species.

Mr. BICKWIT. Nonetheless, we are left with the conclusion that the average is somewhere around 0.3 parts per million?

Dr. EDWARDS. Right.

Mr. BICKWIT. Would your own figures or calculations suggest that 3½ ounces of tuna with 0.3 parts per million consumed per day will put you into the danger zone, if you eat 3½ ounces of tuna per day?

Yesterday we asked Dr. Herdman whether it was likely that an average human would eat one fish meal a day or one tuna meal a day. He said in each case it was not likely. However, in case of a weight watcher he said it was quite likely that a weight watcher would be eating one tuna meal a day. If a tuna meal is 3½ ounces it strikes me that weight watchers who follow that diet are in the danger zone, given your figures.

Dr. WODICKA. Depending upon how you define danger zone. They are crowding the edge of the 10-point safety factor, that is correct. The only response I can make to that is that Dr. McDuffie has published his findings with respect to weight watchers and finds that the blood levels and hair levels of mercury in these people are not such as to cause concern.

Mr. BICKWIT. Does he find that none is over the safe level?

Dr. WODICKA. That is my understanding, yes. I don't know for sure.

Mr. BICKWIT. Our understanding from his testimony yesterday is that about 20 percent of those tested are over the safe level.

Dr. WODICKA. Then he has information more recent than that we are aware of.

Mr. BICKWIT. In the light of that information would you be inclined to advise weight watchers to lay off tuna fish?

Dr. WODICKA. We would want to study the situation most particularly to assess his findings. As I commented a little earlier with respect to swordfish, I think our problem will become more widespread in that there are foods which are acceptably safe if their frequency of consumption is regulated. I am not sure that the Congress would consider that we had carried out our mandate if we simply applied a warning label to such foods warning against undue frequency. That really is the focus of the issue.

Mr. BICKWIT. And yet this is the tack you have taken in the case of swordfish. It is our suggestion that if that is the tack, consistency demands that you take a similar tack in the case of tuna. You have applied a warning in the case of swordfish. Our suggestion on the basis of Professor McDuffie's evidence and on the basis of your

figures is that consistency mandates a similar if not lesser warning in the case of tuna.

Dr. EDWARDS. As Dr. Wodicka said, we have not had these most recent figures avilable to us but certainly if they are in fact accurate we would have to give them serious consideration.

Mr. BICKWIT. With respect to cadmium, you say that USDA and the FDA both have authority to look for cadmium in liver and kidney; is that correct?

Dr. EDWARDS. That is correct.

Mr. BICKWIT. Is the Department of Agriculture now looking for the presence of cadmium in liver and kidney?

Dr. EDWARDS. Yes.

Mr. BICKWIT. May we have the findings for the record?

Dr. EDWARDS. Yes, I am sure you can obtain them.

Mr. BICKWIT. Thank you very much.

Senator HART. Doctor and gentlemen, thank you very much.

It now being about 12:30, with at least two and perhaps three witnesses remaining, we will recess until 2 p.m.

(Whereupon, at 12:30 p.m., the hearing was recessed, to reconvene at 2 p.m., this same day.)

AFTERNOON SESSION

Senator HATFIELD (presiding). The hearing will come to order.

As we come to the point of hearing Mr. Lee Weddig of the National Fisheries Institute, I would like to have the record made complete by a few comments of mine that relate to a subject that is most eminently tied to this matter of fish inspection.

As our committee reviews various bills relating to fish inspection legislation, I think we should examine the more basic question of preserving the very industry that the bills would regulate.

As a Senator from the Northwest, I know firsthand the decline our fishing industry has experienced, due in large part to the increased Russian fishing off the coasts of Oregon, Washington, and Alaska.

I believe fish protection should be just as important as fish inspection. There will be no fish to inspect if past trends continue. There will be nothing but fishing ghost towns left along our coasts unless the Federal Government takes strong steps to preserve what is left of this once valuable industry.

Yesterday I checked with my home State, Oregon, to ascertain the latest report. I call attention to these dramatic statistics. At one plant, production is down 80 percent from last year. At a second it is down 75 percent. At a third, 63 percent. At a fourth, production is only half of what it was last year at this time.

The annual Oregon trawl landings of fish have decreased from 33-million pounds in 1965 to 18-million pounds in 1970.

I also call your attention to the attached statistics which I shall have placed in the record at this point.

(The information follows:)

RECENT OREGON FISHING STATISTICS

Type of fish	1965	1966	1967	1968	1969	1970
Pacific Ocean perch (in millions of pounds)	13.5	3.8	1.6	0.8	0.6	0.6
Catch per hour unit of effort	1,200	1,000	700	400	400	300
Other rock fish	4.0	4.8	4.0	3.6	4.6	3.1
Arrow tooth flounder	2.3	2.2	2.1	1.0	0.9	0.4
Totals of all specimen (Otter Trawl Fisheries)	32.5	24.2	20.3	18.2	19.8	18.7
Catch per unit of effort (in hours)	1,100	1,100	1,000	800	800	700
Total efforts in thousands of hours	28.5	22.6	19.6	22.4	24.2	25.9

Intensive Russian fishing began in April 1966, so 1965 serves as base year. Arrow tooth flounder used mainly as mink food—found in deeper water.

While Oregon is known as a lumber State, our fishing industry has played a historical role in the life of our State's economy.

Unemployment in Oregon statewide was 7.6 percent in February, but was higher along our coast, where Russian fishing has cut into Oregon jobs as indicated above.

In Clatsop County, at the mouth of the Columbia River, unemployment was 18 percent in January and 12.2 percent in February. It was over 9 percent in the other coastal counties.

As another example, I have been advised that the Oregon catch of ocean perch was about 13 million pounds before the Russians moved in, and last year it had fallen to one million.

In my home town of Newport, I was told that if the trends of the past year continue there will be no groundfish industry in 2 or 3 years. While I recognize that fish imports also contribute to decline, I know from discussions with Oregonians just how much the Russians have eaten into the traditional catch.

As I speak today, I am advised that 50 Russian fishing vessels are operating just outside the 12-mile limit off the Northwest coast. I know that other States have experienced similar reductions in the catch by American boats, and I have evidence that they are within the 12-mile zone as well and that the reason they remain there is that by the time our communications reach the Coast Guard cutters or other such facilities, that they are monitoring the same radio bands and they can move outside that 12-mile zone before the enforcement agency arrives.

The same interest shown towards establishing laws for Federal fish inspection must be shown to establish protection for the fish resource.

If strong action is not taken soon by the Federal Government, these inspectors we are talking about will not have anything to inspect, because foreign fishing boats will have effectively eliminated one of this country's oldest industries.

I believe this is vital to the record at this point and to this resource, as one who has long been vitally interested in conservation. I feel very strongly that since we do have the privilege of hearing Mr. Weddig at this time, of the National Fisheries Institute, we ought to concern ourselves with the problem as it relates to the source of the very food product which we are talking about regulating here through further inspection.

Mr. Weddig, we are happy to have you here today.

Senator Hart, who is our chairman, is tied up on the floor at this moment on a vote on a conference report. I voted a bit earlier and got over here in order to start these hearings. He will be here shortly and wanted me to welcome you to this committee. If you will proceed on your own. We will be happy to hear your testimony. It will be printed in the record in complete form as we have it before us, and you may handle it any way you want.

STATEMENT OF LEE WEDDIG, EXECUTIVE DIRECTOR, NATIONAL FISHERIES INSTITUTE; ACCOMPANIED BY DR. DONALD G. SNYDER, DIRECTOR OF SCIENCE; DR. LEONARD J. GOLDWATER, PROFESSOR OF COMMUNITY HEALTH SCIENCES, DUKE UNIVERSITY, DURHAM, N.C.; AND ROBERT W. HAYMAN, PRESIDENT, AMERICAN SEAFOOD DISTRIBUTORS ASSOCIATION

Mr. WEDDIG. I have with me Dr. Donald Snyder, director of science, the National Fisheries Institute; Mr. Bob Hayman, president of the American Seafood Distributors Association; and at my far left Dr. Leonard J. Goldwater, professor of community health sciences at Duke University, a consultant, who has some distinction in the field of mercury research.

Before I go into the prepared testimony I would like to make a few comments on a number of items that came up this morning that seemed to be left open.

I believe you or Senator Stevens asked about the relative health hazards of fish versus other foods. During that period of time when nine people died from fish products there were something on the order of 10,000-plus who died from food and drug toxication, so we are not necessarily the majority of the problems in this country.

Senator HATFIELD. Would you give the committee a breakdown?

Mr. WEDDIG. These are statistics from the National Communicable Disease Center.

Senator HATFIELD. Dr. Edwards responds that he was going to provide this committee with that material and if it is from the same source, that will be sufficient.

Mr. WEDDIG. The National Fisheries Institute is a trade association of 350 companies engaged in the production, processing, and marketing of fish and seafood products. The bulk of products handled by our member companies is marketed in frozen, fresh and cured form.

The institute is pleased that the committee has reopened the question of fishery product inspection legislation. As stated at previous hearings on the subject, we believe an improved system of inspecting fish and seafood is required.

Virtually all concerned have expressed agreement that a better program would benefit the consumer and the industry. Differences of opinion in the past have been confined only to a few issues.

Hopefully, this year, we will be able to resolve the differences and move forward with a meaningful legislative package, one that can be implemented equitably and that will return value to the taxpayer.

The position of the institute on a basic inspection scheme has been made clear in previous hearings. Very simply, we believe the con-

sumer will be protected through implementation of a system of certification of plants followed by inspection of plant and product for compliance on a steady systematic basis that could include techniques of verification of the plant's quality control program, unannounced visits by inspectors, a minmum number of inspections, and even full-time presence of inspectors in a plant for extended periods of time, if this were deemed necessary.

One observation that should be of interest to Senator Hart is that the potential passage of an inspection bill, and the attention devoted to it during the past 4 years, has had a beneficial effect on the capabilities of the industry to produce wholesome product.

For the record and your information, Mr. Chairman, the amount of fish and seafood product used for human food in this country has grown by 27 percent to more than 6 billion pounds since you first held hearings on inspection legislation. Dollar value has grown by 45 percent to $3.2 billion at the wholesale level.

Senator HATFIELD. Let me interrupt for just a moment. There is another rollcall vote called, which means that I am going to have to be excused for a few moments.

You point out here, some statistics relating to the increase in fish consumption. Can you provide the committee with the percent of this increase that is attributable to domestic fish catches as contrasted with the amount attributable to imported fish products?

Mr. WEDDIG. Very simply, sir, the domestic catches remained stable over the period of the last 5 or 10 years, so all increases have been a result of product brought from abroad.

Senator HATFIELD. Do you have the graph showing these increased tonnages and their sources that could be given to us in statistical form?

Mr. WEDDIG. Certainly, sir. It is Government information.

(The following information was subsequently received for the record.)

SUPPLY OF FISHERY PRODUCTS, 1959–70

[Round weight basis]

Year	Domestic catch		Imports [1]		Total (million pounds)
	Million pounds	Percent	Million pounds	Percent	
1959	5,122	60.5	3,338	39.5	8,460
1960	4,942	60.1	3,281	39.9	8,223
1961	5,187	5492	4,383	45.8	9,570
1962	[2] 5,354	51.4	5,054	48.6	10,408
1963	4,847	42.4	6,587	57.6	11,434
1964	4,541	37.7	7,490	62.3	12,031
1965	4,777	45.3	5,758	54.7	10,535
1966	4,366	35.0	8,103	65.0	12,469
1967	4,055	29.0	9,936	71.0	13,991
1968	4,116	23.7	[2] 13,221	76.3	[2] 17,337
1969	4,292	36.4	7,510	63.6	11,802
1970	4,884	42.6	6,576	57.4	11,460

[1] Excludes imports of cured cod into Puerto Rico, but includes landings of foreign-caught tuna in American Samoa.
[2] Record.

SUPPLY OF EDIBLE FISHERY PRODUCTS, 1959–70

[Round weight basis]

Year	Domestic catch		Imports [1]		Total (million pounds)
	Million pounds	Percent	Million pounds	Percent	
1959	2,369	55.5	1,901	44.5	4,270
1960	2,498	58.6	1,766	41.4	4,264
1961	2,490	57.4	1,845	42.6	4,335
1962	2,540	54.6	2,115	45.4	4,655
1963	2,556	53.2	2,247	46.8	4,803
1964	2 497	51.2	2,376	48.8	4,873
1965	2,587	50.1	2,576	49.9	5,163
1966	2,573	47.4	2,859	52.6	5,432
1967	2,368	48.8	2,481	51.2	4,849
1968	2,296	41.5	3,232	58.5	5,528
1969	2,246	40.1	3,353	59.9	5,599
1970	2,482	40.2	[2] 3,692	59.8	[2] 6,174

[1] Excludes imports of cured cod into Puerto Rico, but includes landings of foreign-caught tuna in American Samoa.
[2] Record. (The record domestic catch of edible fishery productc amounting to 3,307,000,000 pounds was landed in 1950.)

SUPPLY OF INDUSTRIAL FISHERY PRODUCTS, 1959–70

[Round weight basis]

Year	Domestic catch		Imports [1]		Total (million pounds)
	Million pounds	Percent	Million pounds	Percent	
1959	2,753	65.7	1,437	34.3	4,190
1960	2,444	61.7	1,515	38.3	3,959
1961	2,697	51.5	2,538	48.5	5,235
1962	[1] 2,814	48.9	2,939	51.1	5,753
1963	2,291	34.5	4,340	65.5	6,631
1964	2,044	28.6	5,114	71.4	7,158
1965	2,190	40.8	3,182	59.2	5,372
1966	1,793	25.5	5,244	74.5	7,037
1967	1,687	18.5	7,455	81.5	9,142
1968	1,820	15.4	[1] 9,989	84.6	[1] 11,809
1969	2,046	33.0	4,157	67.0	6,203
1970	2,402	45.4	2,884	54.6	5,286

[1] Record. Note: The weights of the domestic catch and imports represent the live (round) weight of all items except univalve and bivalve mollusks (conchs, clams, oysters, scallops, etc.) which are shown in the weight of meats, excluding the shell.

Senator HATFIELD. Would you collate that for the committee?

Mr. WEDDIG. I will be glad to.

Senator HATFIELD. Second, in relation to these foreign imports and domestic products, could you provide the committee with information comparing the incidence of mercury in domestic catches with that which is found in foreign fish imports, presuming there is such mercury content in foreign imports.

Mr. WEDDIG. Senator, very quickly, the fish come out of the same water so that if they are caught by a U.S. boat or caught by a vessel from overseas, the incidental presence of mercury is going to be the same.

Senator HATFIELD. If you could give us any kind of information that you may have through any experiment or spot check or other such data that would be helpful to show the contrast, we would appreciate it.

Earlier this morning I got into a discussion about our capability to enforce this kind of inspection upon foreign imports.

Mr. WEDDIG. I think Mr. Hayman might be able to comment on that since he was in the swordfish business at one time. He basically dealt in imported swordfish.

The FDA was very capable of determining which products from overseas had mercury in them.

Senator HATFIELD. Very good.

Mr. Weddig, I noticed, also, that you have presented here in your testimony the maps and charts showing certain data as it relates to processing facilities in four locations. I note that there is no illustration from the Northwest and I know that I speak for Senator Stevens of Alaska, and I am sure, knowing my good colleague from Washington, Senator Magnuson, the chairman of our Commerce Committee, that they, as well as I, wonder if it would be possible for you to prepare similar charts using similar material and data as it relates to our coastal cities in those three Northwest States.

Mr. WEDDIG. I am not too certain I can do it for Alaska unless you want to extend a grant for travel money. The reason this was done was to show graphically that continuous surveillance as a method of inspection can be handled very neatly, we believe, by stationing a number of inspectors in key locations from which they could fan out and cover on a very regular basis the plants in a given city.

Senator HATFIELD. Could you do it for Oregon and Washington?

Mr. WEDDIG. We would have no trouble in doing it for the major ports such as Astoria and Newport, and certainly Seattle would give us no trouble at all in making the same kind of illustration.

Senator HATFIELD. Now, if you will just be patient for a few moments I will go and cast my vote and either Senator Hart will return shortly or I shall be back to continue these hearings.

(Recess.)

Senator HART (presiding). The committee will be in order.

You may proceed.

Mr. WEDDIG. Thank you, sir.

The one point I did want to make at this time was to indicate to you, sir, that since the introduction of the inspection bill 4 years ago we believe it has had a beneficial effect upon the compatibility of this industry to produce a wholesome product.

I had gotten to the point of indicating that in anticipation of an inspection program the industry has made major improvements and investment in new plant construction and renovation of old facilities.

As a very small example, we took a rather tiny survey of about 48 companies, members of the institute, and found that they had expended more than $30 million in the past 4 years on new plants and improvements and many indicated that the reason they had done this was in anticipation of the tighter regulations requiring better sanitation facilities and processing improvements.

We think that these improvements have had a marked effect on the quality of product being offered to the consumer, which, in turn, we think, is one reason for the steady increase in consumption of fish and seafood products.

For your information, during the past 4 years we have had a steady increase in per capita consumption each year. Last year was the fourth year in a row.

One basic issue that remains to be settled is the type of inspection after regulations are researched and written and the subsequent plant certifications take place.

I would like to refer back to testimony of Dr. George Michael, director of the Division of Food and Drugs for the Commonwealth of Massachusetts 2 years ago where he indicated:

> The concept of continuous inspection in regards to any area of the food business is archaic, obsolete, and it does not take into consideration the great advances made by the scientists in our Federal and State laboratories.

The advances referred to by Dr. Michael certainly have continued since he made those comments and reinforce our belief that a flexible program of continuous surveillance, perhaps modified to include a mandateory minimum inspection level, will do the job.

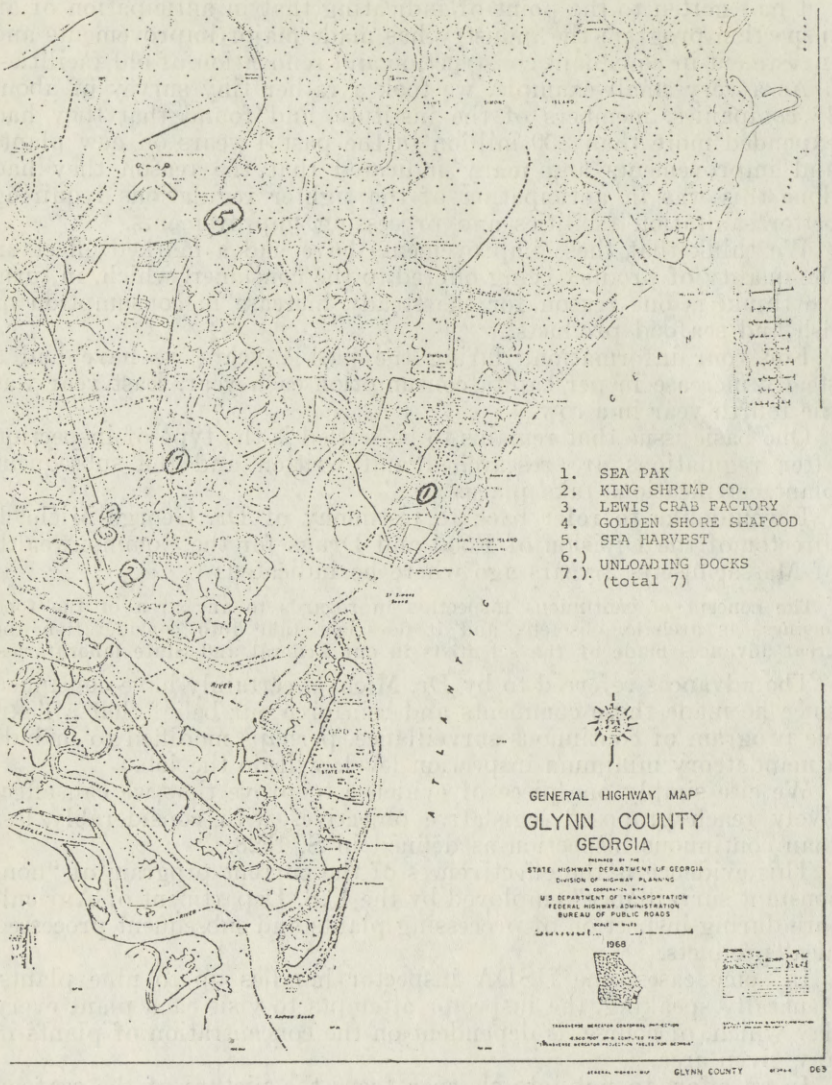
We cite simply one piece of evidence to prove that we can effectively reach proposed legislative objectives with considerably less than continuous inspection as defined in S. 1528.

This evidence is the effectiveness of the current program of "nonconstant surveillance" employed by the U.S. Department of Agriculture during inspection of processing plants and subsequent processed meat products.

In some cases, one USDA inspector handles up to nine plants. Generally speaking, the inspector attempts to visit each plant every day which, of course, is dependent on the concentration of plants in any given area.

In an effort to put into sharper focus the picture of the seafood processing industry, the institute surveyed four specific production-processing areas to illustrate how a team of inspectors could provide intensive inspectional service without burdening the system with a requirement for an inspector for each plant. The first area we would like to show is the major shrimp and crab production communities of Brunswick, Ga. That would be the first map, Senator.

(The map follows:)



Mr. WEDDIG. As you can see from illustration No. 1, the community has five seafood processing facilities which employ more than 1,600 persons at the peak seasons. Shrimp, crab and fish products are processed in Brunswick, with shrimp being the major item.

The seven unloading docks in the community operate from June to December during the local shrimp season which results in landings of about 1.5 million pounds.

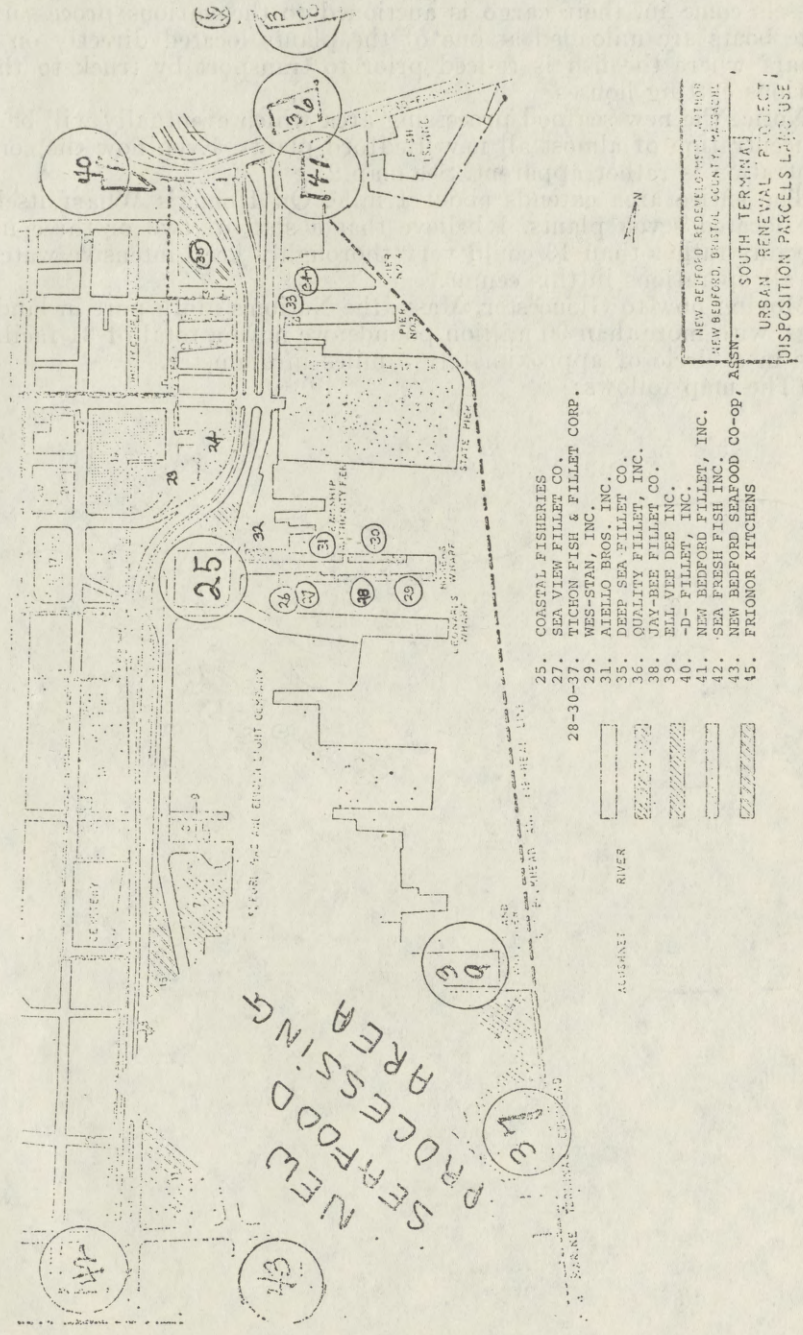
The processing facilities operate throughout the year utilizing almost 40 million pounds of raw material which consists of the local production plus trucked-in domestic production from throughout the South and imported shrimp and fish blocks.

As you can see, the five plants, plus the unloading docks are all within a 3-mile circle. It is our belief that two or three inspectors

based in Brunswick would be able to effectively assure compliance to the regulations throughout the area.

Next, let us look at the community of New Bedford, Mass., the Nation's second port in value of landings.

(The map follows:)



Mr. WEDDIG. More than $19 million in flounder and scallops are landed in this city and processed at 13 fresh fish handling plants. More than 112 million pounds are involved. In addition, the city is the site of a major processor of frozen imported fish blocks. A total of 1,500 are employed in the plants during peak season.

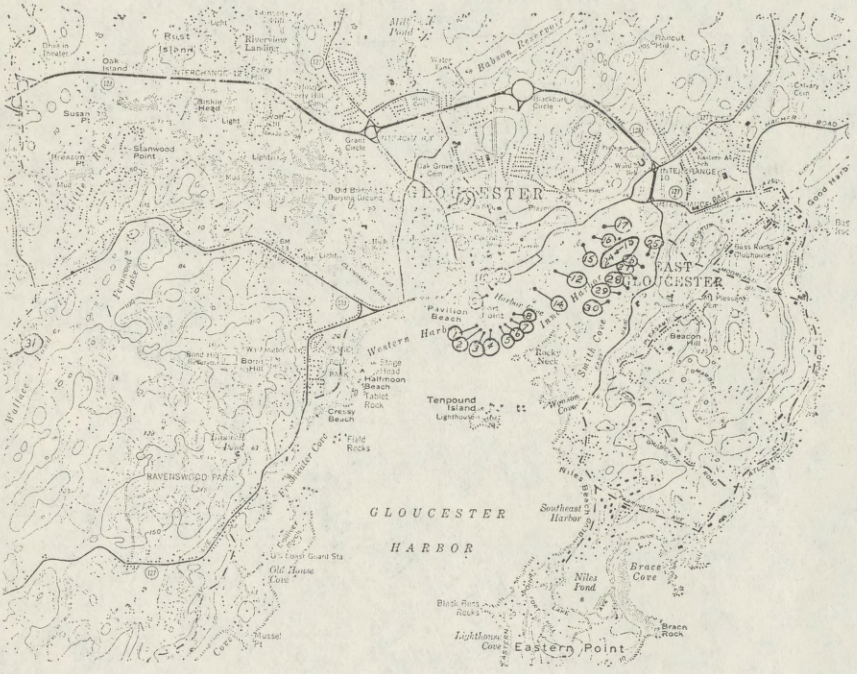
The New Bedford industry operates through an auction. As the vessels come in, their cargo is auctioned to the various processors. The boats are unloaded at one of the plants located directly on a wharf where the fish is re-iced prior to transport by truck to the various cutting houses.

Notice the new seafood processing area which eventually will be a concentration of almost all new Bedford plants. Even now the concentration is rather apparent. See map 2.

The entire area extends about 1 mile. On Homer's Wharf itself are located seven plants. I believe that a staff of two or three inspectors rather than 13 could very thoroughly keep intensive watch on all operations in this center.

Moving now to Gloucester, Mass., the Nation's ninth port in landings, with more than 90 million pounds, we have a total of 31 facilities in a circle of approximately 3 miles in diameter.

(The map follows:)



Mr. WEDDIG. The city is a major landing port and processor of U.S.-caught fish and northern shrimp, and is also extremely significant as a landing port of frozen, foreign-produced fish blocks and fillets. More than 300 million pounds are landed annually, and stored in Gloucester.

About 30 percent of this, or 90 million pounds, are converted to fish sticks, portions, dinners, and other prepared foods in the major processing plants in the city.

The balance of this imported product is transshipped to other areas of the country for processing. Employment related to the industry is approximately 4,000.

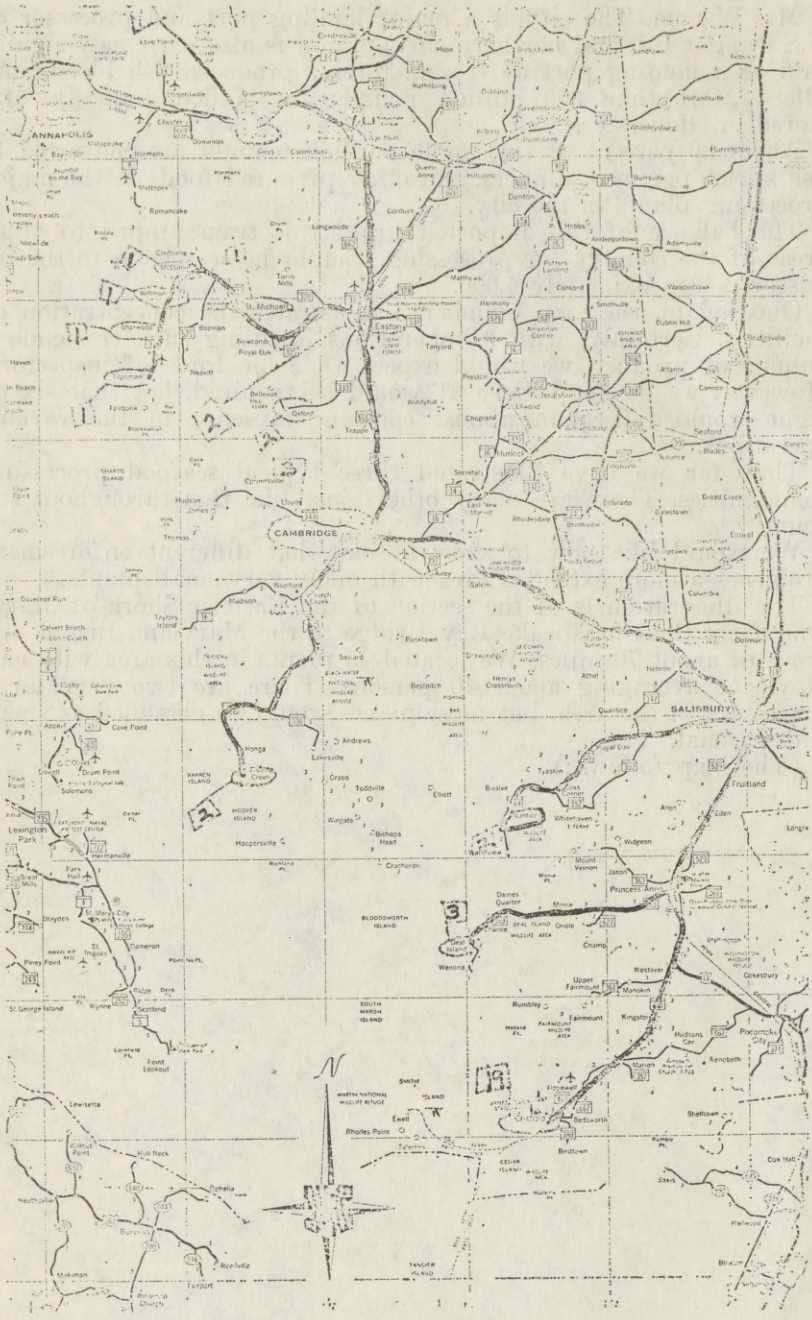
Once again, the map, number 3, illustrates the concentration of facilities. Certainly, with 31 operations handling such tremendous volume of product, we would expect a sizable force of inspectors. However, we do not believe 31 would be required, but that six or eight would reflect an almost constant presence in the various operations.

Thus far we have illustrated three typical seafood processing communities. There are many others just like this throughout the country.

We would like now to show a somewhat different enforcement problem—a more extended area with many very small plants.

The illustration is of the section of the Eastern Shore of Maryland from the Chesapeake Bay Bridge to the Maryland line, a distance of about 70 miles. We located 45 plants in this area with employment averaging about 40 persons. There are two very large processors in the area, but most plants would be classified as small and seasonal.

(The map follows:)


ANNAPOLIS
CAMBRIDGE
SALISBURY
Easton
Denton
Centreville
Chestertown
Queenstown
Oxford
Trappe
Cambridge
Hurlock
Secretary
Vienna
Salisbury
Princess Anne
Crisfield
Somerset
Dorchester
Talbot
Caroline
Kent
Queen Anne's
Anne Arundel
Calvert
Charles
St. Mary's
Prince George's
Montgomery
Howard
Baltimore
Harford
Cecil
Wicomico
Worcester
Maryland
Virginia
Delaware
Pennsylvania
Chesapeake Bay
Tilghman Island
Hooper Island
Smith Island
Tangier Island
Deal Island
Bloodsworth Island
Rhodes Point
Crisfield
Pocomoke City
Fruitland
Delmar
Federalsburg
Denton
Greensboro
Hillsboro
Ridgely
Preston
Hurlock
Cambridge
Easton
St. Michaels
Tilghman
Oxford
Trappe
Neavitt
Bozman
Tunis Mills
Matthews
Harmony
Bethlehem
Tanyard
Choptank

In Grasonville we found nine plants. The largest of these employs 110 people. The average is around 40 to 50 people.

Their peak season runs for 10 months, generally split between clams and oysters. The plants usually consist of one room with long—15 foot by 25 foot—tables, and people on both sides shucking. It will also have another room where the shucked food is washed and canned, or put into packages for sale on a fresh basis.

Of the nine plants, six are all on one road, spread out for about one-half mile; the other three are within 3 minutes' driving time of the first six.

Next, on one peninsula of the Shore area from Easton to Tilghman, there are six plants all within 4 or 5 miles of each other on the same road. Four of the six employ under 50 people, while two have under 140 during their peak season. These plants are, in description, almost carbon copies of those in Grasonville.

The next leg of the Shore, Cambridge to Fishing Creek, has six plants. With the exception of two plants in Cambridge, all these plants had under 30 people employed during their peak season. Again, the operations were very similar to those described earlier.

The area between Salisbury and Crisfield comprised the last and southernmost leg of the shore. Here there were 24 plants, 19 of which are in Crisfield, Md. The setup here is somewhat different because there is quite a bit of crabbing done where there is none in the north.

In Crisfield, of the 19 plants, 17 have under 50 people employed. The plants are, as in Grasonville, clustered in groups of five or six. In plants of this nature the workweek is most erratic, going from 20 to more than 50 hours.

Total catch in Maryland is about 72 million pounds.

Since we know there is other production on the Atlantic coast and on the western side of the bay, we feel the total production is about 40 million pounds a year.

All of these, I might add, ship from State so these are all the responsibility of the Federal Government for inspection.

I think you can see how several inspectors based strategically in the various communities could effectively cover the area. We cannot see how value to the Nation would be provided by a requirement that the town of Grasonville, population 1,183, with nine small plants, working seasonally, be staffed with nine Federal inspectors.

Similarly, we cannot find any justification for placing 19 inspectors in the town of Crisfield, as S. 1528 would mandate.

We would hope that these illustrations of actual conditions in the industry would show that comprehensive inspection to assure compliance can be accomplished through a flexible system of surveillance, and that the total cost would be beneficial to the taxpayer.

In practice, the attention applied by an inspector to any given plant, as in the Agriculture system, should be related to the size of the plant, the complexity, variety and nature of the operation, and to the continuing quality of the operation.

Obvoiusly, the plant under inspection would not be aware when the inspector would visit—thus nearly eliminating any possibility of inferior practices.

One final point on this issue is the concern, by some, of which I am personally aware, that poor quality fish may be processed in a situation which does not embrace a full-time inspector on board.

Dr. Snyder advises me that precise programing the processing of poor quality fish is nearly impossible. Plants generally receive fish as it comes. Of course, any poor lot of fish could be stored to process at a particular time, but the inspector would be aware of the lot and act accordingly.

The task of instituting an equitable inspection system in the United States would be different. Expense in these days of tight Federal budget and mounting national needs in many critical areas will depend in part on the type of inspection finally determined by the Congress.

The matter is, of course, complicated by the well-known fact that the U.S. fish and seafood market is served by more than 100 nations, which supply 60 percent of the total requirements.

The proposed legislation, both S. 1528 and S. 700, require that overseas nations desirous of shipping to the United States, legislate and establish inspection systems equal to that determined for the United States. This is a copy of the requirements in the meat and poultry inspection legislation.

We cannot stress too strongly that the legislation being enacted is worldwide in impact. What is designed here must be just as workable in Guyana, Venezuela, Pakistan and scores of other nations, as it is in Massachusetts or Georgia.

Contrary to statements in the record of the last inspection bill hearing, there is no country in the world that operates a continuous inspection system as defined in S. 1528.

The Canadian and several Scandinavian fish inspection systems are highly developed, but do not meet the criteria of an inspector in each plant on a full-time basis.

The Icelandic system has an inspector in the plant on a full-time basis, but this man also serves in other duties as an employee of the processing plant.

The importance of avoiding the establishment of an artificial trade barrier in the guise of consumer protection is paramount. Should unrealistic, unworkable requirements for inspection systems, rather than inspection results be imposed, we can expect that the fishing nations of the world will choose to sell their products elsewhere. The result would be detrimental rather than beneficial to the consumer, who would then expect to pay inordinately higher prices for the product.

Earlier in this statement I cited several statistics which showed that over a 4-year period the volume of fish and seafood used increased by 27 percent, but that its value increased 45 percent. Inflation, of course, had a hand in this, but the major reason for the more rapid increase in price is the overall, worldwide shortage of fish and seafood. The law of supply and demand exercises its influence in the fish commodities very strongly.

For example, a worldwide shortage of cod fish blocks developed during the second half of 1970 continues at present. Inventory at the end of the year was only 30 million pounds, 29 percent lower than a year previously. The shortage drove block prices from 25 or 26 cents per pound to 40 or 41 cents in a period of 6 months.

Another example: Shrimp production around the world is down and the Japanese are net importers of shrimp at the present time. As a result, the U.S. market has been unable to obtain enough shrimp to satisfy its needs. Imports during the first quarter are down 20 percent. This reduces the total supply by approximately 10 percent. The result is that the price of shrimp, in the standard 15–20 count size, has jumped from $1.45 to $1.95 per pound since January 1.

The point should be clear. Reducing availability of fish and seafood to the market through excessive legislation that cannot be met in overseas countries will serve only to create a trade barrier with negative results to the consumer.

Some might believe that the overseas nations will be happy to do anything we say to maintain access to the U.S. market. The world situation in fish and seafood is such that the U.S. market, while still very desirable to most producing countries, is by no means the only market. Western Europe, Asia and even Africa are active in the world market, outbidding the U.S. buyer for many commodities.

We believe that a system which is based in the concept of continuous surveillance, identical to that which we believe best for the domestic industry, buttressed by intensive port-of-entry inspections, will protect the consumer and be workable in most of the overseas nations shipping to the U.S.

We have a few additional comments on specific provisions of S. 1528. We believe the provision that an inspector must be given access to a plant "at any time," should be modified to say "any reasonable time" or "any time during which the plant is in operation."

We also cannot see any need for a provision for summary suspension of a certificate. The Secretary has the ability to detain product during which time normal enforcement procedures of seizure and injunction can be exercised.

Likewise, there should be no way a certificate can be suspended on grounds of disagreement with a condemnation of product or appeal of a condemnation.

Again, the public can be adequately protected through normal routes of seizure and injunction so that a plant operator can feel confident in taking a condemnation appeal through the judicial review stage without jeopardizing his plant certificate.

We were somewhat disturbed about the lack of a companion bill which would provide financial assistance to smaller firms which might otherwise find it impossible to remain in business under a new set of regulations.

For the record, we are attaching an appendix which itemizes the type of improvements which will have to be made by many smaller, older plants in the industry if they are to conform to new regulations.

To recite that a company may have to retile a floor or wall, or install new icemaking equipment, may seem rather trivial, but this type of detail and expense is precisely what an inspection bill will mean to hundreds of small businessmen if they wish to continue in this industry.

We are trying to show that the provision of this bill have very real effects on the industry and the consumer, and are not matters that can be considered in a theoretical sense only.

There is one new element in S. 1528, the requirement for monitoring hazardous materials. I will ask Dr. Snyder to comment on this section of the proposal.

May I add that Dr. Snyder is no stranger to fisheries. He worked for 15 years with the Bureau of Commercial Fisheries, the last 7 of which, as the director of the Fisheries Technological Laboratory at College Park, Md.

Dr. Snyder, incidentally, initiated and directed the extensive Government program on fish protein concentrate until 2 years ago.

(The appendix follows:)

FACILITIES

Company	Unloading dock	Plant processing fresh fish	Plant processing frozen fish	Cold storage warehouse
1. Cape Ann Fisheries	X	X		
2. Producers Fish Co	X			
3. Quick Freeze Corp	X			X
4. Deep Sea Products	X			
5. Ocean Crest Fisheries	X	X		
6. Neptune Fish Co	X	X		
7. North Atlantic Fisheries	X	X	X	X
8. O'Donnell-Usen Fisheries			X	X
9. Fort Cold Storage	X	X		X
10. Orlando Bros		X		
11. Pioneer Fish Co		X		
12. Quincy Market, Rogers Street	X			X
13. Quincy Market, Washington Street	X			X
14. Empire Fish Co	X	X	X	X
15. The Gorton Corp			X	
16. Quincy Market, Rowe Square	X			X
17. Atlantic Ocean Products	X	X		X
18. Malpeque Seafoods	X	X		
19. Star Fisheries	X	X		
20. Sea Freez Corp	X	X		
21. Atlantic Seafoods	X	X		
22. American Fillets Corp	X	X		
23. Gloucester Ice & Cold Storage	X			X
24. Kennebec Fisheries	X	X		
25. Oceanside Fisheries	X	X		
26. Cle-Mac Fisheries	X	X		
27. Captain Joe & Sons	X	X		
28. Quincy Market Cold Storage, East Gloucester	X			X
29. O'Donnell-Usen Seafood Kitchen			X	
30. J. B. Wright Co	X	X		
31. Massachusetts Coastal Seafood Co			X	

NOTE.—Processing fresh fish: Fresh and frozen fillets, H. & G. whiting, shrimp, and herring. Processing frozen fish: Coverts frozen blocks and fillets to raw breaded and cooked portions or sticks.

Dr. SNYDER. Mr. Chairman, I should be pleased to comment on section 410(j), entitled "Surveillance of Dangerous Materials."

Permit me to briefly review various issues in this section from a technical position and suggest what we believe to be a reasonable approach that would strengthen the proposed surveillance program and thus help obtain the objectives desired. I will briefly, but positively, propose a surveillance program of extended scope to help achieve this purpose.

Undoubtedly, problems related to man and his environment will be with us for quite some time. Likewise, concomitant concern will continue over the significance to public health of various residues, natural or unnatural, in foods.

And I think the point Senator Hatfield made this morning is very good.

The health and ecological implications of dangerous materials in food should not simply be related to just fish and the consumer. We must be concerned with all foods that reach the public. Our U.S. dietary patterns show that fish makes up only 11.4 pounds out of a total of 1,400 pounds of all other foods consumed on a per capita basis. Therefore, legislation should be designed to include the screening of all foods consumed if it is to have any meaning. Also, for real meaning, we must relate level of possible contaminants with the level of the food consumed in any possible regulatory program.

The definition used of dangerous material brings up the issue that we may not know what constitutes a dangerous material. More precisely, we note that a material may become dangerous only if consumed at excessive levels. Selenium, for instance, can be nutritionally useful, at certain low levels, and conversely highly toxic at excessive levels.

It is difficult, based on available information, to judge what levels of what materials can be expected to reach toxic levels, as is indicated in the proposed legislation. This determination will require intensive study. Here, I might add, that we really do not even have comprehensive information to provide a high degre of insurance of what levels of mercury are truly toxic.

As indicated in this section of S. 1528, proposing regulations within a 90-day period concerning dangerous materials will impose a technological hardship that would result in negating, we believe, the true purpose of this section. I know of one well qualified laboratory that has taken longer than 90 days to just perfect their analytical procedure for mercury.

This indicates that at this time conducting mercury analysis on board fishing vessels wouldn't be very realistic.

Again, we must conclude that research and intensive study must precede any specific determinations and specifications of regulating dangerous materials.

How might we extend the scope of the program and effectively handle the technical critiques indicated?

Presently, no organization is engaged in a comprehensive scientific program to assess the importance of trace materials in fish and their long term physiological effects on man. Clearly, therefore, we believe the Government has the responsibility to initiate such a program and to provide the comprehensive scientific data needed to place the problem in proper perspective.

May I add here that in the last 2 days I feel that the problem was not in its proper perspective.

Although the Food and Drug Administration shares this responsibility, its primary role is in establishing safety levels for contaminants in all foods to protect public health.

On the other hand, the National Marine Fisheries Service, is responsible for managing the fish resource and assuring its wise utilization. NMFS also has had the responsibility in the past for providing basic information on the characteristics of certain constituents—including trace elements—in fishery products and on the metabolism of these constituents when consumed by man, and other animals. A program should be established, therefore, possibly within

NMFS, to comprehensively assess the occurrence of trace materials in fishery products and to determine their metabolic fate, as well as their biochemical-physiological effects when consumed by man.

This program should consist of several phases and should be carried out in a sequential order to meet overall objectives.

First, the amounts of specific trace materials and the chemical form in which they are present should be determined. This information will indicate which trace materials deserve further scientific investigation.

Second, for those trace materials selected, studies should be conducted to determine their biological availability and metabolic fate when consumed by animals. Some elements may be relatively unavailable and thus not absorbed into the blood. Others may be absorbed and either excreted in the urine or deposited and concentrated in certain organs and tissues. If the latter is found, efforts should be made to detect any biochemical and physiological alteration that may occur, and to determine the turnover rate for the deposited elements.

Finally, long term toxicological and teratological studies should be conducted with laboratory animals to determine the implications of ingesting high amounts of certain trace materials over several generations. These studies should include complete evaluations of the effects of trace materials on carcinogenicity, reproduction, and mutagenicity.

These studies, coordinated with concurrent work involving animal, vegetable products, and drinking water, we believe would provide a sound scientific foundation for assessing the biochemical-physiological implications of consuming fish containing certain trace materials.

This, briefly, then is the program we would recommend.

Thank you.

Mr. WEDDIG. Mr. Chairman, I would like now to ask our consultant, Dr. Leonard Goldwater, who is the professor of community health science at Duke University and professor of environmental sciences in the School of Public Health at the University of North Carolina, to comment on some of the statements made yesterday and this morning.

Dr. GOLDWATER. Senator Hart and members of the committee, I would like to point out that I am here at the invitation of the National Fisheries Institute and of the National Canners Association.

I have served and am serving as consultant to these groups and to several others, including perhaps a half dozen governmental agencies including EPA, Public Health Service and other Government agencies, and including also the World Health Organization.

I would like to say that I am expressing my own personal views here and that they do not necessarily reflect those of any organization.

I have been interested in mercury as a potential health hazard for some 35 years. In the course of that time I have published perhaps 30 or 35 articles on the subject resulting from research done in my own laboratories during the time, principally, when I was professor of occupational medicine at Columbia University.

Most recently I have had an article appear in the Scientific Amer-

ican, in the May issue, and I also have a statement which was submitted to the House Committee of Agriculture a couple of months ago. A few copies of these are here if anybody should be interested in them.

Senator HART. We would appreciate receiving copies of each.

(The article requested follows:)

SCIENTIFIC AMERICAN
Established 1845 May 1971 Volume 224 Number 5

Mercury in the Environment

The metal is widely distributed, mostly in forms and amounts that do no harm. The question is whether its concentration by industrial and biological processes now endangers animals and human beings

by Leonard J. Goldwater

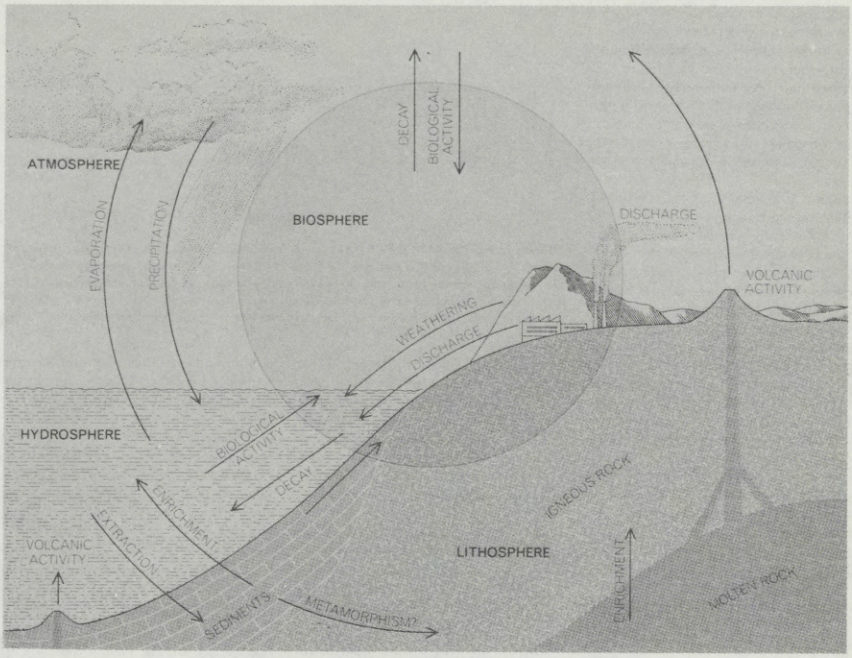
In the early 1950's fishermen and their families around Minamata Bay in Japan were stricken with a mysterious neurological illness. The Minamata disease, as it came to be called, produced progressive weakening of the muscles, loss of vision, impairment of other cerebral functions, eventual paralysis and in some cases coma and death. The victims had suffered structural injury to the brain. It was soon observed that Minamata seabirds and household cats, which like the fisherfolk subsist mainly on fish, showed signs of the same disease. This led to the discovery of high concentrations of mercury compounds in fish and shellfish taken from the bay, and the source of the mercury was traced to the effluent from a factory.

Since then there have been several other alarming incidents. In 1956 and 1960 outbreaks of mercurial poisoning involving hundreds of persons took place in Iraq, where farmers who had received grain seed treated with mercurial fungicides ate the seed instead of planting it. There were similar outbreaks later in Pakistan and in Guatemala. In Sweden, where poisoning of game birds and other wildlife, apparently by mercury-treated seeds, began to be noticed in 1960, the Swedish Medical Board in 1967 banned the sale of fish from about 40 lakes and rivers after it was found that fish caught in those waters contained high concentrations of methyl mercury. In 1970 alarm rose to a dramatic pitch in North America. Following the discovery of mercury concentrations in fish in Lake Saint Clair by a Norwegian investigator working in Canada, restrictions on fishing and on the sale of fish were imposed in many areas in the U.S. and Canada, and government agencies in both countries began to take action to control the discharge of mercury-containing wastes into lakes and streams.

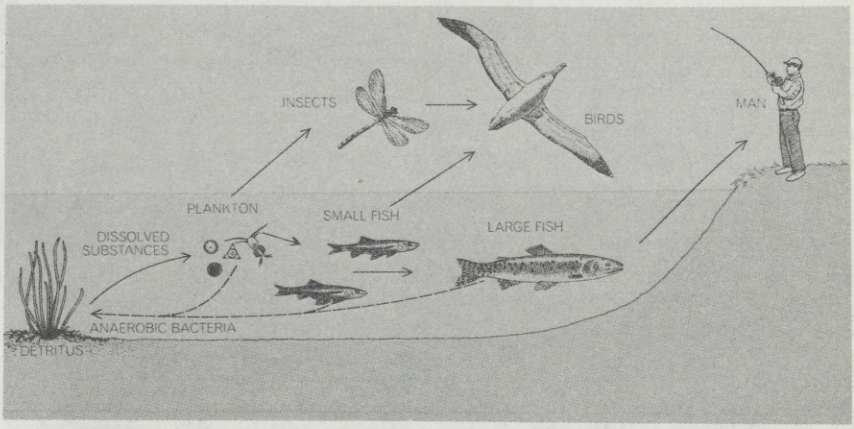
Suddenly, almost overnight, mankind has become acutely fearful of mercury in the environment. The alarm is understandable. Quicksilver has always been regarded as being magical and somewhat sinister, in part because of its unique property as the only metal that is a liquid at ordinary temperatures. Mercury's peculiarities have been recognized since medieval times, when the alchemists took a keen interest in the element's fascinating properties. Its toxic properties became so well known that some mercury compounds came to be used as agents of suicide and murder. There are indications that Napoleon, Ivan the Terrible and Charles II of England may have died of mercurial poisoning, either accidental or deliberate. (Charles II experimented with mercury in his laboratory.) It has been suggested (incorrectly) that mercury is what made Lewis Carroll's Hatter mad (since it is used in the manufacture of felt hats). And it is authentically recorded that as early as 1700 a citizen of the town of Finale in Italy sought an injunction against a factory making mercuric chloride because its fumes were killing people in the town.

Nevertheless, although the recent incidents give us justifiable concern about the potential hazards of mercury in the environment, a panicky reaction would be quite inappropriate. Mercury, after all, is a rare element, ranking 16th from the bottom of the list of elements in abundance in the earth and comprising less than 30 billionths of the earth's crust. There are comparatively few places in the world where it occurs naturally in more than trace amounts, and the ore-bearing deposits of commercial value are so limited that a handful of mines scattered over the globe account for most of the world production. The uncompounded element in liquid form is not a poison; a person could swallow up to a pound or more of quicksilver with no significant adverse effects. Nor should it be forgotten that certain compounds of mercury have been used safely for thousands of years, and some are still prescribed, as effective medications for various infections and disorders. We need not shrink from mercury as an unmitigated threat. What is now required is detailed investigation of how mercury is being redistributed and concentrated in the environment by man's activities and in what forms and compounds it may be harmful to life. Extensive research on these questions is under way.

We consider first what might be called the normal distribution of mercury in nature. The element is found in trace amounts throughout the lithosphere (rocks and soil), the hydrosphere, the atmosphere and the biosphere (in tissues of plants and animals). In the rocks and



MERCURY CYCLE disperses the metal through the lithosphere, hydrosphere and atmosphere and through the biosphere, which interpenetrates all three. Mercury is present in all spheres in trace amounts, but it tends to be concentrated by biological processes. Man's activities, in particular certain industrial processes, may now present a threat by significantly redistributing the metal.



AQUATIC FOOD CHAIN is a primary mechanism by which mercury is concentrated. At each trophic level less mercury is excreted than ingested, so that there is proportionately more mercury in algae than in the water they live in, more still in fish that feed on the algae and so on. Bacteria and the decay chain (*broken arrows*) promote conversion of any mercury present into methyl mercury.

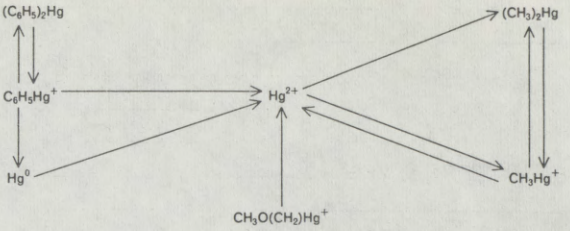
soils (apart from ore concentrations) mercury is measured in fractions of one part per million, except in topsoils rich in humus, where the amount may run as high as two parts per million. In the hydrosphere (the seas and fresh waters) it generally occurs only in parts per billion. In the atmosphere mercury is present both as vapor and in the form of particles. Under natural conditions, however, the amount is so small that extremely sensitive methods are required to detect and measure it; the measurements that have been made at a few locations indicate that this atmospheric "background" amounts to less than one part per billion. The situation is somewhat different when we come to the biosphere. Plants and animals tend to concentrate mercury; it has been found, for example, that some marine algae contain a concentration more than 100 times higher than that in the seawater in which they live, and one study of fish in the sea showed mercury concentrations of up to 122 parts per billion. There is considerable variation, as we shall see, in the amounts of mercury found in plants and animals, depending on circumstances. Under natural conditions, however, the concentration in the earth's vegetation (aside from cultivated plants) averages no more than a fraction of one part per million.

Thus the natural cycle of circulation of mercury on the earth [*see top illustration on opposite page*] disperses it widely through the habitable spheres in trace amounts that pose no hazard to life. How seriously has man altered its distribution?

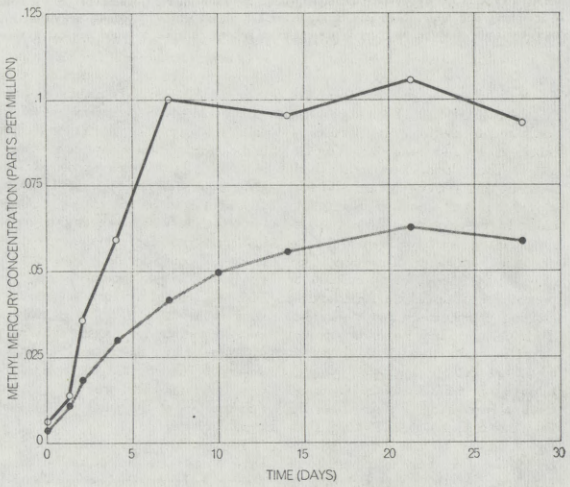
The only ore containing mercury in sufficient concentration for commercial extraction is cinnabar, or mercuric sulfide (HgS). There are minable cinnabar deposits in many regions around the world, and man was attracted to its use as early as prehistoric times. There is evidence that cinnabar was mined in China, Asia Minor, the Cyclades and Peru at least two or three millenniums ago. Cinnabar, a brilliant red mineral, came into use at first as a pigment, but it was not until medieval times that physicians and other investigators became interested in extracting quicksilver from ore to produce medicines and other useful compounds. Hippocrates is believed to have prescribed mercury sulfide as a medication, and this was probably one of the first compounds of a metal to be employed therapeutically.

By the Middle Ages, when alchemists had synthesized chlorides, oxides and various other inorganic compounds and mixtures of mercury, its use in medications began to spread. Calomel (mercurous chloride, or HgCl) came into wide use as a cathartic, and in the 16th century mercury compounds were introduced as a treatment for syphilis. By the 19th century scores of mercurials were being employed in medicine. Many are still in the pharmacopoeias; the most useful ones today are the diuretics. It has been found that even among the organic compounds of mercury there are some that can be used safely. As much as 78.5 grams of mercury in the form of an organic compound has been given to a patient without harmful side effects!

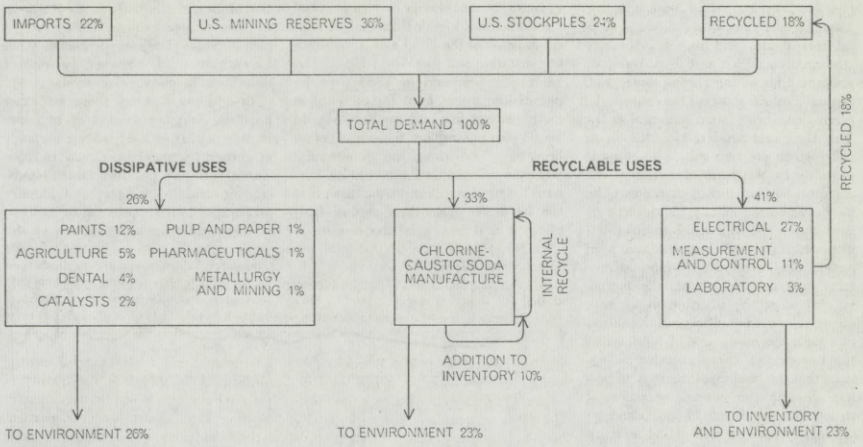
The use of cinnabar as a coloring agent and of mercury compounds in pharmaceuticals under careful control introduced no threat to the quality of the environment. With the development of other applications, however, particularly in industry and agriculture, came serious problems. The extraction of mercury from the ore by heating (that is, distillation) dangerously contaminates the air in localized areas with mercury vapor and dust (as the protesting citizen of Finale observed nearly three centuries ago). Mercury today is used on a substantial scale in chemical industries, in the manufacture of paints and paper and in pesticides and fungicides for agriculture. The world production of mercury



METHYL MERCURY COMPOUNDS are the most injurious ones. According to Arne Jernelöv of the Swedish Water and Air Pollution Research Laboratory, mercury discharged into water in various forms can be converted by bacteria in detritus and sediments into methyl and dimethyl mercury (*right*). Phenyl mercurials, metallic mercury and methoxyethyl mercury (*left and bottom*) are converted into methyls primarily through ionic mercury.



CONVERSION of inorganic into methyl mercury in sediment was measured by Sören Jensen and Jernelöv at intervals after the addition of 10 (*gray*) and 100 (*black*) parts per million of inorganic mercury. At lower mercury concentrations methylation may not occur.



MERCURY FLOW through the U.S. is shown for 1968. The chart is based on one prepared by Robin A. Wallace, William Fulkerson, Wilbur D. Shults and William S. Lyon of the Oak Ridge National Laboratory. Major use of mercury has been as a cathode in the electrolytic preparation of chlorine and caustic soda. In this process a large inventory of mercury is continuously recycled, but in 1968 23 percent of total mercury demand still went to make up what was wasted. Another 10 percent went for start-up of new plants. Since then legislation and lawsuits have required manufacturers to increase recycling sharply, reducing emissions to the environment.

now amounts to about 10,000 tons per year, of which about 3,000 tons are used in the U.S. (The principal producers are Spain, whose mines at Almadén are the richest in the world, Italy, the U.S.S.R., China, Mexico and the U.S.) From the large-scale uses a considerable amount of mercury wastes is flowing into the air, the soil and streams, lakes and bays.

In agriculture, for example, corrosive sublimate ($HgCl_2$) is used to disinfect seeds and to control many diseases of tubers, corms and bulbs (including potatoes). The chlorides of mercury (both mercuric and mercurous) are also employed to protect a number of vegetable crops. In recent decades farmers in Europe and the U.S. have adopted the use of organic compounds of mercury, some of which are highly toxic, principally to prevent fungal diseases in seeds and in growing plants, fruits and vegetables. These chemicals may present a potential threat to health through the ingestion of treated seeds by birds (and people), through concentration in food plants and through percolation or runoff from the fields into surface waters. The U.S. Geological Survey, after analyzing the concentration of mercury in a number of U.S. rivers in 1970, reported that although the mercury content was only one part per 10 billion or less in most rivers and streams, "it may be several thousand times this concentration in some natural waters."

In order to evaluate the hazards of mercury in the environment we must examine the forms in which it occurs there and the relative toxicity of its various compounds. Liquid mercury itself, as we have already noted, is not ordinarily toxic to man. Inhalation of mercury vapor, however, can be injurious. In acute cases it causes irritation and destruction of the lung tissues, with symptoms including chills, fever, coughing and a tight feeling in the chest, and there have been reports of fatalities from such exposure. The acute exposures, however, usually come about not from the general environment but by accident, such as heating a household mercurial. More common is a chronic form of injury resulting from occupational exposure to mercury vapor, for example among mercury miners and workers in felt hat factories employing mercury nitrate for processing. These exposures, as we have found in examinations of miners, are not necessarily incapacitating; they produce tremors, inflammation of the gums and general irritability.

The soluble inorganic salts of mercury have long been known to be toxic. Mercury bichloride (corrosive sublimate), which has been used on occasion for suicide and homicide, produces corrosion of the intestinal tract (leading to bloody diarrhea), injury to the kidneys, suppression of urine and ultimately death from kidney failure when it is taken by mouth in a substantial dose. Its former use in moderate doses by mouth for treatment of syphilis did not, however, result in observable poisoning in most cases. Mercurous chloride is less soluble than the mercuric salt and therefore is less dangerous. It is still used medicinally, but some of its uses have been abandoned because it was found to cause painful itching of the hands and feet and other symptoms in children. Among other inorganic mercurials, some of the oxides, such as the red oxide used in antifouling paint for ship bottoms, may be potentially hazardous. In general, however, these inorganic mercurials are not important factors in contamination of the general environment.

What does cause us concern now with regard to the environment is the presence of some of the organic compounds of mercury, specifically the alkyls: the methyl and ethyl compounds. In Minamata Bay the substances that had poisoned the fish and people were identified as methyl mercurials. The grain that caused outbreaks of illness and death among the farmers of Iraq had been treated with ethyl mercury *p*-toluene sulfonanilide. And alkyls of mercury were similarly incriminated in Sweden and other places.

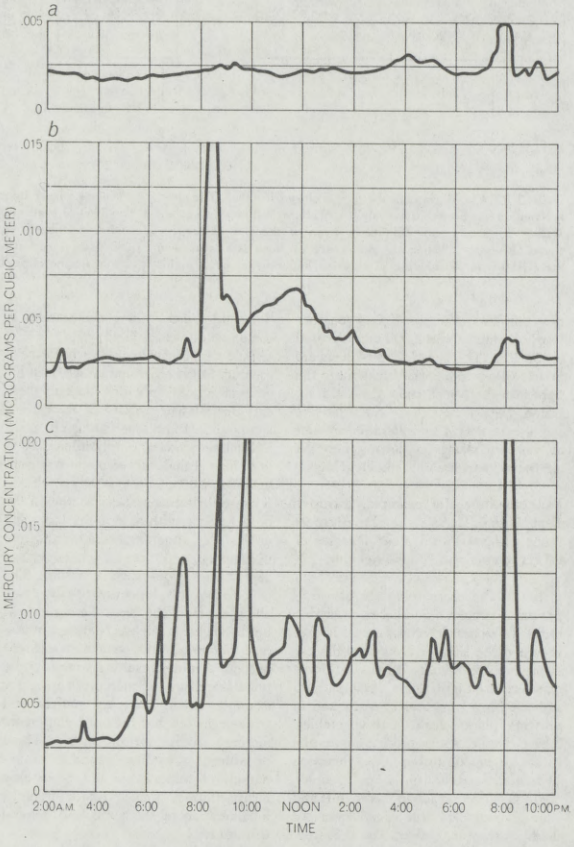
It has been known for some time that alkyl mercury can cause congenital mental retardation, and recent laboratory studies have shown that it can produce abnormalities of the chromosomes and, through "intoxication" of the fetus in the uterus, can bring about cerebral palsy. The alkyl mercurials attack the brain cells, which are particularly susceptible to injury by this form of mercury. The chemical basis of this effect seems to be mercury's strong affinity for sulfur, particularly for the sulfhydryl groups (S-H) in proteins (for which arsenic and lead have a similar affinity). Bound to proteins in a cell membrane, the mercury may alter the distribution of ions, change electric potentials and thus interfere with the movement of fluid across the membrane. There are also indications that the binding of mercury to protein disturbs the normal operation of structures such as mitochondria and lysosomes within the cell. Alkyl mercury appears to be especially dangerous because the mercury is firmly bonded to a carbon atom, so that the molecule is not broken down and may maintain its destructive action for weeks or months. In this respect it differs from the inorganic and phenyl (aryl) mercurials, and that may explain why it produces permanent injury to brain tissue, whereas the injury caused by inorganic and aryl mercurials is almost invariably reversible.

At one time it was thought that aryl mercurials (compounds based on the phenyl group) might act like the alkyls; however, in an extensive series of studies I initiated in 1961 at the Columbia University School of Public Health we found that chemical workers who continually handled phenyl mercurials and experienced exposures far above the supposedly safe limit did not show any evidence of toxic effects.

Having examined the nature of the mercury "threat" and its quantitative presence in the environment, we should now look at the other side of the equation: the extent of man's exposure and his response to this factor up to now.

Without question the major source of man's intake of mercury is his food. Alfred E. Stock in Germany initiated analyses of the mercury concentration in foods in the 1930's, and there have been several follow-up studies since then, including one by our group at Columbia in 1964. (Numerous further investigations are now in progress.) The measured concentrations in samples from various sources are in the range of fractions of one part per million [*see illustration on next page*], but the concentrations in fish in contaminated waters may run several hundred times higher than that. A joint commission of the Food and Agriculture Organization and the World Health Organization proposed in 1963 that the permissible upper limit for mercury in foods (except fish and shellfish) should be .05 part per million; there is as yet no firm basis, however, for determining what the safe standard ought to be. Perhaps the most significant conclusion that can be drawn from these sets of samplings is that in general the concentration of mercury in foods does not appear to have changed substantially over the past 30 years. The comparisons may not be entirely valid, however, because of differences in analytical methods.

In addition to food, there are other possible everyday sources of exposure to mercury. It is used fairly commonly in antiseptics, paint preservatives, floor waxes, furniture polishes, fabric softeners, air-conditioner filters and laundry preparations for suppression of mildew; no doubt there are other such exposures



ATMOSPHERIC MERCURY LEVELS were measured by S. H. Williston at a station south of San Francisco. The concentration averaged about .0002 microgram of mercury per cubic meter of air when the wind blew from the Pacific (*a*) and was somewhat higher when the wind was from the generally nonindustrial southeast (*b*). The average was .008 microgram, with many peaks that went off the record at .02 microgram, when the wind was from the industrial area to the northeast (*c*). The mercury was often associated with dust particles.

of which we are not aware. In view of all these factors, it is not surprising to find that 20 to 25 percent of the "normal" population—persons who have apparently had no medicinal or occupational exposure to mercury—show easily measurable amounts of mercury in their body fluids. Several studies of this matter have been made, including a fairly extensive international investigation we carried out at Columbia in 1961–1963 as a joint project with the WHO. Analyzing 1,107 specimens of urine collected from "normal" subjects in 15 countries, we found that except in rare instances the mercury content in the urine ran no higher than about 20 to 25 parts per billion. A similar examination of blood samples showed that the highest mercury concentration in the blood among "normal" subjects was 30 to 50 parts per billion. And analyses of human tissues made at autopsy have indicated that similar traces of mercury are present in the body organs.

It is important to consider these findings in the context of the evolutionary relationship of life on our planet to the presence of mercury. Unquestionably the element has been omnipresent in the sea, where life originated, from the beginning, and presumably all plants and animals carry traces of mercury as a heritage from their primordial ancestry. Man as the top of a food chain must have added to that heritage by eating fish and other mercury-concentrating forms of food. Over the millions of years he presumably has built up an increased tolerance for mercury. (The development of tolerance for chemicals is of course well recognized today. It was put to use more than 2,000 years ago by Mithradates the Great, king of Pontus, who armed himself against poisoners by taking small and increasing doses of toxic agents.) Tolerance for a potent substance not infrequently grows into dependence on it, and it is reasonable to suppose that man, as well as other forms of life, may now be dependent on mercury as a useful trace element. Whether its effects are beneficial or harmful may be influenced decisively by the form in which it is incorporated in tissues, by the dose and probably by other factors. It has been found, for instance, that the highly toxic element arsenic is sometimes present in healthy shrimp in concentrations of close to 200 parts per million (dry weight) in the form of trimethylarsine. Methylation in this case apparently suppresses the element's toxicity. The biochemical behavior of mercury has much in common with that of arsenic, which suggests that there may be harmless forms of methyl mercury as well as toxic ones in fish.

Our concern, then, must be with any disturbance of the environment that alters the natural balance of mercury in relation to other substances or that generates virulent forms of mercurials. In the case of the fish in Minamata Bay apparently both factors were at work. The polluting effluent from the chemical plant itself contained methyl mercury, and elemental mercury in the effluent was methylated by microorganisms in the mud on the bottom of the bay. This conversion was fostered by the enrichment of the water with a high concentration of mercury and organic pollutants that promoted the growth of the methylating bacteria. The result was the accumulation in the fish of concentrations of methyl mercury as high as 50 parts per million (wet weight), which is 100 times the *total* mercury concentration currently accepted as "safe" in the U.S. and Canada. The effect on the fishermen and their families was compounded by the fact that their diet consisted largely of the bay fish and may have been deficient in some essential nutrients; dietary deficiencies are known to enhance the adverse effects of toxic agents.

The current journalistic outcry on the "mercury problem" has produced a state of public alarm approaching hysteria. "Protective" measures are being proposed and applied without basis in established knowledge. Research on mercury poisoning in the past has focused primarily on occupational hazards involving prolonged exposure, principally by way of inhalation. Mercury in the general environment, however, presents an almost entirely different problem. Discharge of mercury into the atmosphere, either as vapor or as particulate matter, is not likely to become a serious general hazard. The main threats to which we shall have to give attention are solid and liquid wastes that may ultimately enter bodies of water, thus threatening fish and eaters of fish, and agricultural uses of mercury that may dangerously contaminate food. We do not yet have enough information to estimate the magnitude of these threats or to establish realistic standards of control.

To begin with, we need a better understanding of what should be considered a toxic level of mercury in the human body. Analysis of the mercury con-

	A	B	C	D	E
MEATS	.001–.067	.005–.02	.0008–.044	.31–.36	.001–.15
FISH	.02–.18	.025–.18	.0016–.014	.035–.54	0–.06
VEGETABLES (FRESH)	.002–.044	.005–.035	0	.03–.06	0–.02
VEGETABLES (CANNED)			.005–.025		.002–.007
MILK (FRESH)	.0006–.004	.0006–.004	.003–.007	.003–.007	.008
BUTTER	.002 (FATS)	.07–.28			.14
CHEESE	.009–.01				.08
GRAINS	.02–.036	.025–.035	.002–.006	.012–.048	.002–.025
FRUITS (FRESH)	.004–.01	.005–.035		.018	.004–.03
EGG WHITE				.08–.125	.01
EGG YOLK				.33–.67	.062
EGG (WHOLE)	.002	.002	0		
BEER	.00007–.0014	.001–.015			.004

CONCENTRATION IN FOODS was reported by Alfred E. Stock in Germany in 1934 (*A*) and 1938 (*B*), O. S. Gibbs in the U.S. in 1940 (*C*), Y. Fujimura in Japan in 1964 (*D*) and the author's group in the U.S. in 1964 (*E*). A listing of "0" means simply a concentration too low to be detected by the method used. The World Health Organization proposed a permissible upper limit of .05 part per million for foods other than fish; the U.S. Food and Drug Administration has set an upper limit of .5 part per million for fish.

centration in the urine or in the blood has not given much enlightenment on this point. Among workers exposed to mercury in their occupations it has been found that the mercury content in the urine varies greatly from day to day and from one individual to another. As a general rule the body's excretion of mercury does tend to reflect the amount of exposure, but recent studies of workers in the chemical industries have disclosed that individuals who have been exposed to mercury in high concentrations or for long periods often show no sign of adverse effects. Furthermore, high levels in the urine or the blood do not necessarily indicate poisoning; many cases have been observed in which the individual had a mercury concentration in the blood amounting to 10 to 20 times the "normal" upper limit and yet showed no indications of illness or toxic symptoms! All in all there is substantial evidence that host factors may be more important than the amount of exposure, up to a point, in determining the individual's response to mercury in the environment. In any case, urine or blood analysis is of no value for early diagnosis of mercury poisoning. Other possible indicators, such as disturbances of the blood enzyme system, are being investigated, but no reliable diagnostic test has yet been produced. Nor can we define a precise threshold for the toxic level, either for exposure to or for absorption of mercury.

A good deal of useful information is available, on the other hand, about the sources and avenues of possible danger. Mercury in one form or another can invade the human system by way of the lungs, the skin or the ingestion of food. (Incidentally, recent studies have shown that the mercury in dental fillings is not a hazard; most people with amalgam fillings have negligible amounts of mercury in their urine or blood.) Mercury in the air, as we have noted, is a local problem confined to certain industries. Attack by way of the skin is also a problem that does not apply to the general environment, although direct contact with organic mercurials can cause severe (second degree) local burns of the skin and can result in absorption of measurable quantities of mercury into the body from underclothing and bed linen.

With regard to food, we can identify the most important possible sources of trouble. There is abundant evidence that the inorganic compounds of mercury and the phenyl mercurials are relatively nontoxic compared with the alkyl mercurials. We need to be concerned, however, about the potential conversion of the inorganic forms and the phenyls to methyl mercury, which on the basis of the experience so far must be rated as the prime hazard in the environment. A number of alkyl mercury fungicides have already been eliminated, quite properly, from use on food crops. Government agencies are now beginning to move to ban other organic mercurials as well from any use that might contaminate our food or water.



CHROMOSOME DAMAGE is found in persons with high blood levels of mercury after exposure to methyl mercury in fish. Photographs of lymphocytes made by Staffan Skerfving of the Swedish National Institute of Public Health show a broken chromosome and extra fragment (*top*) and three sister-chromatid fragments that lack centromeres (*bottom*).

A calm view of the present state of affairs regarding mercury in the environment suggests that the best way to deal with the problem is to apply the techniques of epidemiology, preventive medicine, public health and industrial hygiene that have been effective in meeting hazards in the past. A system should be set up for frequent monitoring of the environment for the detection of significant increases in mercury contamination. Research should be carried forward to establish measures for the levels and forms of mercurial pollution that signal a threat to health. Techniques for mass screening of the population to detect mercurial poisoning should be developed. Controls should be applied to stop the discharge of potentially harmful mercury wastes at the point of origin. Toxic mercurials in industry and agriculture should be replaced by less toxic substitutes. To implement such a program we shall need, of course, realistic education of the public and legislative action with adequate enforcement. And these measures should be applied to all contaminants that threaten man's environment, not only mercurials.

It would be foolish to declare an all-out war against mercury. The evolutionary evidence suggests that too little mercury in the environment might be as disastrous as too much. In the case of mercury, as in all other aspects of our environment, our wisest course is to try to understand and to maintain the balance of nature in which life on our planet has thrived.

STATEMENT OF LEONARD J. GOLDWATER

My name is Leonard J. Goldwater, M.D. and my address is Route 3, Chapel Hill, N.C., 27514. I am presently Professor of Community Health Services at Duke University, Visiting Professor of Environmental Science at the University of North Carolina and Professor Emeritus of Occupational Medicine at Columbia University.

I am serving and have served as consultant to several industries and a like number of governmental agencies but have no permanent relationship with any. I am appearing before the Committee as an individual and my views do not necessarily reflect those of any organization.

My reason for wishing to appear is that I believe that I have more than a casual familiarity with the toxicology of mercury and its compounds, particularly with phenylmercurials. I have published in scientific journals more than two dozen papers dealing with mercury and have recently completed a book on the subject. My studies date back to 1936 and have continued to the present time. Since about 1956 a major part of my professional activities has been devoted to studies of the effects of mercury and its compounds on man. I have not been directly concerned with any animal experimentation since I have had ample opportunity to study man under a variety of conditions of exposure. A number of my published papers have been reproduced in a report which I believe has been filed with this Committee by Mr. Wayne Gustafson. My comments will focus primarily on phenylmercurials and their use as pesticides.

In order to avoid misunderstanding I should like first to define a few terms and discuss some basic concepts of toxicology, this latter being the study of poisons and their effects. Most important is the realization that there is no substance known to man which cannot, in overwhelming doses, cause serious illness and death. This applies to oxygen, water and table salt, to name a few well-known materials. On the other hand, there are few if any substances which cannot be tolerated in minute doses. Curare, for example, the potent South American arrow "poison" has important uses in medicine. Quite properly it has been said that the difference between a poison and a medicine is the size of the dose. This quantitative concept is an important principle which has often been overlooked in many recent articles on mercury, even in the technical literature.

Potentially harmful agents may enter the body through swallowing, inhalation, the intact skin or by injection. They may or may not behave differently depending on the route of entry. Some materials, when swallowed, may pass directly through the intestinal canal without actually getting into the blood for distribution into the organs and tissues. The degree of solubility is the most important controlling factor in absorption from the stomach or intestines.

The presence of mercury in the waters of the sea has been known for at least 200 years. More recently, with the development of sensitive methods of analysis, it has been found to be present in all animate and inanimate bodies. The most common form found in nature is the sulfide, cinnabar, but mercury in greater than trace amounts has been found in at least thirty different types of ore. The distribution of these is world-wide. There is a natural cycle of mercury between the earth, the atmosphere, waters and living things. So sensitive are modern analytical techniques that reliable results require a high degree of skill. Even experienced analysts have been known to encounter difficulties, as has recently occurred in Canada.

Combinations of elements result in the formation of substances whose properties may be completely different from those of the uncombined elements. The most familiar example of this is the combination of sodium and chlorine, both of which are highly reactive and hazardous, to form sodium chloride (table salt) without which man cou'd not live. Extensive experience, involving both human exposures and animal experimentation, has shown that there is wide variation in the response of living organisms to different forms or compounds of mercury. Failure to recognize this has been a major cause of undue apprehension. One has only to point out that a number of mercury compounds have been used for many years in medical practice and some are still in common use, often with life-saving results.

Four major classes of mercury compounds have been used as pesticides:

1. Inorganic forms such as the chlorides and oxides. These were used for many years without attracting much attention.

2. Alkyl compounds such as methylmercury dicyandiamide and a number of related forms. It is this type which was involved in the recent tragic episode in New Mexico. Their high toxicity, in my opinion, justifies their complete elimination from pesticidal uses.

3. Alkoxyalkyl mercurials such as methoxymethyl mercury hydroxide. This compound is now in use in Sweden for seed treatment as a substitute for the alkyls. Although this toxicity of this group is probably lower than that of the alkyls, it is my opinion that the experimental data which led to their use in preference to the phenylmercurials are of questionable validity.

4. Phenylmercurials, of which phenylmercuric acetate (PMA) is a familiar example. (Extensive observations on human exposures indicate that most or all phenylmercurials have similar toxicological properties). There is overwhelming evidence that this class of compounds is much less toxic than the alkyls.

Concern over the use of phenylmercurial pesticides is related to: (a) its possible entry into food and fodder; (b) its possible effects on wildlife, particularly game birds; (c) its fate in soil, particularly its possible migration into water and subsequent conversion to methylmercury compounds. In considering all three of these points, the quantities involved are of major importance.

(*a*) I am not aware of very many studies of the passage of phenylmercurial pesticides into growing crops, but research conducted under my direction at Columbia University about ten years ago showed that when approved agricultural practices were followed the mercury content of a variety of vegetables and fruits treated with PMA was not significantly higher than that in untreated crops. All plant life can extract some of the naturally-occurring mercury from soil and the minute amount added by PMA treatment had no demonstrable effect. When, under experimental conditions, excessive amounts of mercury compounds are added to soil, proportionately high concentrations can be found in plants.

(*b*) Observations, particularly in Sweden, have shown that injury to game birds was drastically reduced when alkylmercurials were eliminated from seed treatment. I am advised that in our own country studies in Idaho have shown that phenylmercurials are relatively harmless to pheasants (see data provided by Mr. Wayne Gustafson). This low order of toxicity is in consonance with extensive studies on humans who are occupationally exposed to these compounds. The rapid excretion of PMA seen in pheasants is found also in man.

(*c*) Quite properly, there has been concern over the conversion in nature of inorganic and phenyl mercury compounds into the highly toxic methylmercury. This conversion can take place in polluted waters under certain conditions, but not necessarily under all conditions. Controlling factors are the concentration of mercury, the type of bacterial growth in the water, the temperature, the acidity and probably other conditions. Normally present in agricultural soils are a variety of organic compounds which tend to bind mercury and thus prevent its migration into subsurface waters or into streams. When normal seed treatment practices are followed, the amount of PMA applied is so small that it would be expected to remain in the soil, bound to the organic content. It has been stated by an authority on soil chemistry that ". . . mercury carried down by rain adds to each acre of land per year about the same amount of mercury one would expect to be added by mercury-bearing seed dressing for fungal control of cereal crops. Mercury from either source is held tightly by the upper 2 inches or so of soil." Available evidence supports the conclusion that the use of PMA in seed treatment does not pose a threat to the quality of water supplies or to fish.

Modern technology constantly obliges us to form judgments on risks versus benefits. In my opinion the use of PMA for seed treatment presents minimal risks and a potential for major benefits. This opinion is based on the relatively low toxicity of PMA, the small amounts needed for fungicidal effect and the minor ecological disturbances it might cause.

LEONARD J. GOLDWATER, M.D.

March 7, 1971.

ADDENDUM

Frequently cited as evidence of possible toxicity of PMA is a report by Fitzhugh et al published in 1950. The studies in question showed that there was kidney injury in female rats fed for one to two years on a diet containing 0.5 parts per million of PMA. No similar effect was found in male rats. This experiment has been repeated by other observers and the findings of Fitzhugh were not confirmed. Minor abnormalities were found in *male* rats and these regressed when the feeding of PMA was terminated.

Dr. GOLDWATER. I suppose you can see that I choose to live dangerously. I smoke cigarettes. I eat swordfish when I can get it and I come here to express some views which perhaps are not in line with those which are most fashionable today.

Senator HART. Doctor, I think I should state for the record, in the presence of you gentlemen, that I had fish for lunch today.

Dr. GOLDWATER. Congratulations. It is hard to get swordfish now but we manage to find a little left here and there.

I have been here since yesterday morning and it seemed to me, although it may be presumptuous, that I could be most useful by commenting on some of what seemed to me to be loose ends that were dangling around. Certainly I would welcome any questions after I run through a few of these points that, it seemed to me, puzzled the members of the committee and others who were here.

First, and perhaps this is elementary, what do we mean when we say something is poisonous or toxic? This is not a simple concept. I think it has been indicated that really everything can be toxic. We can be killed with sodium chloride, which is table salt. The important thing is how much?

There is an old saying in medicine that the only difference between a drug and a poison is the size of the dose. This is a very useful way of looking at this question.

In this connection I might point out that both mercury and arsenic have had many important uses in medicine for many years, mercury going back perhaps to Egyptian times and arsenic certainly to the Middle Ages. They are used today. Some of these mercurial drugs, particularly those used for heart failure and kidney disease, are actually life saving. They are given in huge doses.

We have been hearing here about micrograms. There are patients who receive 60 to 80 grams of mercury. A microgram is one-millionth of a gram. And this is done with life-saving results. I mention this just to highlight the fact that one cannot conclude that all forms of mercury under all conditions are necessarily bad. In fact, as we all know, the standard treatment of syphilis for 450 years was mercury. It was being used right up until the 20th century.

I have just written a book on mercury from a historical point of view so I like to display my erudition along these lines.

The expression has been used "a toxic level." I am asked frequently what is a toxic level? I have one of my students here whom I brought down to keep me honest. He knows what I told the class. A few months ago I was asked to see an infant in Montreal, a premature infant, who was being prepared for cardiac surgery. As is the standard procedure, some tests were run on the oxygen levels in both sides of the heart. As happens infrequently but is known to happen, an accident occurred and this premature infant received 30 million micrograms of mercury directly into the heart. This is about an ounce.

This shows how you can play tricks with numbers. You can say 1 ounce or 30 million micrograms.

I have had followup on this premature infant after 3 months and the infant is doing just fine and growing normally without any signs of illness or ill effect.

What is a toxic level?

This infant's blood levels have been running between 60 and 80 micrograms per 100 cc. of blood.

If you recall yesterday, Dr. Herdman mentioned 1 microgram per 100 cc. is the upper limit of normal. Dr. McDuffie went a little bit further. Actually the standards for this particular thing were developed in the laboratory at Columbia University while I was there as a result of an international study involving 15 countries and about a thousand unexposed people which showed that the upper limit of normal is around 5 micrograms per 100 cc.

All of this information has been published in the literature and I don't know where the one came from.

I am going to be in touch with Dr. Herdman, whom I happen to know personally, and I will have a little bit more to say about that in a few minutes.

If a premature infant can survive 50 to 80 times what is considered the upper limit of normal, I think we have to take a good hard look at what we mean by what is a toxic level. The answer is it is a highly individualized concept and one cannot take a number and say that this is the upper limit of normal or the upper tolerance limit because that would imply that anything above that will regularly result in adverse effects. No such simplistic situation exists, unfortunately.

As far as mercury being around, it has been known for at least 300 years, first determined by Robert Boyle of Boyle's law fame, that there was mercury in the sea. This has been verified through the centuries and up until the present time analyses are being made showing that not only mercury but a whole host of other materials, some of which have traditionally been considered "toxic" are there as normal constituents.

What this means, of course, is that any life which has evolved from the sea will reflect this chemistry. This is what Dr. Snyder referred to as trace elements. This applies to some of these chemicals.

As long ago as 1930 it was worked out that the average daily intake of mercury was 20 to 30 micrograms. This is still valid. People studying this today have come up with practically the same total dietary mercury intake, between 20 and 30 micrograms per day.

Where does it come from? Essentially from food.

As part of the research which was done at Columbia during my 25 years there, a number of analyses were made on various foods. These were published in 1964 and subsequent studies have been made which have more or less verified the ranges, or you might say the ball park figures, that first were developed in Germany in 1930 and thereafter, and then again by our group at Columbia.

It is interesting to see that there are at least half a dozen foods which were found to have considerably higher mercury values than fish. For example, canned chicken, butter, beef liver, cheddar cheese, bacon, and egg yolk all had higher concentrations of mercury than fish. Here we have recorded some figures for smoked salmon of 0.05 parts per million, which incidentally is a number proposed by WHO for everything except fish, and canned tuna fish, which was examined at Columbia and found to have 0.04 parts per million.

We must point out that the analytical methods used at that time were perhaps less delicate than they are today. There have been huge

advances in the technology of microanalysis. But I think the ranges here are interesting in that there are analyses being done today showing that there are other foods which have considerably higher concentrations of mercury than fish.

This doesn't mean that I am going to go and tell everybody they mustn't eat canned chicken or butter or beef liver or cheddar cheese. I just point this out in connection with comments that have been made earlier to the effect that if we are going to do this job we should be consistent about it. If we are really worried about mercury, let's look at other foods as well and perhaps pick up the number that Senator Kennedy mentioned yesterday, for example, of the relative importance of meat versus fish, a 15 to 1 ratio.

If we are to be consistent, it seems to me, if we set a level for fish at a certain point, we should consider the total food intake from protein sources and levels for meat should be one-fifteenth of fish because the potential intake of mercury from meat would be 15 times as much as from fish.

I merely point this out again to suggest a little consistency in what is being proposed and not as a reason for not being concerned about mercury and other metals as well.

As far as the other metals are concerned, the question of arsenic was brought up yesterday by Dr. Wood.

The fact that arsenic is present in foods has been known since 1935. He quoted the work of Challenger. I think he read it differently than I read it. He talked about dimethylarsine. I read trimethylarsine and I also read dimethyltelluride from tellurium as being present in aquatic organisms and presumably there as normal and natural constituents and not these highly threatening substances that Dr. Wood implied they might be.

Methylation is one of the most frequently recognized biological processes in all living systems. It is one way in which living systems detoxify things which are foreign to them or which are present in excessive amounts and it helps the body to handle them and render them harmless. If we didn't have methylation we could not survive.

It is puzzling, I think, to some, why it is that methyl mercury, which comes out of a bottle made in a factory and given to an animal—why is this toxic and why methyl mercury, assuming that it is present in living things, is not toxic. This is an interesting point which needs further explanation.

I have certain theories about it with which I will not burden you at this time, but I might point out as a not very perfect analogy the question of hydrochloric acid. The way that hydrochloric acid is generated and manufactured in the body is essential to us and we would be in bad shape if we didn't have it. But hydrochloric acid out of a bottle in a laboratory doesn't behave exactly the same way.

I think this is not a perfect analogy but perhaps a partial analogy, looking at it this way.

Questions have been raised about the analytical methods and these are very, very, tricky things. The only person who is not skeptical about microanalytical results is the person who has never had any experience with them. The more you know about these things the more they frighten you.

I might here quote from an article published in the Journal of the Association of official Agricultural Chemists. This is an article

from the FDA in which they report on a collaborative study in which they had a number of laboratories all take the same materials, the same specimens, with different amounts of mercury in them, to see what kind of results they got. This is pretty frightening because in one sample, for example, four of nine laboratories reported zero and the highest reported 0.06 parts per million. In another one some laboratories reported two to three times as much as other laboratories on the identical samples, presumably analyzed by identical methods.

This is not unusual, gentlemen. This is known by laboratory people. But it gives us pause, I think, when we come to placing too much validity on a single laboratory determination. Which laboratory did you send your sample to, the one that got zero or the one that got six? It could be the same sample. These are not simple matters and they are not things for inexperienced people to fuss around with. This comes from the FDA.

I was happy to see that they are continuing their studies and trying to standardize analytical procedures.

Dr. Edwards said in his statement that these methods have not yet been perfected, and this is true, they have not. I can tell you that some of the most experienced laboratories in the country are working feverishly on this to try to perfect and standardize these methods so that they can get reproducible results. Perhaps I have said more than enough. I think there are certain questions as to the validity of certain studies that have been published. I have found other articles in Japanese literature which have not received widespread publication which seriously question the whole concept of Minamata disease being due to mercury.

If anyone wants more about this, I can get it.

Senator HART. Doctor, we would appreciate having the Japanese article or articles.

Dr. GOLDWATER. I will have some copies made of this.

(The following information was subsequently received for the record:)

[From Pergamon Press, 1963 Vol. 7]

WATER POLLUTION AND MINAMATA DISEASE

(By Raisaku Kiyoura, Tokyo Institute of Technology,
Ookayama Meguro-ku Tokyo, Japan)

INTRODUCTION

Minamata disease in a severe neurological disorder first recognized by Dr. H. Hosokawa in 1953 among inhabitants on the shores along Minamata Bay, Kyushu, Japan. Since then about ninety cases have been recorded with about 40 percent mortality.

Minamata Bay is a rather small bay on the southwestern coast of Kyushu and about 10,000 people are living in eleven small villages around the bay. Minamata City with a population of about 50,000 is located at the northwestern head of the bay, and there is a large chemical plant, employing approximately 3,500 people and manufacturing various products, such as industrial chemicals, chemical fertilizers, synthetic resins, plasticizers, and raw materials for acetate rayon, of which calcium carbide and calcium cyanamide were first industrially produced here in Japan about 1908–9.

The hygienic environment of this area is not satisfactory as revealed by the fact that the outbreaks of infantile paralysis are at a higher rate than in the average rate of Japan.

Seafoods from the bay, fish and shell-fish, were most abundantly consumed by fishermen and their families of this area.

Epidemiological investigations of Minamata disease were initiated by the staff of the department of medicine, Kumamoto University. From the results so far obtained they claimed that the disease was closely related to the intake of the toxic material contaminating seafood from the bay and that the source of the toxic material was the mercury compound contained in the effluent from the chemical plant.

Studies on Minamata disease have also been undertaken by many others, several of them associating in the Dr. T. Tamiya committee and in U.S.A. by Dr. Kurland, Dr. B. W. Halstead *et al.* The final conclusion is not, in the author's opinion, yet reached.

Organo-mercuric compounds

Many organo-mercuric compounds were synthesized and screened, with a view to identifying the toxic substance responsible for the disease, by several researchers including Dr. K. Sebe and others throughout Japan. His results, supported by the others, confirmed that it is scarcely possible to induce symptoms which are characteristic of this disease in laboratory animals by any organo-mercuric compounds except one type, namely that having R (alkyl)-Hg-S- linkage in the molecule.

Compounds with this type of linkage are generally so unstable as to easily change the color to dark and decompose. They cannot be expected either to be biosynthesized in marine organisms or, without killing the fish, to pass from one fish to another by way of the food chain. Moreover, there are hardly any such compounds in the original effluent and the operating conditions of the plant prevent the formation.

The most probably type of organo-mercuric compounds to occur in the organisms is considered to have a linkage such as R (alkyl)-S-Hg. Mercaptan, or compounds having a function -SH group, readily combine with mercury to form R (alkyl)-S-Hg-, thus detoxicating the mercury poison.

Cystein -Hg-Cl provides an example of this type of organo-mercuric compound which, it has been confirmed, does not produce symptoms characteristic of Minamata disease. If in fact a small amount of mercury is taken up by marine organisms it must be converted to this non-poisonous kind of compound.

It is also known that an organic mercurial compound is now in use in chemical therapy for cancer by injection into the human body. The actual doses of injections were: 2050 mg/year or 1950 mg/73 days; thus a total amount of Hg of 493 and 468 mg respectively to each patient with complete safety.

Other possibilities

There are three remarkable features to be pointed out from the investigations so far undertaken throughout Japan, including that of Dr. H. Hosokawa who first recognized this disease and who has performed a series of animal experiments using more than 1,000 cats.

(1) Neurological disorder can be induced by many organic compounds not containing mercury, such as DDT, tetraethyl lead, dimethyl hydroxytrichloroethyl phosphonate, cyclotrimethylene-trinitramine-trinitramine (an explosive, hexogen), hexamethylenediamine, pentamethylenediamine (cadaverine), and others, as well as by some inorganic compounds such as thallium salts, this being confirmed by Dr. K. Miyagawa.

(2) Outbreak of the disease is independent of the mercury content in the food.

(3) *Toxicity is not parallel* with the mercury content in the fractions of fish and shellfish which can induce disorder as a whole. Fishmeal rich in mercury does not necessarily induce disorder, while juices not containing mercury can. This remarkable fact is confirmed by Prof. K. Tokita (Toho Univ.) and has been published recently.

Thus he claimed that *the onset is not always parallel to the mercury contents in the sea-foods and that, furthermore, Minamata disease can be caused by some substances in sea-foods that do not contain mercury.*

EXTRACTION OF CASUAL SUBSTANCES BY THE AUTHOR

Results obtained by the present author are as follows:

He could separate fractions containing and not containing mercury merely by adjusting pH of digesting water. A powdered sample of dried shell-fish or fish

was digested with water at 40° C adjusting its pH by dilute hydrochloric acid. The pH could not be raised above 5, since there was fear of putrefaction. If the pH was then lowered to 1 to 0·5, mercury began to be found in the extracts.

The former fraction could develop in mice and cats chronic symptoms of some resemblances with that of the Minamata disease. The latter fraction did not have the toxicity. Paper chromatography of the former fraction revealed that there were 6 or 8 compounds of fairly strong ninhydrine-positive along with other ninhydrine-negatives.

From R_f value of the ninhydrine-positives some diamines were suspected. Thus the animal test was performed both with the former fraction and with synthetic diamines. Both were found to be toxic, and the pathological changes in the nervous system were kindly examined by a member of the medical group engaged in the research of this disease. The changes were found to be quite similar to that known specific of the Minamata disease.

Discussion

Toxic organo-mercuric compounds have hitherto been studied in order to use them as sterilizers or insecticides. Lethal doses of their typical examples are: Phenylmercuric acetate, LD_{50} in mice, 31–35 mg/kg; Sodium ethylmercuric thiosalicylate, LD_{50} in mice, 66 mg/kg.

In one of their reports Drs. K. Miyagawa, S. Kitamura *et al.*, Kumamoto University, stated that sprats (one kind of sardine) containing much less mercury than other fish, have nevertheless a remarkably strong toxicity. From their data, it was possible to evaluate the total amount of mercury that was necessary to induce disorder. It amounted only to 0.7–2.6 mg of mercury per kilogram of cat.

Another interesting result was obtained by Prof. K. Tokita, that is, water extract of fish caught in Minamata Bay could induce disorder and the total amount of mercury in this extract given to laboratory animals in the period of his experiment amounted only to 0.3 mg. These small values of mercury necessary to induce disorder, the toxicity of unknown compound, are beyond our present knowledge about the toxicity of organo-mercuric compounds. Present toxicology does not supply any examples of such poisonous organo-mercuric compounds.

Thus, in considering the probable source of the disease, it seems important to note that the *mercury compound is not yet confirmed as the only source of the disease and that there may be some other substances or factors being overlooked.*

Professor K. Tokita carried out another experiment as follows: He fed cats with addition of the fish specimens over a one hundred day period and found all five cats did not develop disorder, on the contrary they increased in weight.

The fish specimens, their mercury content being 16 ppm, were prepared by drying the residue of hot water extraction of fish caught in Minamata Bay, and were fed to cats by 100–200 g/day. Though cats were thus given mercury by a total amount of 40–80 mg/kg of their weight, it was shown their weight increased and their general condition was healthy.

All things considered, it seems most probable to conclude that the disease is adduced not by a minute amount of mercury but by some compounds extractable with hot water and not containing mercury.

On the other hand, Dr. B. W. Halstead of the World Life Research Institute, California, comments on the Minamata disease as follows:

The Minamata outbreaks constitute more than just another interesting little known neurological problem, and should be viewed in the light of the overall picture which has been taking place in the Pacific area since 1943. In 1943 an entire chain of islands, Midway, Palmyra, Johnston, Banning, and Christmas Islands, an edible fish fauna within days became suddenly poisonous. These outbreaks have since been identified as ciguatera one of the neurotoxic types of fish poisoning. Mass intoxications from marine organisms began in Japan from about 1952 and became increasingly severe during 1955–57. Japanese epidemiologists estimate that about 40,000 persons were involved but the exact number is unknown. According to the Philippine Bureau of Fisheries similar outbreaks occurred in the Philippines too.

Japanese public health records, dating back to the middle 1800's fail to reveal any similar intoxications on such a scale. During the period from 1942 to 1950 there were a total of 455 persons intoxicated by venerupin poisoning in Japan. All of the outbreaks were restricted to Hamana Marine Lake Area and caused from eating shell-fish. All of the victims developed a diffuse necrosis with hemorrhage and fatty degeneration of the liver, with a mortality rate of about 33 per cent. Most of technical data available on the subject are deficient and have failed to point to the primary source of the intoxications.

The Minamata outbreaks point to the fact that it is possible for marine flora and fauna to pick up a toxic substance, and—in most instances—without killing the marine organism, pass this substance on to man with lethal effects.

The exact mechanism by which the process takes place and the metabolic effects of the transvector upon the primary toxic substance, or its precursor, is not understood, and constitutes an unexplored area of marine biotoxicology.

There is considerable evidence which points to the possibility that in certain types of marine bio-intoxications, certain marine bacteria may play a significant role in a toxin producing symbiotic relationship with marine algae."

MARINE WASTE-DISPOSAL AND POLLUTION IN THE MINAMATA BAY

The marine pollution in and outside of Minamata Bay was investigated by the author, as well as others and the results showed that the sea water was not appreciably contaminated by the factory disposal, no more than in other parts of Japan.

Marine waste disposal

The average discharge into the lagoon (precipitation basin) from the factory was 3700 m^3/hr and the discharge from the municipal (urban) foul waste from Tazan river was about 600 m^3/hr.

The fact that the dissolved oxygen control (DO) increases at the exit of the lagoon shows that the oxygen transfer in both the lagoon and the canal is effective (see Table 1).

TABLE 1.—WASTE DISPOSAL FROM THE FACTORY AND URBAN AREA TO MINAMATA BAY

Sampling points	Date	pH	DO (parts per million)	B.O.D. (parts per million)	I_2 (parts per million)	C.O.D. (part. per million)
Waste canal of factory	Aug. 25, 1959	6·0	0·6	6·8	5·2	17·9
	July 17, 1960	6·2	2·9	7·6	7·5	18·0
Urban waste, Tazai canal	Aug. 25, 1959	6·6	0·4	3·1	13·2	6·4
	July 17, 1960		4·0	4·3	13·5	7·7
Hachiman canal	Aug. 25, 1959	7·0	0·5	6·4	15·7	10·0
	July 17, 1960					
Exit of the "Lagoon"	Aug. 25, 1959	6·0	5·8	6·1	11·2	18·5
	July 17, 1960		7·0	5·2		15·8

Final discharge into the harbour, Hiyakken, of Minamata Bay was about 4300 m^3/hr or more, but in the rainy season the disposal is diluted to a greater extent.

A few typical values of DO, B.O.D., I_2 consumption and other chemical components are given in the following TABLES 1–2 and FIGS. 1–3.

TABLE 2. CHEMICAL ANALYSIS OF WASTE WATER AT THE EXIT OF THE "LAGOON"

[Parts per million]

PO_4	NH_3	Cl	SO_4	Ca	Mg	Fe	Al	Pb	Cu	Se	As
5.0	1.5	8300	1075	104	284	1.0	4.0	0.1	0.2	0.01	0.6

Note: Date of sampling, July 17, 1960.

Mercury contents in the factory disposal water and in sea water

Some people suspect that mercury is the cause of the Minamata disease. The author, however, has done extensive research in the effluent from the factory in and outside of Minamata Bay and also in other parts of Kyushu and Honshu (main island of Japan) and Hokkaido. Results are shown in the following TABLES 3–4 and FIGS. 4–6.

TABLE 3 (PARTS PER MILLION)

Factory name	Hg contents in disposal water
Minamata	0.002–0.012
N	0.062
Da	0.038–0.052
S	0.025
D	0.019
M	0.006–0.1

Note: The mercury contents in the sea water of southern parts of Kyushu, Honshu, and Kokkaido are shown in the table 4 and figs. 4–6 (map).

Deductions from our investigations showed that the mercury content at the exit of the factory lagoon was comparatively lower than that of disposal water of other factories where mercury was used as catalyst.

The results so far obtained can be summarized as follows:

(1) The sea water in and out of Minamata Bay has a sufficiently high value of dissolved oxygen (DO) and a small value of Biochemical Oxygen Demand (B.O.D.) and Chemical Oxygen Demand (C.O.D.) and, generally speaking, the degree of pollution here is nearly the same as on other bays of our country where an urban community or chemical plants are situated nearby.

The effluent from the Minamata chemical factory of Shin Nippon Chisso Hiryo Co. does not cause a remarkable effect on the pollution of the bay, compared with other similar cases in Japan.

(2) The concentration of mercury in sea water in this area is of the same order as in each of other bays of southern Kyushu. The concentration of mercury in the effluent from this factory is rather low compared with those from other factories manufacturing similar products.

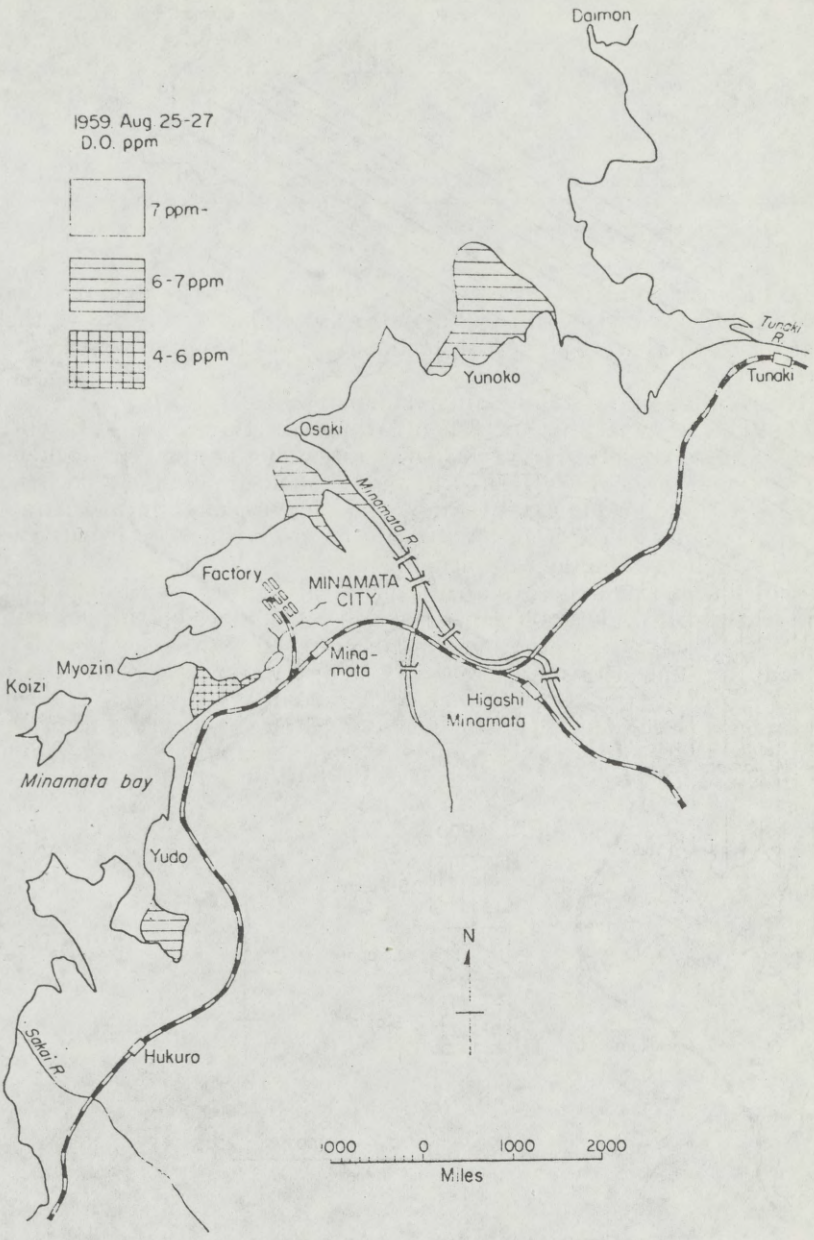


FIG. 1. Map indicating the DO values.

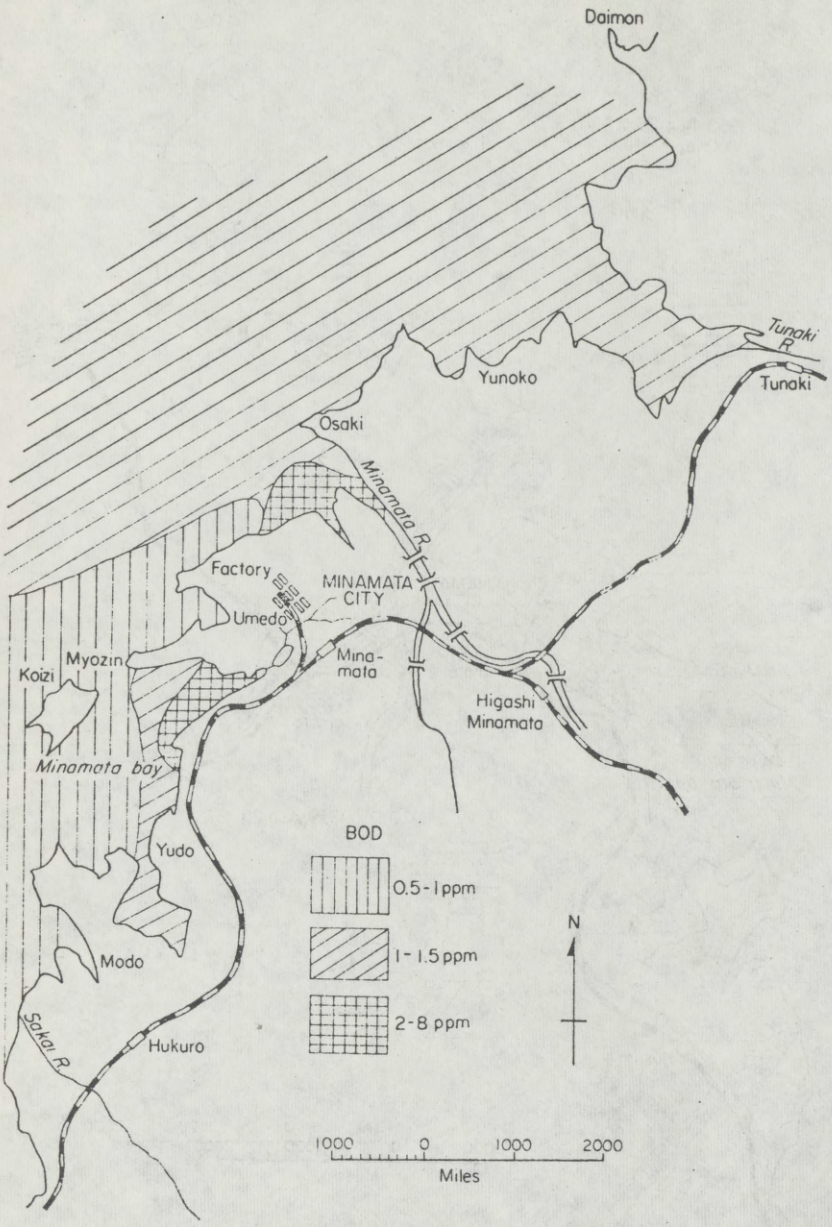


FIG. 2. Map indicating the B.O.D. values.

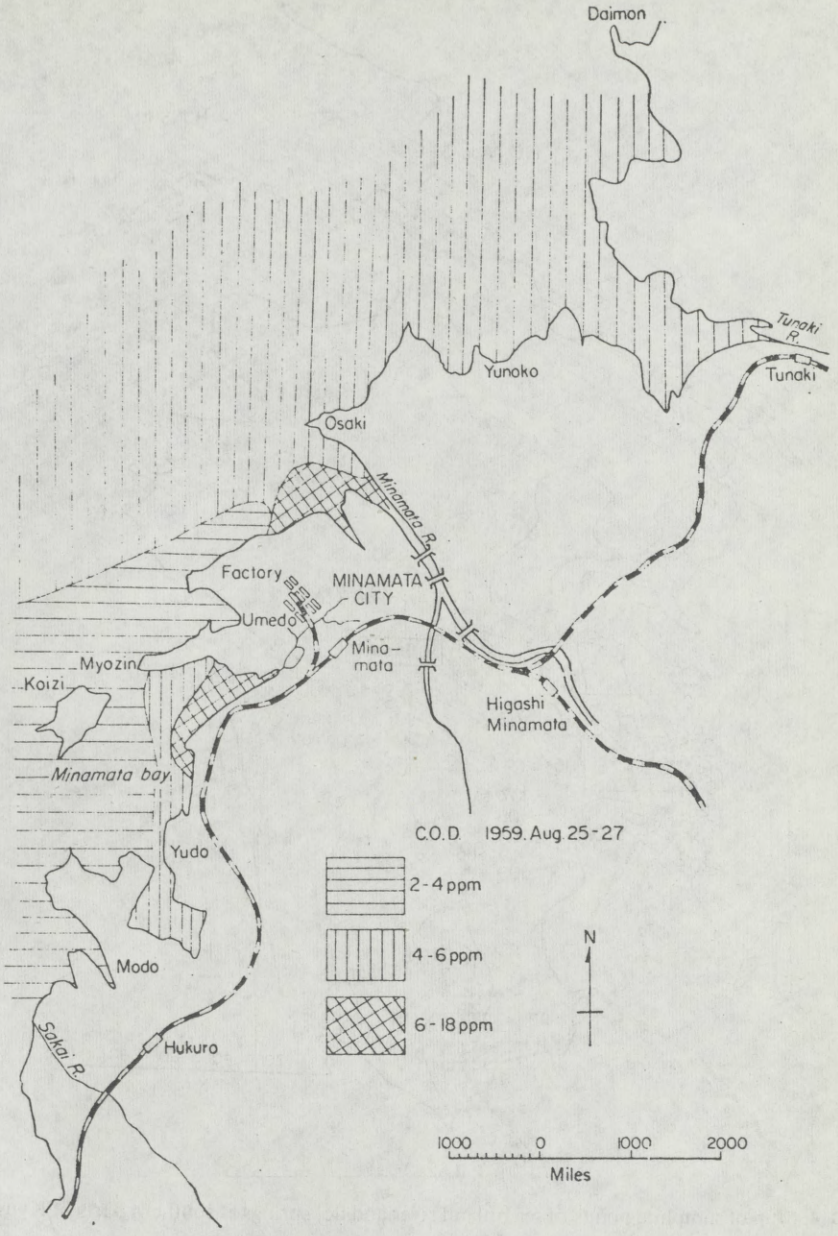


FIG. 3. Map indicating the C.O.D. values.

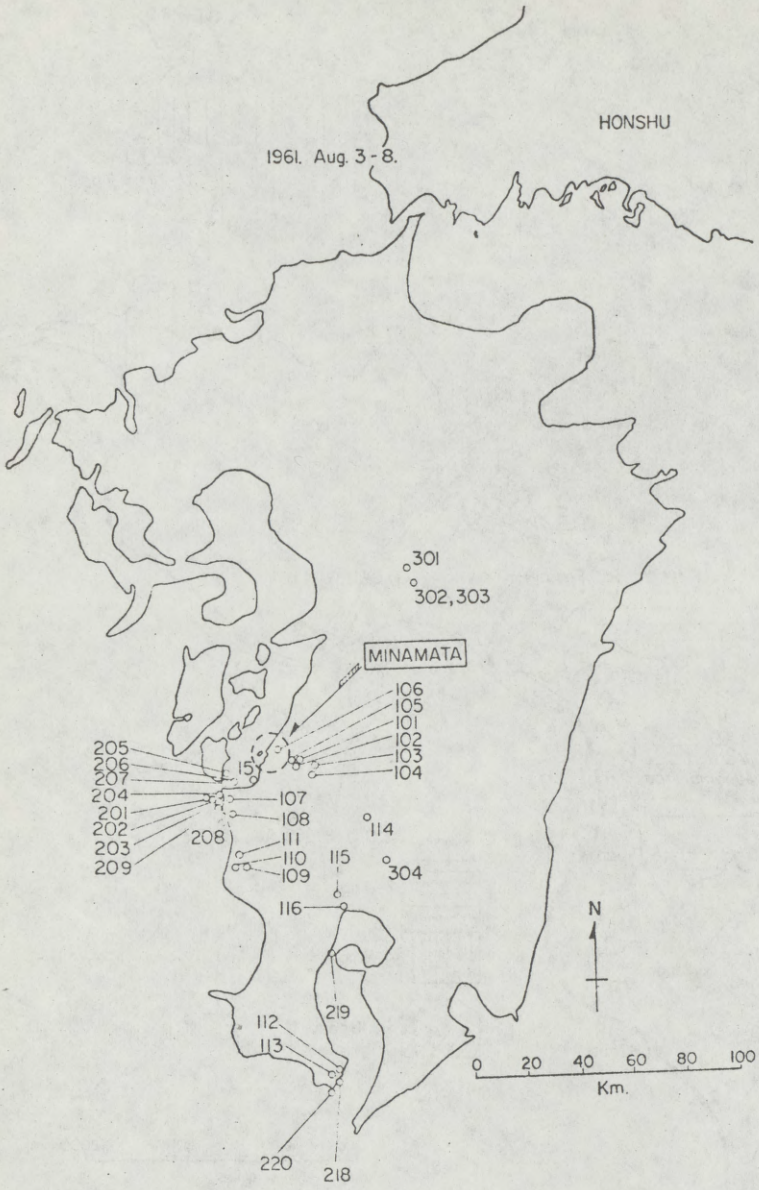


FIG. 4. Map of sampling points of sea, inland river and hot springs at southern parts of Kyushu.

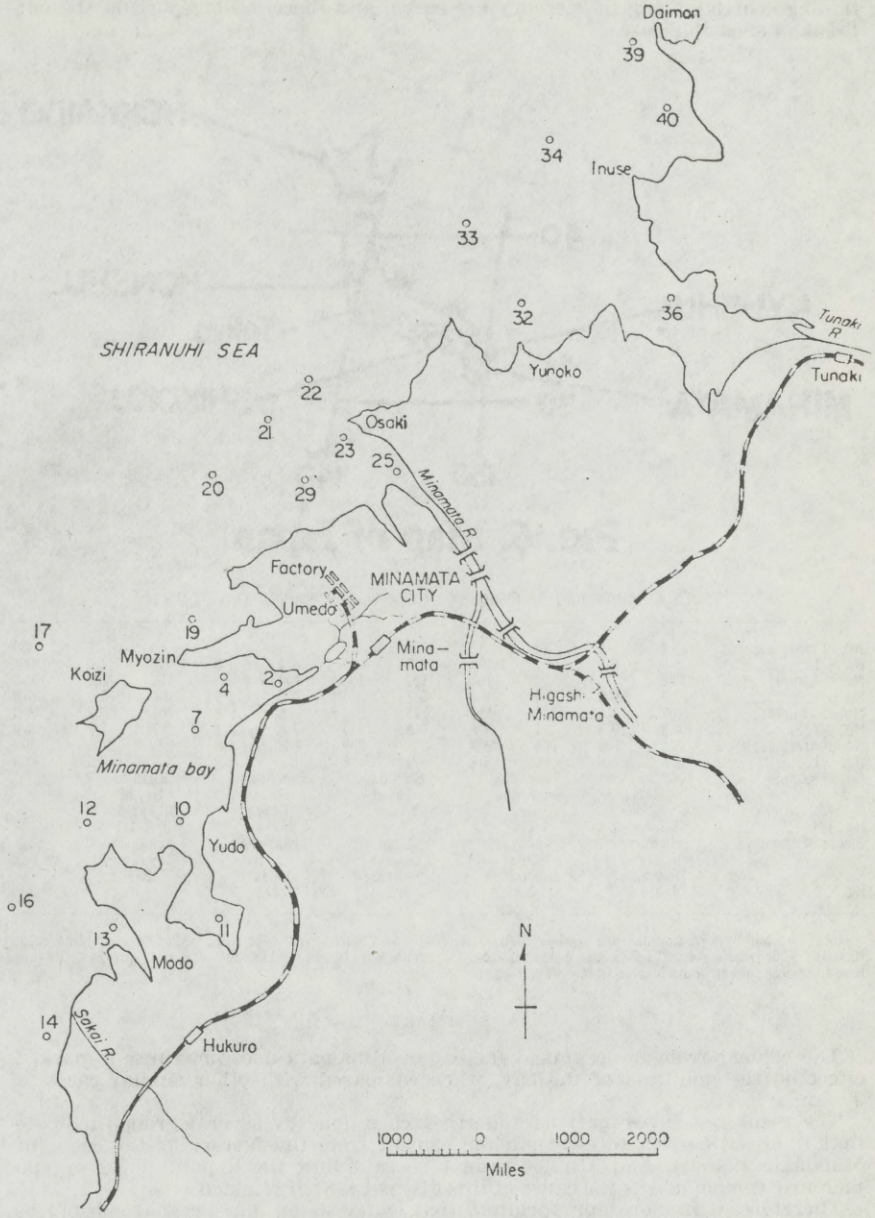


FIG. 5. Map indicating points of sampling.

There are other areas in our country where the same kind of seafoods containing a high content of mercury are eaten, and there is no report on the outbreak of such a disease.

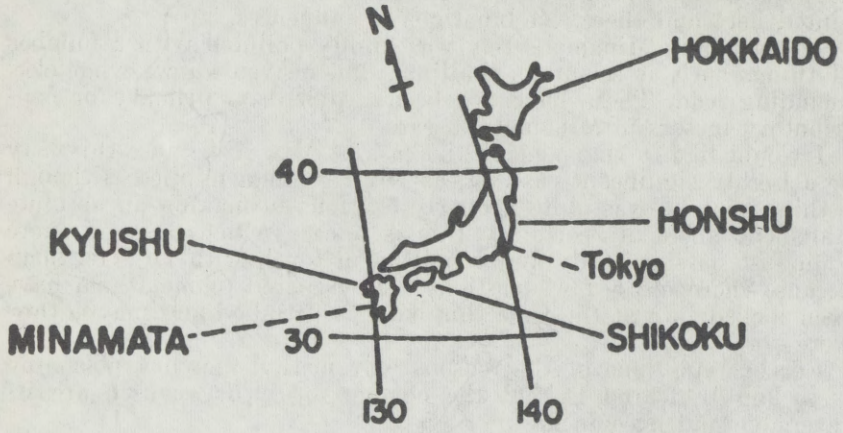


FIG. 6. Map of Japan.

TABLE 4.—CONTENTS OF MERCURY IN SEA WATER, RIVERS AND OTHERS

No. of sample	2	7	11	12	13	14	15	17	19	29	30
Hg. γ/l	5·3	6·5	6·7	0·9	3·3	2·9	5·1	1·8	1·8	4·5	0·4
No. of sample	32	36	39	101	102	103	104	105	106	107	108
Hg. γ/l	0·8	0·9	0·9	0·8	0·7	4·3	0·9	2·9	4·0	0·9	6·4
No. of sample	109	110	111	112	113	114	115	116	201	202	203
Hg. γ/l	4·3	10·3	1·1	1·2	0·8	4·1	7·8	6·1	0·7	1·7	0·0
No. of sample	204	205	206	207	208	209	218	219	220	301	302
Hg. γ/l	2·5	0·0	0·0	3·2	3·9	4·2	1·1	3·8	0·7	1·5	0·9
No. of sample	303	304	Takeshiba of Tokyo Bay		Sumida river of Tokyo		Tama-gawa river of Tokyo		Kushiro Bay of Hokkaido		
Hg. γ/l	1·3	0·4	2·4		4·8		3·3–4·6		0·8–1·1		
Places of sample	Kushiro Bay Hokkaido		Abashiri Bay of Hokkaido		Akan Lake of Hokkaido		Kiso-riv. Owari Oohashi		Yokkaichi Bay of Ise Bay		
Hg. γ/l	0·8–1·1		0·8		0·6		1·2		1·4		

Note: The numbers of samples are marked their location on the "Map" Figs. 4–6: Nos. 1–33, Sea near Minamata; Nos. 101–106, river water; 201–220, sea water far from Minamata Bay. Nos. 111, 113, 301–303; Hot Springs of inland. Kiso river and Yokkaichi are located in Mie-ken, Honshu.

SUMMARY

The effluent from the chemical factory of Minamata does not cause a marked effect on the pollution of the bay, when compared with other similar cases in Japan.

The results of investigations and researches done by several groups indicate that it is not correct to condemn the effluent from the factory as the cause of Minamata disease. And also, it cannot be said that the hypothesis of organo mercuric compounds as the cause of this disease, is well founded.

Therefore, it is more appropriate to put emphasis on other casual substances than the mercury disposed of by the factory.

I wish to thank Dr. T. Tamiya, the Chairman, and members of the Tamiya Committee, for their helpful advice in this work.

Dr. GOLDWATER. This man, for example, took extracts of fish and had some portions with no mercury at all, and fed them to cats and produced the symptoms of Minamata disease. He took other fractions from the same fish with mercury in and fed them to cats and produced no

symptoms at all. This is heretical to even talk about such things. But there are many other aspects to this Minamata picture which have not been thoroughly explored, particularly I think as has been hinted here and there, combinations of influences.

The water in Minamata Bay was highly polluted with a number of things such as selenium, thallium, and heaven knows what else, including lead. These have not been explored as primary or contributory factors in Minamata disease.

I would like to comment on the case of Mrs. Y because this may be a highly significant case. If, as Dr. Herdman implied, although I think that he was quite properly cautious in making an absolute statement about it—certainly this is a case which deserves more than just passing study and I will be in touch with Dr. Herdman because there are a few questions that occurred to me which have been looked into at the time this lady was studied and maybe they were not.

For example, one of the reasons why methyl mercury poisoning is so highly feared is that the changes or injury caused are irreversible and permanent.

From the history given to us this lady was improving. This is not typical of methyl mercury poisoning. But that doesn't mean it couldn't be methyl mercury poisoning. It simply is not typical of it and it would make me as a physician want to look a little further.

We all know perfectly well that there are available at every drugstore all sorts of reducing pills, either by prescription or over the counter. Many of these contain mercury. I don't know whether any special effort was made to ask this lady whether at any time in the past she had ever taken any of these particular reducing pills. She may not even have known there was mercury in them. But they are very commonly used by obese people. If she had taken them at any time, meaning even 10 or 15 years earlier, there would still be signs of increased mercury levels in her blood and urine. Actually they were not very much increased in any case. But this could be a factor.

Also the amphetamines, such as Dexadrine, and thyroid extracts are also in these reducing preparations. They could produce all or practically all of the symptoms of which this lady complained, jitteriness, unstaid gait, forgetfulness and all the other things that were related here.

Another possibility is just caloric restriction with particular reduction in carbohydrates leading to low blood sugar levels which would be analogous to insulin shock, which is hypoglycemia, low blood sugar levels.

Those of you who have seen a diabetic in insulin shock know that they sweat, they get nervous, they get confused, they become unsteady on their feet and break out into a sweat. These are some of the symptoms and this is also another possibility.

In addition to this there are in every household I should say almost innumerable household preparations which contain mercury. They are used as preservatives in paints, cosmetics of all kinds, furniture polishes and floor waxes, air conditioner filters, toothbrushes. It is inconceivable how many uses there are for mercury and how many opportunities for absorption there are, largely unknown to the consumer. While these are infinitesimal amounts, we know they

could lead to increased levels, because we have studied this. These are some of the things I would want to get straight with Dr. Herdman and I will, before I am prepared to accept this as a documented case. It is a suggestive case at best but I think because of its critical importance in the whole history of this thing we must leave no stone unturned to see whether in fact this could be attributed totally or partially to this lady's strange dietary habits.

Mr. WEDDIG. Thank you, sir.

Senator HART. Thank you very much. Your presentation has been excellent.

Mr. WEDDIG. I am only sorry we couldn't put it on yesterday after the other people, sir.

Senator HART. I can understand that. There are a lot of questions of chicken and egg here. I wish we didn't have roll calls today, which is a way of apologizing for my not having heard the beginning of your statement.

I was struck particularly by your comment about this lady. If you were in Dr. Herdman's position of responsibility would you have conducted yourself differently?

Dr. GOLDWATER. Yes, sir; I would have.

Senator HART. What is the specific criticism of his performance?

Dr. GOLDWATER. I am not critical of anybody, sir. I set my own standards.

Senator HART. Let me rephrase the question. In what respect would you, occupying his public health position, not have made the disclosure?

Dr. GOLDWATER. I think I would have reported this case in one of the medical journals where it could be evaluated by my peers. I would have made sure that there were no other influences brought to bear.

You know what Dr. Wood said, that next time he will announce these things to the press. There was a little bitterness in that remark. I think the bitterness was due to the fact that he did not get recognition from his scientific colleagues. This is sometimes painful. But in medicine we are a very reactionary lot, you know, and we are bound by tradition. Our protocol is that we discuss our scientific discoveries with our professional colleagues before we make public announcements.

Dr. SNYDER. If I may, please, I am not a physician. I am a scientist. I would be very critical. It is very difficult after the fact to really analyze data from any significant point of view when you don't have a controlled experiment. One of the biggest principles we have in science, a basic principle, is that an experimental procedure if it doesn't embrace a control, is worthless.

Dr. GOLDWATER. There is another thing, if I may interject here.

In Dr. Herdman's statement—mind you I am going to be in touch with Dr. Herdman and we are going to thresh this thing out face to face in a very friendly sort of way. He said, for example—and this is the kind of statement which is so misleading and which the press loves to pick up and distort—that first the average values for mercury and swordfish are 1.2 parts per million, or whatever it is. Then he goes on to say the lady ate so much swordfish. What is the implication? We don't know anything about the amount of

mercury in the swordfish she ate. Maybe there was none or maybe there were 10 parts per million.

But this kind of juxtaposition creates, I think, an unfair association which people who want to make great to do about it find very handy. Believe me, they do.

Senator HART. What about the performance of the FDA? As professional men are you critical of that?

Dr. GOLDWATER. No, I think that they have done the best they can under extremely difficult conditions. I know something about the problems they have and the responsibilities loaded on them with inadequate staff. There have been numerous turnovers in the administration of the agency. I think that perhaps morale is beginning to rebuild at this point. Everybody wants them to do everything. I don't know who is responsible for the edict that swordfish cannot be sold any more. According to Dr. Edwards, there is no such edict but I think we might ask Mr. Hayman whether there is such an edict.

Mr. HAYMAN. First, I would like to thank Senator Hart and also Senator Hatfield for their comments that they still eat fish.

As a person celebrating his 21st anniversary of being in this business, it is nice to know that someone still likes our product.

With respect to swordfish it has been a very mixed situation around the country. In New York there is a city embargo on swordfish as opposed—it is the only city in America that has that embargo by local authority. The FDA generally throughout the country is attempting a monitoring program with the cooperation of industry which, in effect, has for practical purposes eliminated the swordfish business as a future business. In other words, swordfish produced locally in America by American boats would be perhaps 10 percent of the swordfish consumed in this country.

The annual consumption is 25 million pounds a year. Japan is the leading shipper to the United States. The FDA edict has meant that no fish is now being shipped from Japan. The fish that was entering the country in December was turned around by many of us and sent back to Japan. There was very little fish left here in America. There is some and I would agree with Dr. Edwards that there is some that they have not examined. I don't think the little that is there is a potential health hazard so I, of course, would disagree with their handling of this matter.

I presented some figures to Food and Drug during our discussions of the problem. On a per capita basis, there is approximately 2 ounces of swordfish available per year to the American public. To be realistic, not everybody eats swordfish in the interior of America so if you would take just the coastal populations and then take only 10 percent of the coastal population and assume they love swordfish, according to figures that Food and Drug have not denied to me the consumption per year of those people would not exceed 3 or 4 pounds. This makes me reminisce about cylclamates and cranberries as I view the shambles of this industry.

Dr. GOLDWATER. I am sorry Senator Hatfield didn't come back because I can tell him where cadmium is used. He asked that question this morning. Cadmium plating, of course, is the most frequent use. It is used in certain pigments. During World War II when

aluminum was scarce, cadmium plated metal containers were prepared with dire results because cadmium dissolved off in acidulated drinks like lemonade and so on and there were several major outbreaks of severe intestinal upsets in the Armed Forces as well as elsewhere. I have had direct dealings with some of these.

Senator HART. The suggestion that one of you made—and my notes do not reflect which—was that there should at least be a consistent situation in our approach to foods and in the effort to identify hazardous elements.

Dr. GOLDWATER. Potential hazardous elements, if you don't mind, sir.

Senator HART. You were here this morning and heard the testimony from FDA. I had the impression that they said they could find mercury levels of significance only in fish. Am I wrong?

Dr. GOLDWATER. I don't believe they said that, but if they did, then there is something very wrong with their analysis. I don't believe they said that. I think they said they were focusing on fish because fish was in the spotlight and they were now starting to do other foods. I haven't seen any publications of their data. I am very much interested in what they find.

Senator HART. For our records, let us have your figures on bacon, cheddar cheese, and egg yolks, for example. You can submit them for the record.

Dr. GOLDWATER. I can leave them here.

(The following information was subsequently received for the record:)

TABLE V—MERCURY IN FOODS IN GAMMA/100 G. FRESH WEIGHT

	Columbia	Gibbs[23]	Stock[22]
Banana	3.1		
Canned chicken	15.0		
Butter	14.1		[1] 7.0–28.0
Beef liver	10.0		
Cheddar cheese	8.2		
Bacon	8.0		
Egg yolk	6.2		
Smoked salmon	4.9		
Canned tunafish	3.8		[2] 2.5–18.0
Fresh apple	2.1		
Fresh carrot	2.0		
Fresh halibut	1.6		
Egg white	1.1		[3] 0.2
Fresh veal	0.9		
White bread	0.8	0.4–0.6	0.5
Whole milk	0.8	0.3–0.7	0.6– 1.0
Fresh tomato	0.7		
Fresh beef	0.5	0.5–0.8	[4] 0.5– 2.0
Beer	0.4		
Rice	0.2		

[1] Animal fats.
[2] Fish
[3] Eggs.
[4] Meat.

Senator HART. But bring the particular figures so we will easily be able to find them. I am not sure that we are in any disagreement, Dr. Goldwater, but let me try to play back that toxic level point that you were making.

I think I understand it as a layman, but I want to be sure. You cited an infant who by accident had been given an extraordinarily high injection of mercury even though he was apparently healthy and sound. You made the point that when an agency fixes a tolerance level it doesn't mean that there will not be individual cases where taking in an amount in excess of that level nonetheless does no harm. But you are not suggesting that because there will be the exceptional case such a level should not be fixed in order to respond to the average of the community, are you?

Dr. GOLDWATER. I recognize that enforcement agencies must have numbers. They have to have standards and this means numbers. To me the ultimate test is whether or not a certain thing will or will not make anybody sick. The numbers may protect a certain number of people but the history of this sort of thing in the past has been that the information available to serve as a basis for fixing these numbers is rarely what one would like it to be. This comes back again to the research needs.

Senator HART. That I understand, but we are in agreement that, assuming the level which will safeguard most people can be identified with reasonable scientific reliability and above which many people would be harmed, we do not argue that because some would not be hurt above that level that that level should not be described.

Dr. GOLDWATER. We are in agreement on this basically, but I think that along with this should be either an implicit or explicit provision for easy modification, either upward or downward. The trouble is that these things tend to get fixed and the mechanisms for changing them are really quite cumbersome. You know, we have had huge experience with this in industry where I have had a lot of experience in the question of setting what they call threshold values or maximum allowable concentrations. The principles involved are exactly the same. But in the case of industry, exposures there have usually been many thousands of man-years of exposure which could be observed to serve as a basis for some of these standards.

The procedures and the technology of measuring these things were worked out in the 1930's and are still being applied very usefully. But there is a provision which I am afraid may be lost in the new occupational safety and health act for rather simple change of these levels as more information becomes available. I think that is a most important concept to be included with new legislative numbers or standards that are promulgated.

Senator HART. Before asking Mr. Bickwit for any questions he may have, let me be even more explicit in commending the character of the testimony.

The discussion in terms of specifics with the maps and the number of plants and their employees, where you urged an inexpensive system that does not require a man in every plant all the time is quite acceptable. It is so much more persuasive than a broad generality that doesn't work and that is what we frequently hear. This is good. I was here when you made the point that we were incorrect in an earlier hearing in saying that other countries did have continuous inspections systems in the fashion proposed.

Either now or for the record, would you describe the system, which you say is highly developed, for inspection in Canada and in Scandinavia?

Mr. WEDDIG. Yes, sir.

First of all, we obtained this information at a meeting of our American Seafood Distributors Association at our recent convention, where we did have represented in the audience people from Norway, Canada and Iceland. We asked them very specifically as to the type of inspection system in operation in their plants.

In the countries of Canada and Norway it would be most similar to what is termed continuous surveillance. It would be very much like it. The inspectors came around on a periodic basis. They tested a lot of fish but they are not necessarily there all the time.

Iceland is different. There a man in the plant on a full-time basis but is an employee of the plant and he is licensed by the Government as an inspector. He does perform other duties, usually as a foreman. In turn, the central Government authority would be performing an overriding audit of the system.

Senator HART. Regarding the argument that unless you have a man present at all times as an inspector, it is possible to save poor quality fish to be processed when the roving inspector is not there. In your testimony you say that you think that is nearly impossible. You are not saying it couldn't be done?

Mr. WEDDIG. Oh, no, sir. Also, Senator Hart, with an inspector in the plant, if a man really put his mind to it, I think he could put some things through. But basically, enforcement in this country has to depend on the inherent honesty of the people.

For example, you don't have an inspector looking at every automobile coming out of the Detroit area nor do you have a policeman on every single traffic light. You do depend upon people wanting to do a good job. You try to encourage that desire by making it very difficult to get away with something. You have to depend upon the willingness and the desire to obey the law and I think almost everybody does have that feeling. At least I think so.

Senator HART. But the patrol car makes us even better people, doesn't it?

Mr. WEDDIG. You had better believe it. I think also the possibility that a patrol inspector such as we are talking about would make us better people as well.

Dr. SNYDER. I would add, Mr. Chairman, that it would be much easier, even with an inspector in the plant, for someone to get away with sloppy manufacturing practices than it would be to save a big load of fish that was not so good. Someone would have a warehouse hidden somewhere that nobody knew anything about. That would cost more than the operation would be worth.

Senator HART. Mr. Bickwit?

Mr. BICKWIT. With regard to consistency in the matter of inspection for toxic substances the reason we have pushed in the fish area, at least initially, is because of statements like Dr. Wodicka's this morning and statements he has made before us in the past. Here is one statement that ought to be read. Senator Hart's question to Dr. Wodicka:

> I have to raise the question of whether we are now looking at interstate shipments of food other than fish for mercury or any other metal. Are we?

Dr. Wodicka's answer:

There has been a survey in the so-called market basket studies of a cross section of the food supply for mercury. These have not disclosed disturbing levels of mercury. They are essentially background levels.

Background levels, as I understand the term, mean something like 0.05 parts per million of mercury in fish. What is your thinking on that?

Dr. SNYDER. According to the FDA the information is not complete as yet. I do not think we should presume to release their data before they have a chance to do it. Nineteen fish were surveyed. In one fish that they are particularly concerned about right now—the level of mercury, the mean level of mercury—they had a 99 percent confidence level of 0.27 parts per million. In statistics this means that 99 times out of 100 when they picked up this one fish, if they sampled it by their method, and tested it for mercury, the mean or the average value that they would get would be 0.27.

Mr. BICKWIT. In this fish?

Dr. SNYDER. In this particular fish they studied. So that is a long way off from 0.5.

Mr. BICKWIT. Why does that suggest to you that background levels in food other than fish is not 0.05?

Mr. WEDDIG. I think he misunderstood you. It is 0.05.

Mr. BICKWIT. When you pit that statement against statements he made this morning saying tuna averages 0.3 parts per million and that swordfish averages 1.2 parts per million, there is a distinction. If the distinction can be refuted, we are most grateful for any evidence that can be offered refuting it, and we will attempt to be consistent. So any documentation which would establish that Dr. Wodicka's statement that food other than fish contains essentially background amounts would be of great use to this committee and we would appreciate it for the record.

Mr. WEDDIG. I think the point we were making was that consistency should be present in this entire investigation of potentially hazardous materials. As we pointed out, with fish being approximately 3 percent of our intake of food, if we are going to look at potentially hazardous materials we should really look at all foods, not just fish. That is the message we want to leave with the committee.

Senator HART. I agree. But I got the impression that they were telling us today that they had studied other food.

Mr. WEDDIG. They were talking about mercury, as I recall it.

Dr. GOLDWATER. They implied they were doing analyses on other foods as well and had not found levels equivalent to those of fish. Had I had the opportunity I would have said, "please give us the numbers and what foods."

Mr. BICKWIT. We certainly will ask for those numbers.

Dr. GOLDWATER. I think you should ask how many samples, where they got them, how many analyses were done and so on, whether they were checked in more than one laboratory by more than one method, and a few little things like that before we go off the deep end on the basis of one test on one bit of food.

Mr. BICKWIT. You have our assurance that we will ask for that information.

Mr. HAYMAN. As a laymen I think a comment would be helpful to you. I have been very confused. All of a sudden I have been thrust into a scientific arena where I feel very unsure of myself. But I have had the opportunity to discuss with Food and Drug several times the problem we are referring to here. The difference is, as it was explained to me, is methylmercury as opposed to mercury. I understand that you could perhaps break a thermometer and ingest that mercury and it would not hurt us to do that today, as opposed to bad effects we were to ingest mercuric oxide or methylmercury, the methylated product. This is what Food and Drug explained to me, that in red meat there is mercury but not methylmercury, just a very background trace. On that basis he felt that our industry had the largest problem of anyone in their market survey.

My answer to that is that one would look at it in a reasonable fashion, since fishery products are a small portion of our diet, that it should be looked at in that context. Talking to that point and thinking of the problem of cigarettes, perhaps in some fishery products we should have a statement saying you should only eat it once a week. They do this in Sweden as a way to approach the problem.

Mr. BICKWIT. But our diets vary and it seems to me that the FDA is taking the position that if someone has a high meat diet and is eating only meat he really has nothing to worry about. Yet if he has a high fish diet, then he may.

Mr. WEDDIG. Mr. Bickwit, I think this is the position they are taking in the absence of any real scientific data to overcome this. We are following the guidelines to the best of our ability and our people have removed millions of pounds of swordfish from the marketplace and are trying desperately to figure out what they are going to do with it at this point. Disposing of the product is even tough these days with this concern for environment.

Nevertheless, on that point you make that if someone has a high meat diet he has nothing to worry about, perhaps he does not from mercury. But by the same token with every substance here having a potential hazard, I suppose that a person who has a fatty meat diet might have a potential from cholesterol buildup in his blood, and the same with butter and eggs and so forth. So if we are going to look at fish on the basis that I am prevented from having swordfish, which I like very much, and in view of the information I now have I probably would be eating it at a less frequent interval than I have before, by the same token I really wonder whether a guideline is a way you can approach this type of problem. In other words, why shouldn't we be able to have a swordfish steak once in a while if we care to and still protect a low common denominator.

The same peril to my health exists if I eat six or eight eggs a day, from another cause, or drink a quart of whiskey. You know, we have problems with this guideline method of enforcement. I do not know of a better way at the moment, frankly.

Senator HART. I know we are going to hear from the egg people. A couple of days ago someone told me that the doctors are out of their heads on this cholesterol from eggs, that in cholesterol itself

there is an offsetting element so that it winds up the more you eat, the better. Every time you make a move some other expert will jump and say you are wrong.

Dr. SNYDER. That is why I think this surveillance section that you have added is so important and why we feel it should be extended.

Senator HART. You would say broadened?

Dr. SNYDER. Broadened. I have just recently become director of science, and I do not know if they did me a favor. I am getting the feeling that they find them faster than we can attack them. Everytime we turn around there is something else. This is done in a helter-skelter kind of way with no scientific evidence to back it up. I think somewhere along the line we should get a lead on the problem. We should start anticipating the problem. We should find out what are the potential hazards, what are the levels where people may have toxic problems.

This whole bag is to try to protect the health of the U.S. consumer. We are going to try to find out what is necessary, but let's not wait until somebody dies before we start worrying about it. We should not have to have a major crisis before we even know that there is a major problem with mercury in fish.

This is something that should be extended in scope and we should be years ahead of ourselves here so that we can stop it before it occurs and maybe in so doing end up wrecking the whole industry. After all, it was not the fishing industry that was entirely responsible for polluting the environment.

Mr. WEDDIG. We have to be concerned about the potential hazard of any substance in products but it must be done on a broader, more comprehensive basis we think than what is outlined in the proposed legislation. This means years and years of research as opposed to determining in 90 days that everything on this list can be hazardous and therefore let's set guidelines and go at it. We do not think that would work nor would it be fair to anyone, most of all the consumer.

Mr. BICKWIT. This morning it was suggested that the committee may be entertaining the idea of requiring research rather than screening, and that insufficient research has been done. I trust you would agree with that. It does seem to be a more defensible proposition.

Dr. SNYDER. It would make my job easier.

Mr. BICKWIT. You mentioned a distinction between methyl mercury and inorganic. This child that had this injection, was that methyl or inorganic?

Dr. GOLDWATER. No, that was metallic mercury. This question about methyl mercury is quite crucial to this whole discussion. It has been assumed on the basis of work done primarily in Sweden that all mercury in fish is methyl mercury, or practically all. This may or may not be true. Japanese investigators have recently been here with some figures indicating that this is not the case, that perhaps as little as 10 percent of mercury in fish is methyl and the rest is some other form of mercury.

I was present at a meeting in which these figures were presented to the Food and Drug Administration and they said they do not

believe it. Well, does this mean they believe what they want to believe and reject what they do not want to believe? I have no reason to question the competence or integrity of these Japanese scientists. I am sure we would be very resentful if our data were treated that way in Japan or somewhere else.

There is more to this than just methyl mercury. As I implied in passing I believe—and I cannot support this with factual data although I have a research project under way right now directed toward elucidating this point—the methylization of mercury which takes place in nature is in fact a detoxifying effect. It places the mercury in a form where it does not cause adverse effects unless there is some very unusual circumstances such as occurred in Minamata where first of all inordinate amounts were eaten, where the contamination was not only through the naturally formedmethyl mercury but chemical methylmercury being discharged into the water which could be taken up as methylmercury rather than as a food chain which would convert it to the detoxified form.

There is considerable theoretical as well as some experimental evidence to support this notion and this is what I am now working on, testing this, because I believe this is so. I think that methylmercury can be present in inactive form if it is the natural methylmercury which I think is being measured in swordfish. It is something that has always been there. I think it is quite harmless and I would eat swordfish every day and I would not recommend to anybody that they restrict their swordfish habits. I am more reckless than Mr. Weddig.

Mr. BICKWIT. You say the methylmercury in Japan was the kind of methylmercury that we really do have to worry about?

Dr. GOLDWATER. In the Minamata episode there was a combination of the mercury which got into the water in some other form and was converted by the aquatic life, the bacteria, the algae, the plankton and all these little things which live in the water. It was that form which was taken up by the fish. But also in that water was methylmercury as such being discharged in the raw state from the factory along with a great host of other things which could easily upset the balance of these metals in the water and in the fish living in that water. These are things which have not in my opinion been adequately explored.

Mr. BICKWIT. What came out of that Minamata case was that if you have 0.2 parts per million methylmercury in your blood you are going to experience symptoms; is that correct?

Dr. GOLDWATER. There were some statements to that effect. Now, here again we run into analytical problems. There are very few people who can analyze for methylmercury. A lot of this is assumption.

Mr. BICKWIT. Assuming that is correct, and we have been assuming it, then——

Dr. GOLDWATER. In this connection there were some studies I think in Finland which showed that there were people who had very much more than this and had no symptoms whatsoever. This implies——

Mr. BICKWIT. But it might not have been methyl mercury, as you pointed out.

Dr. GOLDWATER. We do not really know what it was. They are all playing by the same rules in making these assumptions. It is possible for people to have much more than this without any adverse effects.

Mr. BICKWIT. You cited the case of someone who had 0.6 to 0.8 parts per million metallic mercury in his blood.

Dr. GOLDWATER. This is total mercury and this is what is being measured mostly. Dr. Edwards said that this morning.

Mr. BICKWIT. But you did say metal mercury.

Dr. GOLDWATER. Metal. The kid got this slug of quicksilver which is the stuff we all know. What form this was in the blood nobody knows. It probably was a mercuric ion really that breaks down into an ionized form and this is what is measured.

Mr. BICKWIT. The only point I want to make is that if 0.2 parts per million methyl mercury is what we are worried about, the fact that he had 0.6 to 0.8 parts per million of metal mercury should not surprise us. It should not surprise us that he did not have any effects if it is true that metal mercury is one hundredth as toxic as methyl.

Dr. GOLDWATER. That is correct.

Mr. BICKWIT. Just one final question. You doubted the Minamata case as being a case of methylmercury poisoning. What is your state of assurance? Do you feel it was not a case of methylmercury poisoning?

Dr. GOLDWATER. I think it is quite questionable. I think, as in the case of the lady, there were many features which were not adequately explored. It could very well have been methylmercury in Minamata, but I do not think it has been proven to my satisfaction. Again there was this combination of things. We know that when metal is normally there, including mercury, arsenic, lead, tin, thallium and you name it, they are all there and unless they are there in certain proportions the distortion of one, either more or less, can add to the toxicity of the others.

In this case we know that there were these other things present. This aspect was not adequately explored. This tells us that we can probably tolerate methylmercury if the other things that ought to be there naturally are there in proper proportions. This was totally distorted.

Mr. BICKWIT. In closing, if your state of assurance is one of doubt about whether this was methylmercury poisoning, although you think it might well have been, and others seem relatively convinced that it was methylmercury poisoning, pending our finding out conclusively whether it was, don't we have to assume that it was?

Dr. GOLDWATER. I do not think we have to assume anything we do not want to assume. I cannot quarrel with somebody who wants to accept this. I think that the dangerous thing is complacency and being satisfied that we have got the answer and perhaps overlooking something which is quite important.

Mr. BICKWIT. I certainly think we ought to look harder for the answers but until we find them in terms of our responsibility, oughtn't we to accept this?

Dr. GOLDWATER. You can accept as a working hypothesis that it is as I will accept as a working hypothesis that it is not. There is no quarrel.

Senator HART. I get the feeling, if I can remember 20 years ago when I used to be in court, that until the judge or jury comes in with a verdict there are always going to be witnesses in conflict on these areas, even though we are theoretically dealing with objective, scientific reality.

Dr. GOLDWATER. I expect to be able to convince some of my colleagues that we should be looking further and not accept this as a foregone thing. In fact, I have already convinced quite a few that we have got to do some further looking.

Mr. WEDDIG. Senator, it is very hard to accept a lot of this as scientific objectivity when we run into situations of analyzing a single sample of a product at the levels we are talking about, which are really very low you know, and when you give something like that to three or four different laboratories and get three or four different answers it is very hard to puzzle through it.

This question of meeting a guideline can be very difficult because we have had situations with three different answers on the same sample, all from very supposedly competent laboratories. We are in the realms of frontiers here in terms of workable scientific capabilities. We are not ready to put analytical forces on boats and so forth.

We cannot even get some of the Government laboratories to agree, and they are supposed to be the best around. There is no way to expect that a fisherman is going to be able to analyze for mercury.

Mr. HAYMAN. Senator, one of the reasons that I was anxious to come to Washington today from New York was to focus on the possible implications of the legislation you have under study in terms of the worldwide outlook on fisheries. The mercury situation has become a topic of conversation this afternoon. Briefly I would like to sketch for you some of the facts of our industry. Sixty percent of all the edible fish and seafoods that we Americans consume are imported. On a recent trip to South America 10 days ago I stopped at a few ministries and left a copy of the Senate's bill and asked them to try to get their house in order and look at it. I do not know what they thought of the suggestion.

I am concerned that unless there is a lot of thoughtful preparation on the part of you gentlemen we are going to lose a large portion of the fishery supplies that now come here. There are many areas in the world that ship products here that have alternative markets. We already see the Japanese, for example, refusing to ship sable fish here because of the hue and cry about heavy metals. We already see a refusal from Taiwan to ship red snapper here.

I think in terms of fish blocks we are going to find that the European producers will sell to the Continent. So the net effect, perhaps, could be a marked reduction of supplies with no possible way of replacing them by American production. I mean that quite sincerely. There is no way. So the net effect is going to be a reduction of what I think is a valuable protein and probably the price will double.

I think today it is a shocking price at $1.75 extra on the menu for shrimp. Let's take the figure on shrimp, for example. We are consuming perhaps 300 million pounds a year; 200 million pounds

are imported. The largest producing area we have is the Gulf of Mexico which is already a declining resource. The boats there are catching not enough to make it pay for them in some weeks. If we were not to have foreign shrimp, shrimp would be virtually off the menu.

The fish stick industry relies on 98 percent imported fish blocks. They are not made in this country to any significant extent. Thirty million pounds of lobsters are imported, which represents 98 percent of our consumption.

As you approach this I do not know how you answer the problem of coming to grips with other countries who perhaps are emerging nations, who want to know who are we to impose our standards on them. It is a very difficult problem that I find difficult to answer. Have you thought about how we go about that?

Senator HART. Yes, we have. But we get back to what I think is the basic question: if in fact the public health of the citizens of this country requires the establishment of standards and an assurance about the product source, then the consequence dislocation is something that we have to pay. Isn't that the way you would approach it in a position of public responsibility?

Mr. HAYMAN. Yes, but of course we are assuming——

Senator HART. You would have to alleviate, to ease through a transition period. Here is where our two scientific friends refute each other.

If in fact we determine that the public health requirement is such that we have to reduce the amount of fish or shellfish coming in—and I think there may be general agreement that we have to do it—your argument is that it is not possible to identify the threat and therefore you can't accept the basic proposition, to wit, the public health.

Mr. HAYMAN. I don't think I am suggesting that. I think I am suggesting that the majority of seafood that is shipped to America is wholesome and I think we would all agree that we would like to see it continue under a system that would insure the American public that they could have confidence in this product.

Senator HART. Right.

Mr. HAYMAN. I am only suggesting that I think it is a little difficult to insure that these other countries aren't going to feel that we have made doing business here so difficult that it is better to go elsewhere. That was my basic point, Senator.

Senator HART. We want to assure wholesome fish for Americans, whether produced domestically or abroad.

Mr. HAYMAN. Right.

Senator HART. If the standards are such that some domestic and foreign supplies fail to meet it, you don't conclude to lower the standards.

Mr. HAYMAN. I think you missed my point. I am saying that fish that is coming here today is wholesome and that we desire and that you and I would give to our children. If we make the rules of the game too difficult they would say not that they can't meet them but that "The Germans are waiting at my door to pay cash."

If you make the game too difficult, that is what I am suggesting. I am saying the fish is already above the standard you will set.

Mr. WEDDIG. I think one point I tried to make before, Senator, might clarify this.

We said, let's make sure that the system that we put in is workable both in the United States and overseas. And let us legislate the results as opposed to the actual method. In other words, the wholesomeness of the product is going to be the same whether you have the requirement for inspectors standing in that plant or whether you have another system that is more workable.

All you are trying to do is assure compliance. So the requirement will be the same and what you are trying to do is assure the compliance. Let's make sure that system of assurance is workable.

Senator HART. I am not in disagreement with that. Was that your point?

Mr. HAYMAN. Yes.

Senator HART. I don't know anybody who wants to figure out a method that is more burdensome than the very minimum to assure wholesome fish in commerce. You make the point that you don't need constant inspection here or any place else. This kind of thing we will have to make judgment on.

Mr. WEDDIG. If I may, Senator, one element that has not been discussed that I think might help to settle this difference if we can get this program underway. You know, we have a lead time here of writing regulations and research to determine what you are going to regulate and so forth. This is going to take time. Training inspectors is going to take time.

I have never been able to understand why there is a reluctance to begin this system on the basis of writing regulations and putting up a continuance surveillance system and seeing how it operates. I have been here in Washington only 4 years. I am sure you have been here longer than that, sir. But has there been any bureaucracy that has been dismantled? In other words, I think it would be a lot easier to go up if we need it but coming back becomes more difficult.

Senator HART. We hope to be able to vote to dismantle the Selective Service, or some of us do.

Is there anything that you would like to add?

Dr. GOLDWATER. I think I should say that I am on record as feeling, number one, that the 0.5 parts per million is a purely arbitrary figure that has no scientific basis.

I think that the so-called mercury crisis has been largely created by the news media. I think there is really no hazard from practically all of the fish that is available to people in this country under present conditions.

I am on record as having said this and I am perfectly willing to put it in the record now.

I am not resting on this, however, but I am now engaged in a rather major research effort to test the validity of this hypothesis.

Senator HART. Thank you very much.

(The following information was subsequently received for the record:)

NATIONAL FISHERIES INSTITUTE, INC.,
Washington, D.C., June 29, 1971.

HON. PHILIP A. HART,
Chairman Subcommittee on Environment, Old Senate Office Building, Washington, D.C.

DEAR MR. CHAIRMAN: In late May, the Environmental Subcommittee conducted hearings on the proposed legislation which would establish a fishery products inspection program. As you know, hearings have been conducted in each Congress since 1968. It would appear that the record is complete and that action is overdue. Consumer spokesmen, food regulatory agencies, and the industry associations have all repeatedly testified to a need for a comprehensive inspection program for fishery products. The National Fisheries Institute has supported the concept of a specific inspection scheme for the industry's plants and products since you first introduced a bill in 1967. The consumer and the industry deserve action now. Neither is served by recurrent airing of problems occurring in small portions of the industry when these conditions are easily solvable through a mandatory inspection program. The various proposals before the Committee suggest all of the elements necessary for a good program, flexible enough to meet the unusual conditions of the fish and seafood industry and economical enough to be supported by U.S. and overseas governments.

Two questions appear to be unresolved, the matter of need for an inspector in each plant on a full-time basis, and the approach to the new problem of potentially hazardous substances found in trace amounts in certain foods.

The very makeup of the U.S. diet in which fish products constitute less than 1% of total per capita consumption and 6% of animal protein consumption would necessitate any investigation of effects of trace substances to be extended to all foods.

Your proposal to establish a program of research and surveillance of hazardous substances must be made a far-reaching amendment to the Food, Drug and Cosmetic Act, applying to the entire food supply. The program, research oriented, must be thorough, yet cautious, to avoid the precipitous scare approach to new discoveries that seems to be a hallmark of government action lately. Each new "discovery" no matter how preliminary, unscientific or irrelevent it may be, gets front page attention, causing unnecessary consumer panic. As more facts become known, bringing the matter to proper perspective, they do not get the public exposure of the original "disclosures." I enclose clippings from the New York Times and the Daily News on an extremely important study. Contrast this coverage with the front page attention of the "Mrs. Y. Case." A sound research program would serve to retain perspective, providing potential for solutions, not just random charges and speculation. We detail later a few observations on types of potential problems that would appear to be worthy objects of such a research oriented program.

Concerning the question of type of inspection needed—consideration of approach unfortunately has been oversimplified. Some believe there must be a full-time inspector in each plant. Any approach other than this is immediately and unfairly dubbed as an inferior "spot" inspection system. The question of inspection method cannot be so simply categorized. As this society works to improve in many areas, we must come to the realization that we have neither resources nor people to solve every consumer problem by adding a federal inspector to the end of the line. Otherwise, why not have a federal inspector examine each new car and each new tire; be on full-time duty in each drug plant, coal mine, insurance office, and TV repair shop?

The Committee has the opportunity to enact a plan that could be a model for future food inspection schemes, one that is not "spot" inspection, but a comprehensive system of monitoring and surveillance, giving the regulator a variety of techniques to assure wholesome product without attempting the outmoded, doomed-to-fail system of an inspector in each plant.

At the time of the hearings on fishery product inspection, we were asked to provide additional information for the record. One question related to total number of deaths caused by food poisoning during the period of time in which nine (9) deaths were attributed to fishery products. Following is the information provided to us by the Department of Health, Education and Welfare:

	Accidental deaths due to poisoning by drugs and other medicants	Accidental deaths from poisoning from liquids and solids in the home (including ethylalcohol)	Deaths from food poisoning
1962	1,094	729	39
1963	1,286	766	47
1964	1,338	758	33
1965	1,350	712	24
1966	1,568	712	20
1967	1,860	642	15
1968	1,692	891	12
Total	10,228	5,210	190

You will recall that the NFI testimony also included several maps illustrating the clusters of fish plants which we believe would enable effective inspection without the need for an inspector in each plant. Senator Hatfield asked whether we could provide additional illustrations from the Pacific Northwest. We have made arrangements with personnel from the University of Washington and Oregon State University to compile data in Newport and Astoria, Oregon; and in Seattle, Washington. As soon as the new maps are completed, we will provide them to you.

Returning to your proposal for surveillance of dangerous materials, the National Fisheries Institute suggests that this concept become an independent amendment to the Food, Drug and Cosmetic Act, providing for research and surveillance of potentially hazardous materials in all food stuffs. While the study of potential hazards of certain trace elements, specifically mercury, has been confined to fish, it is not likely that potentially toxic substances in food are solely a fish problem.

The natural terrestrial sources of man's foods contain many chemical substances that are known to have non-dietary toxicological significance. Many natural products that have found wide acceptance for use as foods are considered safe, not because they contain no toxic substances, but, because, they do not contain enough to produce harmful effects, insofar as we know, under the ordinary circumstances of preparation and patterns of consumption. There is little concern in regard to the acute toxicity of many of the known substances in foods, such as oxylates in rhubarb, cyanogenic glucosides in sorghum and millet, cholinesterase inhibitors in rutabagas, cabbage and broccoli; solanine alkaloids in potatoes, goitrogens in rutabages and in some cases milk; estrogens from the feeding of sex hormones to animals used for meat and the trace elements arsenic, lead, selenium and flourine.

We do face the challenge however that the long term chronic toxicity, or lifetime effects of many of these substances, as well as that of the as yet unrecognized chemical components of our foods is unknown. Long delayed harmful effects that might result from normal consumption patterns are of the greatest potential importance since they would be expected to affect a large number of individuals. Many of these toxic substances, while in man's foods, are present in such small quantities that grossly abnormal patterns of consumption are necessary to reveal the toxic potential of any single substance. This, of course, is in accord with the generally accepted view that for almost any toxic substance there is an intake level below which no detectable effect occurs. What are some of these toxic substances and what is their history and present significance? The solanine alkaloids of the potato have caused many cases of poisoning in man, especially under circumstances of unusual consumption involving the sprouts and eyes and skin. Exposure of freshly harvested potatoes to sunlight increases the solanine content. A level of more than 0.1% of the alkaloid has been considered to render the potato unfit for human consumption.

The toxicity of Ergot, a product of the infestation of rye and less often wheat, barley, and oats by a parasite fungus, Claviceps Purpurea, has been documented for several centuries. Human ergotism due to toxic food is believed to be nonexistent at the present time, although, many outbreaks of poisoning have occurred in this country and Europe, and the latest in France as recently as 1951.

While no human illnesses in this country have been attributed to the aflatoxins and micotoxins produced by several toxigenic filamentous fungi, there have been several very severe outbreaks of animal diseases caused by mouldy feedings stuffs.

Worldwide interest was focused on the aspergillus mycotoxicoses in 1961 when English investigators reported the widespread incidence of fatal liver disease syndromes in various commercial animals. All had been fed a ration partly composed of peanut meal contaminated with A. flavus. Chromatographic analysis of the meal extracts revealed the presence of fluorescing substances, later called aflatoxins, which were found to be responsible for the poisonings. Reports from workers in several other countries suggest that aflatoxin contamination of foods may be a widespread occurrence. Studies conducted by British investigators indicate that contamination of peanuts occurs most often after nuts are lifted from the ground. Damage in harvesting or by termites, as well as improper drying and storage, are important factors favoring contamination and toxin production.

Urov disease is a disease of bones and joints that first develops in children. The condition is characterized by a shortening of the long bones, deforming of the joints, flexor contractures, and muscular atrophy. This disease is widespread in certain areas in the Soviet Union and has been seen in Northern Sweden and Holland, and has been widespread in Korea and Northeast China. It is thought to be caused by the contamination of cereal grain with certain molds of the Fusarium species. Another unusual human disease, alimentary toxic aleukia, is probably caused by the same molds. These diseases occur in areas where the average humidity can be high, and the Fusarium mold can grow on the grain.

There are well documented cases of poisoning by oxalic acid from eating rhubarb, usually the leaves, and always in unusual amounts. Cadmium which is found associated with zinc finds its way in small amounts into the food supply in various ways, sometimes through the water supply. The association of cadmium with hypertension in man is under study. Less well demonstrated is the association of salt (sodium chloride) with hypertension.

Even vitamins have potential hazard. One of the first cases of chronic hypervitaminosis A in man was reported in 1944. Since then, there are reports of at least fifty cases—most of them infants and small children. The symptoms of chronic toxicity in infants have been described as anorexia, growth failure, irritability, skin lesions, alopecia, and skeletal lesions accompanied by pain and bony swellings (hyperostosis). Enlargement of liver and spleen occurs, and occasionally an increased tendency to bleeding has been observed.

The vitamin D tolerance of human adults appears to vary considerably. For example, cases of toxicity have been reported after 25,000 IU per day, after 50,000 IU per day for a few weeks, and after over 1 million IU per day for four years. RDA for adults is 400 IU. On the basis of linear growth in childhood, infants can be very sensitive to the effects of vitamin D; growth has been said to be retarded by the administration of only 1,800 IU per day. A German study showed that while a daily dose of 1,000–1,500 IU to each of 300 infants protected all of them from rickets, it was dangerously high for 84 percent of them. On the basis of these data, the minimum toxic dose is calculated to be five to ten times that recommended for optimal growth and rickets prevention. This statement appears to be controversial, however, since the Committee of the American Academy of Pediatrics has set the toxic dose of vitamin D at 1,000–3,000 IU/kg of body weight/day for several weeks or months—a figure many times that quoted above.

There are a considerable number of toxic substances in legumes and oil bearing nuts that are extremely toxic but rapidly lose this property when heated. Many of the common legumes have this property. They are quite toxic for both man and animals when raw but evidently harmless when cooked.

Many of toxins have resulted in FDA action. The Food and Drug Administration this month disclosed a voluntary recall of shelled almonds in cellophane bags from the retail level in Maryland, Pennsylvania, Delaware, Virginia, and the District of Columbia because of *aflatoxin.*

It was reported in late May that the Food and Drug Administration has ordered a rush survey of the seventeen District Offices to determine the extent of cadmium in spinach. FDA ordered the survey as a result of analysis that uncovered possibly significant levels of cadmium in canned spinach.

The Food and Drug Administration in May issued a public warning about imported candy beads, which the agency said contain high levels of cadmium. The Agency said it found cadmium levels of *1000 p.p.m.* in an edible medalian attached to the Candy Love Beads, which were imported from Hong Kong. FDA said at least sixteen injuries attributed to the beads were reported in Illinois, California, Pennsylvania and Washington. The public warning noted that symp-

toms of *severe stomach pains, vomiting, lethargy and drowsiness* appear within an hour of ingestion and ordinarily disappear within a few hours.

In April, FDA made seizures of *whole cottonseed* because of the presence of *aflatoxin.*

It also seized feta cheese because of *benzene hexachloride* residues.

In February, the Food and Drug Administration revealed that wheat in 2, 5, 10 and 25 pound bags were being recalled from the consumer level in Kentucky, Massachusetts, New Jersey and Pennsylvania because of mercury contamination.

Last fall, FDA reported a voluntary recall from the user level in Chester and Philadelphia, of round creme-filled cookies containing *thallium sulfate,* designed for use in rodent control. FDA said that thallium sulfate is banned for non-government use, and *injuries in this case involved two children who ate the cookies.*

It should be apparent from these brief comments that any program to look at trace materials must be extended to all foods, and that it should be a research oriented program. We simply do not know enough to either create alarm or take precipitous action. Surveillance and enforcement should be initiated when supported by reasonable research into effects of the substance in question in normal dietary patterns.

Thank you for your consideration of these views. We look for early action on the proposals and offer again our support.

Sincerely yours,

LEE J. WEDDIG,
Executive Director.

[From the Granite State Vacationer]

SEACOAST REGION: SWORDFISH BAN "STUPID" SAYS SCIENTIST

Dr. Henry A. Schroeder, director of the Trace Elements Laboratory at Dartmouth Medical School, is reported to have called the recent FDC swordfish-mercury scare stupid.

Dr. Schroeder says, "Eat all the swordfish you can get your hands on . . . it is inconceivable and a physical impossibility for man to have contaminated the oceans with mercury".

N.H. health officials have refused to ban the sale of swordfish in this state, though many restaurant owners have taken the popular dish off their menus.

The Dartmouth scientist maintains that if the U.S. dumped every bit of toxic mercury that it produces into the ocean for 100 years, being diluted by 1.2 quintillion tons of ocean water, it could not even be detected enough to give the lowest scale reading.

No comment from the FDA yet.

[From the New York Times, June 23, 1971]

SEE NO THREAT TO FISH-EATERS

Long-time fish eaters have no higher average mercury level in their systems than do people who eat less fish, a Health Department survey showed yesterday.

The survey was made on 105 members of the Anti-Coronary Club, organized by the department in 1957 to determine if a diet low in saturated fats reduced the coronary disease rate.

The department said fish is the mainstay of the low-cholesterol diet, known as the "prudent diet." It recommended that fish be eaten four to seven times a week and said that tuna is the most popular fish.

"Many of the people on our diet for 13 years were really frightened by all the news of mercury poisoning from eating fish," said Health Commissioner Mary C. McLaughlin. "We felt it was our duty to monitor the safety and nutritional adequacy of our diet."

CITY REPORTS MERCURY LEVEL IN FISH EATERS' DIET IS SAFE

Health Department investigators here reported yesterday that a five-month study disclosed no differences between mercury levels in long-time fish eaters and in persons on a "normal American diet."

Dr. David Harris, the deputy health commissioner who headed the investigation, said recent findings of dangerous levels of mercury in swordfish should not frighten consumers into eliminating all fish from their diets.

The test was conducted on 105 members of the so-called Anti-Coronary Club, organized by the Health Department in 1957 to determine whether diets low in saturated fats could reduce the rate of coronary disease.

About half of the group had been living for more than 13 years on the department's "prudent diet," which prescribes servings of fish four to seven times a week.

Senator HART. There will be two witnesses who will be heard, although the schedule shows only one.

After hearing Mr. Robinson, we will hear from the president of the Shellfish Institute of North America, Mr. Cranston Morgan.

First, as scheduled, let us hear the testimony of the Fishery Products Committee of the National Canners Association.

STATEMENT OF H. R. ROBINSON, CHAIRMAN, FISHERY PRODUCTS COMMITTEE, NATIONAL CANNERS ASSOCIATION; ACCOMPANIED BY DR. IRA I. SOMERS, DIRECTOR OF THE ASSOCIATION'S RESEARCH LABORATORIES; AND EDWARD DUNKELBERGER, GENERAL COUNSEL

Mr. ROBINSON. Thank you, Senator Hart.

My name is H. R. Robinson. I am president of the Robinson Canning Co., of New Orleans, La., and am appearing today as chairman of the Fishery Products Committee of the National Canners Association—a nonprofit trade association whose members pack more than 85 percent of the entire national production of canned fish, fruits, vegetables, juices, specialties, and meat. Accompanying me are Dr. Ira I. Somers, director of the Association's Research Laboratories, and Edward Dunkelberger of Covington and Burling, the association's general counsel.

We very much appreciate this opportunity to appear today to present the views of the fish canning industry—a major segment of the industry that would be affected by the bills now under consideration by this committee.

We have a prepared statement. However, to save time, we will condense our remarks and request the inclusion of the prepared text in the statement.

The National Canners Association has fully supported existing Federal, State, and industry programs that are designed to provide consumers with wholesome, high quality seafoods. NCA does not oppose amendments to the Federal Food, Drug, and Cosmetic Act to provide for the adoption of reasonable plant sanitation standards and increased inspection authority for seafood plants and vessels. In our view, the bills before this Committee provide a constructive beginning for Congressional consideration of such legislation, but we feel very strongly that a number of the provisions of the bills are totally unwarranted and would give to the Secretary and those under him an unprecedented and unneeded degree of discretion and authority over fish processing operations.

Fishery products, like other foods, are also fully subject to the rigorous labeling requirements of the Fair Packaging and Labeling Act.

In addition, any fish processor selling to military purchasing agencies must undergo plant inspection by personnel of the Veterinary

Corps. All States of course administer and enforce their own food laws and some States have programs particularly concerned with seafood products.

These compulsory inspection programs are augmented by voluntary industry efforts. The overriding problem in attempting to develop legislation to provide additional regulation of fish and fishery products consumed in this country is the necessity of having that regulation apply equally to domestic and foreign producers. About 60 percent of the edible fishery products consumed in this country have a foreign origin. These imports come from over 120 nations.

The National Marine Fisheries Service has predicted that by 1975 increased imports of fishery products will amount to 70 percent or more of domestic consumption. Imports will be our major source of fishery products in the years to come.

The importance of this increase in volume of fishery imports for domestic consumption has at least a twofold significance for purposes of these bills.

First, if the premise of the bills is correct that American consumers must be protected by additional regularly controls, then clearly these controls should be applied in an equal manner to all supplies for domestic consumption.

Second, the enactment of legislation that provides for more burdensome regulation of domestic production in comparison to imports would seriously disadvantage U.S. producers and processors in their efforts to compete.

Section 401(i) of S. 1528 speaks to this important question in providing that:

> No fish or fishery products shall be imported into the United States if such articles are adulterated or misbranded or otherwise fail to comply with all the inspection, good manufacturing practice, and other provisions of this act and regulations issued thereunder applicable to such articles in commerce within the United States.

Considerable question is raised, however, by the ensuing provision under which the Secretary may determine that a fishery inspection system of any foreign country is "at least equal" to that of the act, and that he may accept certificates of compliance with that country's system as complying with the act, thus fishery products may be imported with no further U.S. plant or product inspection.

Our industry feels most strongly that something more than one time approval of foreign systems is needed. At the very least the FDA should employ a full-time force of inspectors whose only responsibility is to visit foreign plants where fishery products are packed for export to the United States, and to satisfy themselves that the foreign system—and operations under it—are equivalent to those in this country.

A provision should be added to make it clear that the Secretary is free to withdraw certification whenever he finds that circumstances so warrant.

The Secretary should be required by law to report annually to Congress on his administration of the act with respect to fishery imports. In this way Congress can, to some extent, satisfy itself that its intent of equal treatment is being carried out.

We feel that dockside inspections of imports should be stepped up so that the imported product itself can be sampled and examined with a reasonable degree of effectiveness.

Reliance solely on certification of a foreign program would be a serious mistake. Imports should be examined at least to the same degree as domestic production.

The bill should be revised to give greater emphasis to objective, measurable standards, rather than personal subjective judgments. A continuous inspection approach necesarily places undue emphasis on the presence of the inspector and his evaluation of practices and products. It is at this point that the foreign system will inevitably depart from our domestic program and that production in the U.S. plants will be overregulated as compared to imports.

Even with these modifications we are not satisfied that imports will be produced with the same degree of care that will be required of domestic plants. But failure to modify the bill in these respects could very easily have the dual effects of further damaging the domestic industry and of misleading the public as to the quality and wholesomeness of imported fishery products.

I would like to comment briefly on the proposal in S. 296 that responsibility for enforcement of increased fishery inspection legislation be placed in the National Marine Fisheries Service. We recognize that several years ago the issue of which department of Government should be given this additional authority was the subject of some significant differences of opinion, but it is our understanding that this issue has been resolved in favor of retaining the jurisdiction of the FDA over fishery products. We certainly share that view.

I would now like to turn to other aspects of these bills that cause us some concern. For this purpose I will call on Mr. Dunkelberger to discuss the principal legal issues that are raised and Dr. Somers to discuss with the committee those provisions of the proposals involving scientific and technical considerations.

Mr. DUNKELBERGER. Thank you, Mr. Robinson. If I may, I will summarize my statement and I will try to avoid the practice of letting the summary take longer than reading the actual text.

There are essentially five points that we have raised of a legal nature in the bills S. 1528 and S. 700. I will not go into detail on each. We have covered them in our prior testimony in earlier years, but I do believe that the fact that we will be touching on them only lightly today should not assume any indication that we believe that they are not of vital importance in any reasonable fishery inspection legislation.

First of all, we note with pleasure that S. 1528 has accepted the recommendation we have made for the last few years that if you are going to have sanitation standards that will have the force and effect of law those rules and regulations should be adopted in accordance with the formal rulemaking procedure of section 701 (e), (f) and (g) of the Federal Food, Drug and Cosmetic Act.

We note also that S. 700 does not provide for the application of these formal rulemaking procedures. Commissioner Edwards testified this morning that he believes the more informal procedures of section 4 of the Administrative Procedure Act would be adequate. I would just like to make two comments in that respect:

Number one, he suggests that the formal procedure would be lengthy and expensive, and I guess that is always the price of due process. When you are lawmaking, when you are in fact making

laws that will have the effect of being enforced by criminal prosecution, seizure and injunction, we do not believe it is too much to ask that they be based on a comprehensive factual record where cross-examination is available so that the ultimate rules that are developed can be examined and fairly evaluated by those who will have to abide by them and by any courts if judicial review becomes necessary.

Number two, Commissioner Edwards suggested that they have used the informal rulemaking procedure frequently in the FDA. Very frankly, I am not aware that the Federal Food and Drug Administration is permitted to use informal rulemaking for any substantive rules that will have before us an effective law such as the sanitation standards herein authorized.

The Federal Food, Drug and Cosmetic Act is indeed a pioneer statute in establishing formal rulemaking procedures. Food standards, dietary regulations—virtually all regulations under the Food and Drug Act that have the force of law that will be enforced in themselves in the courts—are adopted pursuant to Section 701 (e), (f) and (g), and indeed that also applies to Senator Hart's Truth-in-Packaging Act which became the Fair Packaging and Labeling Act. Those regulations too are adopted under the formal rulemaking procedure.

I am not aware that they have inhibited in any way the effective adoption of regulations that were deemed in the last analysis to be acceptable to all concerned and that have achieved the purpose that Senator Hart had been pushing for in that legislation.

Senator HART. You tempt me this late in the afternoon to discuss that. My silence should not be construed as complete agreement. That is all I will say for the moment.

Mr. DUNKELBERGER. The fact that it is in and it was adopted in the Fair Practices and Labeling Act——

Senator HART. But it sure was not in my suggestion.

Mr. DUNKELBERGER. No, it was not in the proposed bill, that is correct.

The second point we wish to make is that in section 410 of S. 1528 it authorizes administrative control over packaging and labeling which would include provisions for premarket clearance of packages and labels. This would reflect the practice for meat and poultry but would be a rejection of the practice that was applied for years for all other food products.

We know of no testimony presented to this Committee in the last 4 or 5 years in support of the necessity or the need or the justification for administrative premarket clearance of packages and labels. We believe the Food and Drug procedures have worked as well for fishery products as for all other products and we see no need whatever for the re-creation of a procedure we believe has worked with not a great deal of success for poultry.

Section 410(b) of the act would authorize the suspension of certification on an administrative basis, on an administrative factfinding basis. If your certification is suspended you are out of business for that period. Indeed, the act even authorizes emergency suspension under certain circumstances on the basis of administrative facts, so that you get a decision first and then a chance to have an administrative hearing afterward.

Very frankly, we think that the penalties in the Federal Food, Drug and Cosmetic Act, including seizure, injunction and criminal prosecution, have been more than adequate to provide a full panoply of sanctions to achieve effective enforcement of the Federal Food and Drug Act as it is now or as it would be amended.

We do not believe that you have a step forward in fair administration in having an administrative proceeding that can close fish plants on the basis of administrative determination.

Fourth, there is also a provision in there for the inspector to condemn fishery products that he believes are harmful. Here again we have an appeal to the Secretary, but once again it is difficult for us to see why there should be a basis for an administrative action that imposes a sanction on a citizen when there available very effective judicial sanctions that have worked for the past 70 years.

We think that the provision in 411(c) that authorizes a 20-day holding period may not be necessary but certainly is a more than adequate substitute for section 410(d). If an inspector has any question about any product that he finds at any time he could put the 20-day hold on the product and get the court—if he can establish before an objective factfinder, that is, a judge, rather than before his boss who is also the top—that there is a basis for a seizure, an injunction or a criminal prosecution, and he will get it and that product certainly will not go in interstate commerce.

Finally, as the record inspection provision in the bill goes, it takes a reasonable step in the right direction and we believe that additional methods would not be justified. These novel additions that would be tacked on to the Federal Food, Drug and Cosmetic Act for fish products would, taken as a whole, substantially alter the enforcement philosophy of the food laws administered by the Federal Food and Drug Administration under the Secretary of the HEW.

Existing law recognizes the mutual responsibility of both the Government and the industry to assure consumers that they will receive truthfully labeled, high quality, wholesome food products.

I could not emphasize Mr. Weddig's point more strenuously than that we must rely upon the compatibility of industry to provide a wholesome food supply. The FDA has more than adequate authority to take immediate and effective action whenever necessary in the public interest. At the same time the industry is protected against arbitrary or unreasonable action and against the imposition of sanctions upon inaccurate facts or a misinterpretation of the law.

In the last analysis these protections derive from the fact that the agency must proceed through the courts. These bills would completely alter this approach by putting the Secretary and thus the FDA in the dual role of policeman and judge. Whereas now the Agency is responsible for instituting an action where a violation is believed to exist, the FDA would now have additional authority of citing the questions at issue in the first instance. Thus after having concluded in its enforcement capacity that action should be taken the FDA would be empowered to sit in a judicial capacity to pass judgment on its own enforcement decision.

The closing of a fish processing plant, the prohibition of the use of labels or packages or the condemnation of fishery products would

become the subject of administrative decisions and rulings and the courts would be relegated merely to the role of reviewing, in some instances after the fact, the determination and action of the agency. The net effect is to give to the agency a degree of discretion that is totally at odds with established principles of fairness and due process. No showing has been made that could justify this complete shift in regulatory approach for this one class of foods regulated under the Food, Drug and Cosmetic Act.

Mr. ROBINSON. I would now like to ask Dr. Somers to discuss the technical aspects.

Dr. SOMERS. Thank you.

I have been asked to discuss the degree of inspection required in the dangerous materials section. I will not read all the testimony. As has been indicated we are cutting short in the interest of time.

As we understand the basic intent of the sponsors of S. 1528 it is to authorize the promulgation of regulations establishing sanitation requirements for establishments and vessels which process fish and fishery products and provide for effective inspection of those establishments and vessels to assure compliance. The National Canners Association does oppose this approach.

Certainly everyone agrees that the inspection program must be effective. The only question is whether the inspectors must as a matter of law be on hand at all times in all establishments or what more flexible approach would accomplish equally well the purposes of the Act.

The National Canners Association believes that every objective of the Act can be met by a system of inspection under which inspectors will be present in the establishment however frequently and for whatever period the Secretary believes necessary to assure compliance with the good manufacturing practice regulations and other requirements of the Act.

A plant may be so designed, equipped, and operated that the inspector can be confident that his presence is unnecessary at all times to assure compliance. But if a plant is considered to have problems or difficulties, then the inspector can arrange to stay on hand during all operations.

We certainly would concur with the testimony of the National Fisheries Institute with respect to this point about plants which are located close to each other, and there are many of these that are in the categories of canned foods. We feel that this approach would provide the degree of flexibility that is responsive to the need and consistent with the responsibility that has been exercised by the FDA under existing law.

As we have already noted, we believe this approach would more surely result in equal treatment of imports and domestic production. Under any circumstances we see no need for requiring that skilled inspectors be posted at each and every production line if that is not necessary for protection of the public health and achievement of the legislative purpose.

Although the cost of the inspection program is of course secondary to the goal of assuring compliance, it is highly desirable to avoid inefficient use of trained manpower, wasteful effort, and unnecessary cost.

In previous hearings on fishery legislation the inference has been that because fish is a protein food it should be subjected to the same kind of inspection as required for red meat and poultry. I think we have gone into this issue before, Mr. Chairman, and explained that they are not the same.

You have in the case of animals certain diseases which can be transmitted to man, which is not true in the case of fishery products, and there is no basis for this comparison.

As has already been pointed out and as we say in our testimony, the USDA has less than continuous surveillance programs which are working very effectively and we feel that this kind of program would work equally well with fishery products.

Senator HART. Doctor, I might as well interrupt you there.

You are drawing a distinction between red meat and fish in terms of the need for continuous inspection; is that right?

Dr. SOMERS. That is right.

Senator HART. You suggest that fish products don't carry the diseases transmittable to man. I understand continuous inspection takes place for live animals and their carcasses at the slaughterhouse. Admittedly fish is not slaughtered on site at the processing plant.

Granting that the transmittable diseases will be fewer, isn't the possibility of spoilage between the boat and the processing plant greater, and if so, wouldn't that in part wash out the difference between the two products as far as transmittability of disease goes?

Dr. SOMERS. In the case of red meat, carcasses that have been inspected can be taken into another plant and processed into meat products without inspection in the second plant. We are saying the same situation should be true for fish, which are wholesome just as the carcass is wholesome, and when taken into the plant can be processed into a wholesome product without someone being there all the time to assure that this takes place.

Yes, the plant may have to have better quality control to make sure that spoilage does not take place, but in the case of many seafoods, tuna, for example, the product is brought into the plant frozen as hard as rock. It remains frozen until it is thawed and placed into precooking baskets where it is immediately precooked and from that time on the chance of spoilage is very remote because it goes out of the basket onto the table, is cleaned, and the portions of the fish which are not used are taken away from the loins and the loins go immediately into the can and are closed. In that case the product does not lie around in an area in a way in which it could become spoiled or unwholesome. This is true of other products.

While there may be cases where what you say is true, it is not universally so.

We propose the adoption of the proposals made by you in 1967. We can't ignore that you made this proposal then and I believe some of us appeared before you in a discussion of that bill at that time. It also is the same proposal as put forth in the Cotton-Magnuson bill, S. 700, this year, which would give the Secretary the discretion to determine the degree of inspection needed in each plant for each segment of the industry.

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Now on the subject of surveillance for dangerous materials about which we have heard a great deal today. We were happy to have Dr. Goldwater here to clarify some of the issues, because quite frankly, these were somewhat disturbing to us as they have been discussed. We think a significant difference between the fishery inspection legislation considered in prior years and S. 1528 now before the committee is included in section 410(j) which would direct the Secretary to establish an intensive screening system for the type of dangerous materials in fish and fishery products.

Although we would not for a minute underestimate the vital importance of establishing that all segments of the American diet are free from materials that may be dangerous to health, as a scientist I am particularly concerned with the approach that is put forth in this new provision and I think I would have to endorse what other scientists have said here today about the problems that this would cause.

The issue has been raised as to whether there may be constituent in some food at extremely low levels that are natural to the food or that have found their way there by some unidentified means that may through accumulative impact result in some harms to consumers.

The absence of data makes it impossible to provide meaningful answers at this time. On the basis of presently available information, no segment of the American food supply presently on the market has been shown to contain any such substance at levels that would be expected to cause immediate harm to the consumer.

Yesterday we heard testimony about Mrs. Y, but I think in this case we need documentation or conclusive medical judgments as has been explained by Dr. Goldwater.

The absence of demonstrated harm should, of course, not give rise to complacency or discourage further inquiry but it does dictate that we should proceed in a careful and deliberate manner so as to neither overstate nor understate the significance of what we are doing. At this stage there have been no authoritative decision as to what possible constituents should be investigated or whether any constituents occur at levels that might, in fact, cause injury.

Indeed, adequate methods of analysis may not yet be available for finding significant levels of some of these constituents and this has certainly been going on by some of the things we have heard from the last 2 days.

During these circumstances we believe that the facts cannot possibly justify the crash program as would be proposed by section 410(j). I must emphasize "crash" under which the Secretary would be required as a matter of law to propose regulations within 90 days after enactment of amendments specifying all dangerous materials and indicating the program he will follow. There is no doubt in my mind that this crisis approach could not work to the best interest of the American consumer. It has no scientific basis in fact and could well cause irrevocable harm to innocent people and unnecessary and utter confusion as emphasized by Dr. Perry this morning. He said that cadmium is accumulated before the age of 20 but to my knowledge most children are not heavy eaters of shellfish where he said most of it might come from.

The matter needs much study by a qualified body before moving ahead in the arbitrary manner proposed by this legislation. We agree the recent concern over the possible existence of low level toxic substances in our food should not be overlooked but to move ahead without facts is an illogical and unscientific approach.

Decision made on the present state of knowledge could very easily destroy the public confidence in the segment of our food supply, direct attention away from other more legitimate issues, and deprive consumers of an important part of their food supply.

The FDA has already undertaken a program designed to identify substances, and they have explained this and I will not go into it. We have every reason to believe that HEW is proceeding on the basis of established scientific principles and is ordering its priority in the light of available knowledge.

No new authority is needed to augment these efforts at this time. Further, if as a result of its studies the FDA does in fact identify areas of possible concern, there is every reason to believe that its existing authority under the Federal Food, Drug and Cosmetic Act is more than adequate to deal with the situation. There can be no doubt that the identification of a problem will give rise to cooperative efforts by the FDA and the second segment of industry.

If, for any reason, the administration concludes that the voluntary approach cannot work, it has available the full range of enforcement provisions in the act. Accordingly we believe that the committee would be making a serious mistake to focus attention on merely one segment of the food industry on a crash basis that would well cause misallocation of resources, public misunderstanding and unnecessary harm.

We respectfully submit that section 401(j) has no appropriate part in fishery inspection legislation, and that the only reasonable approach is that which is now being undertaken by the FDA in its attempt to assess on the broadest possible basis the scope of the problem, if any in fact exists.

Senator HART. Gentlemen, thank you very much.

I remember, of course, the other occasions on which you have visited us on that subject. When all three of you went through the summaries of your testimony, it was brought even more clearly in my memory. I hope I will not bring up a couple that we ran around on in those earlier instances. I think not.

You comment on the exemptions that S. 1528 provides. Your statement says processing operations performed on boats or ships would not call for continuous inspection whereas the same operation on shore would be covered.

Perhaps for the record, if you don't know now, have you any idea how many ships there are which actually perform these kinds of processing operations?

Mr. ROBINSON. Sir, I have no way of telling you precisely how many ships are performing it, but as the term processing is defined in the bill, anything other than icing that catch in the hold of the vessel is processing.

It is my opinion, therefore, that the great bulk of what may be coming in is defined under the bill as processed.

Senator HART. We can redefine to bring them under or back off on it.

There is criticism of the exemption of fish houses from continuous inspection. Yet we require it of canners. The theory is that in most cases the product will be inspected later. Isn't it possible that a person could see an inequity here if, for example, adulterated fish are sold to a canner out of a fish house and then the adulteration is discovered and the seizure occurs in the cannery and the cannery is stuck?

Mr. ROBINSON. You have to look at the exemption of the fish house in several respects. First the fish house is defined in the proposed act as a place where it is unloaded and no operation other than icing takes place.

Now, most fish houses would by their very characteristics not be fish houses to the extent that they may be unloading catch, whether it be salmon in Oregon or whether it be shrimp in Louisiana—it makes no difference—but by the same token they are also carrying on in that same house operations other than that including dressing fish, selling to the public.

We think the danger under the act as we see it and interpret it, S. 1528, is that if a fish house delivers to an establishment—and you said cannery so I will say cannery since we are the canners—if it delivers to a cannery the subject is under inspection and is therefore subject to inspection at that point.

There is no argument there. The great area of difficulty and dispute, possibly, is the fact that a great tonnage, a great amount of seafoods of all kinds, fish and other seafoods that are consumed in this Nation, is going to move through a fish house to a retail dealer to the public and they will never have been looked at by anybody, local, State or Federal.

If you are trying to assure the wholesomeness of the product, go to the source of the trouble with the product. The source of the trouble with the product is basically the fresh fish market.

Senator HART. I know we have run around that one for some time.

Mr. ROBINSON. We have exchanged words on this before, Senator.

Senator HART. Even if I thought it possible, I am not yet convinced that we should have continuous inspection at every one of those points, and I know you are not arguing that point, but that there should be supervision adequate to insure the safety of the product even after it is put on the truck and taken to Mobile or from a Great Lakes port to Knoxville.

Mr. DUNKELBERGER. Senator, I think our only point on this is that in this one respect the drafters of S. 1528 seem to reflect the wisdom of our approach, and that is that you should decide where inspection is necessary and then impose it. This is the proposal that was put forth by Commissioner Edwards this morning and the proposal that you made in the 1967 bill.

To a limited extent that idea is still reflected in the exemptions in what you have just said, You don't want more inspection than is necessary. You want to decide where it is necessary and reasonable and then you want it imposed.

Our point is that we believe that that flexibility should not be limited to one area of the industry. It should be available for the

expert, the Commission of the Food and Drug Administration, to apply across the board to all segments of the industry.

Senator HART. Mr. Bickwit?

Mr. BICKWIT. I have no questions, Mr. Chairman.

Senator HART. I hope just as much as you that we don't go through it again.

Thank you for coming.

(The statement follows:)

STATEMENT OF THE NATIONAL CANNERS ASSOCIATION

My name is H. R. Robinson. I am President of the Robinson Canning Company of New Orleans, Louisiana, and am appearing today as Chairman of the Fishery Products Committee of the National Canners Association—a nonprofit trade association whose members pack more than 85 percent of the entire national production of canned fish, fruits, vegetables, juices, specialties, and meat. Accompanying me are Dr. Ira I. Somers, Director of the Association's Research Laboratories, and Edward Dunkelberger of Covington and Burling, the Association's General Counsel.

We very much appreciate this opportunity to appear today to present the views of the fish canning industry—a major segment of the industry that would be affected by the bills now under consideration by this Committee. The value of the annual domestic production of canned fishery products approximates one-half billion dollars. Contributing to this total are such products as canned tuna, salmon, shrimp, sardines, mackerel, clams, crab, oysters, and a variety of specialty products. All of these are packed in hermetically sealed containers and sterilized by heat.

The National Canners Association has fully supported existing Federal, State and industry programs that are designed to provide consumers with wholesome, high quality seafoods. NCA does not oppose amendments to the Federal Food, Drug, and Cosmetic Act to provide for the adoption of reasonable plant sanitation standards and increased inspection authority for seafood plants and vessels. In our view, the bills before this Committee provide a constructive beginning for Congressional consideration of such legislation, but we feel very strongly that a number of the provisions of the bills are totally unwarranted and would give to the Secretary and those under him an unprecedented and unneeded degree of discretion and authority over fish processing operations.

EXISTING REGULATION OF SEAFOODS

As a starting point for the consideration of additional Federal legislation regulating fishery products, we believe a basic understanding of the Federal laws and programs that now apply to these products will be helpful. Indeed, much of the discussion of this bill in this and prior years seems to be predicated on the mistaken assumption that there is little or no regulation of hermetically sealed and sterilized fishery products. Nothing could be further from the truth.

The principal law is of course the Federal Food, Drug, and Cosmetic Act, which prohibits the shipment in interstate commerce of any adulterated or misbranded food, and which is fully applicable to fish, shellfish, and other seafood products.

The adulteration provisions of the Act render unlawful foods that are unfit for human consumption, that contain poisonous ingredients, unsafe color or food additives, unlawful pesticide residues, or ingredients that conceal inferiority, and foods that are packed under insanitary conditions. The misbranding provisions apply with equal thoroughness to the labeling of all food products, prohibiting false and misleading labeling and requiring label declaration of certain information about the product, including the name of the food and its ingredients, the name and address of the packer or distributor, and the quantity of the contents.

The Federal Food, Drug, and Cosmetic Act authorizes the adoption of standards of identity, quality, and fill of container—a number of which

have been promulgated by the Food and Drug Administration for canned fishery products, in cooperation with the National Canners Association and its fish canner members. These standards prescribe minimum requirements for such commodities as canned tuna, shrimp, and oysters, and provide effective and enforceable standards in the interest of consumers.

Fishery products, like other foods, are also fully subject to the rigorous labeling requirements of the Fair Packaging and Labeling Act. As we will point out later in our statement, this coverage is of particular significance in the light of some of the labeling provisions of the bills that are the subject of these hearings.

The Federal Food and Drug Administration adminsters and enforces the provisions of these Acts through its authority to inspect food plants, to examine products shipped in interstate commerce, and to take appropriate enforcement action through seizure, injunction, or criminal prosecution of corporate and individual violators.

In addition, any fish processor selling to military purchasing agencies must undergo plant inspection by personnel of the Veterinary Corps, and must comply with comprehensive quality and sanitary standards promulgated by these agencies. All States of course administer and enforce their own food laws, and some States have programs particularly concerned with seafood products.

These compulsory inspection programs are augmented by voluntary industry efforts, undertaken by companies and associations, either independently or in cooperation with the FDA. The National Canners Association Research Laboratories, under the direction of Dr. Somers, have carried on an extensive sanitation program for many years, training company personnel and advising on individual sanitation problems.

A fundamental part of the work of the NCA Research Laboratories has always included extensive research in the canning process and the establishment of processing times and temperatures for the growing number of canned products. This work is carried on in all three NCA Laboratories, one of which—located in Seattle, Washington—is devoted almost exclusively to fishery products. These quality improvement and quality assurance programs of the Laboratories indicate the emphasis the canning industry places on providing the consumer with wholesome and good quality fishery products.

THE SIGNIFICANCE OF FISHERY IMPORTS

Unquestionably, the overriding problem in attempting to develop effective legislation to provide additional regulation of fish and fishery products consumed in this country is the necessity of having that regulation apply equally to domestic and foreign production. As this Committee well knows, about 60 percent of the edible fishery products consumed in this country have a foreign origin. These imports come from all over 120 countries in all parts of the world, including such countries as Canada, Japan, Mexico, Peru, Iceland, Norway, Spain, Portugal, Denmark, Australia, Russia, Costa Rica, Guyana, Malaysia, Kuwait, India, Pakistan, Saudi Arabia, Sierra Leone, Ivory Coast, and many others.

The accompanying table, taken from a recently released Department of Commerce publication, makes clear the increasing inroads that imports have made on domestic production in the past decade. Whereas the domestic catch has fallen off from 3.3 billion pounds in the record year of 1950 and has stabilized in the past ten years at about 2.5 billion pounds, imports of edible fishery products in this period have grown steadily from 1.9 billion to 3.7 billion pounds in 1970, and have accounted for all of the increased domestic consumption.

SUPPLY OF EDIBLE FISHERY PRODUCTS, 1959–70

(Round weight basis)

Year	Domestic catch		Imports[1]		Total—million pounds
	Million pounds	Percent	Million pounds	Percent	
1959	2,369	55.5	1,901	44.5	4,270
1960	2,498	58.6	1,766	41.4	4,264
1961	2,490	57.4	1,845	42.6	4,335
1962	2,540	54.6	2,115	45.4	4,655
1963	2,556	53.2	2,247	46.8	4,803
1964	2,497	51.2	2,376	48.8	4,873
1965	2,587	50.1	2,576	49.9	5,163
1966	2,573	47.4	2,859	52.6	5,432
1967	2,368	48.8	2,481	51.2	4,849
1968	2,296	41.5	3,232	58.5	5,528
1969	2,246	40.1	3,353	59.9	5,599
1970	2,482	40.2	[2]3,692	59.8	[2]6,174

[1] Excludes imports of cured cod into Puerto Rico, but includes landings of foreign-caught tuna in American Samoa.
[2] Record (the record domestic catch of edible fishery products amounting to 3,307 million pounds was landed in 1950).

Source: Current Fishery Statistics No. 5600, Fisheries of the United States, 1970, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service.

The National Marine Fisheries Service has predicted that by 1975 increased imports of fishery products will amount to 70 percent or more of domestic consumption. Reduced tariffs, spiralling domestic costs, and rising consumption all assure that imports will be our major source of fishery products in the years to come.

The importance of this increasing volume of fishery imports for domestic consumption has at least a two-fold significance for purposes of the bills before this Committee. First, if the premise of the bills is correct that American consumers must be protected by additional regulatory controls, including sanitation standards and increased plant and product inspection, then clearly those controls should be applied in an equal manner to all supplies for domestic consumption. If such controls are necessary for domestic production, then they should be just as necessary, or perhaps more so, for imports—which comprise three-fifths of domestic consumption and are produced under widely varying conditions in all parts of the world.

Second, the enactment of legislation that provides for more burdensome regulation of domestic production in comparison to imports would seriously disadvantage United States producers and processors in their efforts to compete. The inevitable result would be increasing financial difficulties for American fishermen, workers and processors who look to the domestic fishery industry for their livelihood.

Section 410(i) of S. 1528 speaks to this import question in providing that

> "No fish or fishery products shall be imported into the United States if such articles are adulterated or misbranded or otherwise fail to comply with all the inspection, good manufacturing practice, and other provisions of this Act and regulations issued thereunder applicable to such articles in commerce within the United States."

Considerable question is raised, however, by the ensuing proviso under which the Secretary may determine that a fishery inspection system of any foreign country is "at least equal" to that of the Act, and that he may accept certificates of compliance with that country's system as compliance with the Act. In other words, once the Secretary approves a foreign system as equal to Act, fishery products may be imported with no further United States plant or product inspection.

What concerns us is that the day-to-day judgments by inspectors and enforcement officials in a foreign country cannot help but be made in the light of that country's interest in its exports to the United States. It is inconceivable that close decisions in such areas as sanitation, raw product quality, and processing practices will be made with the same vigor, consistency and thoroughness under a foreign system as in this country, when the foreign production is intended for export.

Our industry feels most strongly that something more than one-time approval of foreign systems is needed. At the very least the FDA should employ a full-time force of inspectors whose only responsibility is to visit foreign plants where fishery products are packed for export to the United States, and to satisfy themselves that the foreign system—*and operations under it*—are equivalent to those of this country. In this connection, a provision should be added to make it clear that the Secretary is free to withdraw certification in his discretion whenever he finds that circumstances so warrant. We note that S. 700 would require an annual evaluation of foreign programs by the Secretary and would authorize the Secretary to prescribe the terms and conditions of certification. Certainly such conditions should include authority to withdraw certification at any time if the foreign program does not maintain equality with domestic regulation.

Second, the Secretary should be required by law to report annually to Congress on his administration of the Act with respect to fishery imports. In this way Congress can to some extent satisfy itself that its intent of equal treatment is being carried out.

Third, we feel that dockside inspections of imports should be stepped up so that the imported product itself can be sampled and examined with a reasonable degree of effectiveness. Reliance solely on certification of a foreign program would be a serious mistake. Under any circumstances imports should be examined at least to the same degree as domestic production.

Finally—and most important of all—the bill should be revised to give greater emphasis to objective, measurable standards, rather than personal, subjective judgments. A continuous inspection approach necessarily places undue emphasis on the presence of the inspector and his evaluation of practices and products. It is at this point that the foreign system will inevitably depart from our domestic program, and that production in United States plants will be over-regulated as compared to imports.

The only effective control on foreign production can be in requiring the adoption of equal good manufacturing practice requirements, and by periodic visits to assure that each plant is in compliance with them. Reliance on governmental continuous supervision of operations would be seriously misplaced, and would tend to undercut the responsibility of the operator himself to produce wholesome quality fishery products.

Even with these modifications we are not satisfied that imports will be produced with the same degree of care that will be required of domestic plants. But failure to modify the bill in these respects could very easily have the dual effects of further damaging the domestic industry and of misleading the public as to the quality and wholesomeness of imported fishery products.

Mr. Chairman, I would also like to comment briefly on the proposal in S. 296 that responsibility for enforcement of increased fishery inspection legislation be placed in the National Marine Fisheries Service. We recognize that several years ago the issue of which department of Government should be given this additional authority was the subject of some significant differences of opinion, but it is our understanding that this issue has been resolved, at least for most proponents of this legislation, in favor of retaining the jurisdiction of the Federal Food and Drug Administration over fishery products. We share that view.

* * * * * * *

I would now like to turn to other aspects of these bills that cause us some concern. For this purpose, I will call on Mr. Dunkelberger to discuss the principal legal issues that are raised and Dr. Somers to discuss with the Committee those provisions of the proposals involving scientific and technical considerations.

* * * * * * *

(Mr. Dunkelberger) In our testimony in prior years on fishery inspection legislation we have consistently supported the granting of authority to the Secretary to adopt sanitation standards for fishery plants and vessels. We urged, however, that because these standards would have the force of law, enforceable by criminal prosecution, seizure, and injunction, they should be promulgated under formal rulemaking procedures, with full opportunity for participation by all interested parties. We note that S. 1528 recognizes the fundamental importance of this point in providing that all regulations under

these amendments must be adopted in compliance wtih Section 701(e), (f), and (g) of the Act.

ADMINISTRATIVE CONTROL OVER PACKAGES AND LABELS

Section 410(f) of S. 1528 is modeled on similar provisions in the Meat and Poultry Acts, under which packers of these products must submit packages and labels for clearance prior to use. Whatever may be said with regard to poultry and meat, we know of no facts or allegations that would support the necessity for this label and package licensing procedure in the case of fish and fishery products. There has been no suggestion that labels and packages for fish and fishery products require any different approach from other foods regulated under the Federal Food, Drug, and Cosmetic Act.

As we stated at the outset, fish and fishery products are fully subject to the adulteration and misbranding prohibitions of the Federal Food, Drug, and Cosmetic Act and would remain so after the enactment of the bill. If a product is found to be misbranded or inappropriately labeled, action may be taken in the courts to seize the product or enjoin its shipment, or to prosecute the manufacturer or distributor. A number of canned fish products are of course governed by standards of identity and fill of container, which prescribe detailed labeling and packaging requirements.

Although the bill does not by its terms explicitly require premarket clearance of packaging and labeling on a routine basis, the Secretary could order a package or label in use off the market if he deemed it to constitute misbranding.

The company would be compelled to comply with the order, and its only redress would be either to change the labeling and packaging as directed or to request a hearing before the Secretary.

Although a hearing is provided, as well as judicial review from the Secretary's decision following the hearing, these procedures provide scant protection for a company whose packaging or labeling has been ordered to be withheld. At the Secretary's discretion the labeling or packaging in question could not be used pending the outcome of the hearing. The decision on the hearing record would be made by the Secretary—who had already concluded that the labeling or packaging was in violation. And traditionally, courts are prone to give great weight to an administrator's findings of fact.

Under the procedures contained in S. 1528, the Secretary would thus have virtually unchecked discretionary authority to control the packaging and labeling of fishery products. None of the testimony in support of fishery product legislation has established or implied a need for these arbitrary controls over the labeling and packaging of fishery products, which at present are fully subject to the rigorous requirements of the Food, Drug, and Cosmetic Act and the Fair Packaging and Labeling Act.

One other aspect of the labeling provisions of S. 1528 causes us some concern. The bill contemplates the use of an official mark and inspection legend on all fishery products. In our view, the use of such a mark and legend provides no additional consumer protection, and would in fact be superfluous. Such mark or legend has been justified on other products, such as meat and poultry, in the past, at least in part on the ground that consumers were entitled to know which products were inspected under the Federal program and which were not. In view of the fact that S. 1528 will require that all States adopt comparable regulations for intrastate shipments, it can be seen that all domestic fishery products available for sale in this country will be subject to effective regulations, and that an official mark or legend is unnecessary.

Indeed, an official mark requirement could well cause serious operational problems and unnecessary expense if the mark were required to include a plant identification number. In many segments of the industry it is not unusual for a company to use a single label for production from several plants. A separate label for each plant would increase cost and complicate warehouse and handling operations.

CERTIFICATION OF ESTABLISHMENT AND VESSELS

Section 410(b) of the bill provides that within 60 days after the effective date of sanitation and quality control standards, fishery products may not

be processed for interstate commerce except in an establishment or vessel that has an effective certfiicate of registration issued by the Secretary. Although this certification procedure may be useful for purposes of identifying which establishments and vessels are processing or handling fish and fishery products, we do not believe that it should be used as a means of administrative enforcement in place of court action.

Under the bill, the certificate of any establishment or vessel may be suspended for failure to comply with any of the requirements of the amended provisions of the Act. The company would be entitled to a hearing, but here again the Secretary would sit as the judge after he had already concluded that a violation had occurred.

No showing has been made that this administrative certificate suspension procedure is necessary for the effective enforcement of the Act. We urge that registration of plants and vessels be employed only for purposes of identification, rather than for enforcement, in much the same manner that drug plants are registered under the Federal Food, Drug, and Cosmetic Act. If some suspension authority is thought to be necessary, we feel very strongly that such an action should be brought in the first instance in the courts, rather than by an administrative proceeding.

Another troublesome aspect of the suspension provisions is that a certificate may be suspended immediately by the Secretary if an establishment or vessel refuses to permit access for inspection or where an inspection discloses a violation which the Secretary determines would involve an undue risk of imminent harm to consumers if processing were to continue prior to the correction of the violation. The holder of a suspended certificate would be permitted to apply for reinstatement, which must be granted if adequate measures have been taken to come into compliance, but the establishment would remain closed pending a final decision.

Under these provisions, the Secretary could prevent a company from operating while any question of fact or law was being considered. We know of no justification or need for this punishment first—trial later—procedure. The enforcement provisions of the existing Act provide more than adequate means of obtaining expedited action when imminent harm to consumers is threatened. Injunctions and seizures are readily available on an emergency basis, and the possibility of criminal prosecution has proved sufficient in the past to prevent irresponsible disregard of the Act's prohibitions.

ADMINISTRATIVE CONDEMNATION

A related provision of the bill is equally troublesome. Under Section 410(d) an inspector is authorized to order a company to condemn and segregate any fish or fishery products which he finds to be adulterated, and to order destruction unless an appeal is taken to the Secretary. Failure to comply with such administrative action would be grounds for suspension of a certificate of registration.

A company would thus be faced with the necessity of complying with the inspector's order—or the Secretary's order on appeal—if it wished to continue to operate, even if it questioned the basis for the decision. If it refused to destroy the fish, the company's certificate would be suspended and its only recourse would be to apply for reinstatement. Any shipment of fishery products after the suspension could give rise to an injunction or criminal prosecution.

This authority for arbitrary administrative action appears to be wholly unjustified. The traditional sanctions of seizure, injunction, and criminal prosecution in the FD&C Act provide adequate powers for the Secretary to take whatever actions thought necessary to protect the public health. Certainly an inspector and Secretary should not be empowered to order summary destruction of fish or fishery products if there is any question as to the correctness of the judgment.

These powers for arbitrary suspension of a certificate and condemnation of a product prior to a judicial hearing are particularly inappropriate in view of the additional authority that would be granted in Section 411(c), which would amend the Act to provide that an inspector may detain for a period up to 20 days any article that he finds to be adulterated, misbranded, or otherwise in violation of the Act. The product must be detained in a suitable manner in order to prevent decomposition, but the cost must be borne by the owner. The stated purpose of the detention would be to

permit the Secretary to bring a seizure action against violative articles. This authority does not exist—and has not been found to be necessary—under the present FD&C Act. Nevertheless, it would appear to be a more reasonable approach to preventing adulterated products from being shipped in commerce than condemnation and suspension of certificates on the basis of administrative action.

RECORDS INSPECTION AND ADMINISTRATIVE SUBPOENAS

S. 1528 would broaden the Secretary's inspection authority over plants and vessels to include access to documents and records showing the receipt, delivery, sale, movement, or disposition of fish or fishery products. Under existing law the agency has no right of access to such documents, but it is our understanding that most companies as a matter of practice permit inspectors to examine such records in order to determine the destination and location of particular lots.

The Association does not object to the addition of this new records inspection authority, particularly in view of the fact that inspectors are usually granted access to these records, which are reasonably related to the enforcement and adulteration provisions of the Act S. 700, however, would go substantially beyond this authority, and would have the effect of throwing open to inspectors all company files and records.

The National Canners Association sees no legitimate need for making all company records available for inspection. Indeed, this provision in S. 1528 raises serious Constitutional questions under the recent decisions of the Supreme Court in *Camara* v. *Municipal Court*, 387 U.S. 523 (1967) and *See* v. *Seattle*, 387 U.S. 541 (1967), in which the Court held that commercial establishments are protected by the Constitution's guarantee against reasonable search and seizure. In spite of the fact that the Court has condemned all inspections in the absence of a search warrant, this bill seeks to render these Constitutional protections inapplicable to a selected group of commercial establishments—fish processing plants.

In a somewhat related provision, S. 700 would authorize the Secretary to issue subpoenas requiring the attendance and testimony of witnesses and the production of documents on any matter under investigation or under question before the Secretary in any hearing or other proceeding authorized under the Act. In view of the enforcement and investigational authority of the Secretary under the existing Act, as well as the discovery provisions of the Federal Rules, it is difficult to see why these very broad subpoena provisions are thought to be necessary.

These novel enforcement provisions that would be tacked on to the Food, Drug, and Cosmetic Act for fishery products alone, taken as a whole, substantially alter the enforcement philosophy of the food laws administered by the Federal Food and Drug Administration under the Secretary of Health, Education, and Welfare.

Existing law recognizes the mutual responsibility of both the Government and the industry to assure consumers that they will receive truthfully labeled, high quality, wholesome food products. The FDA has more than adequate authority to take immediate and effective action whenever necessary in the public interest. At the same time, the industry is protected against arbitrary or unreasonable action, and against the imposition of sanctions upon inaccurate facts or a misinterpretation of the law. In the last analysis, these protections derive from the fact that the agency must proceed through the courts.

These bills would completely alter this approach by putting the Secretary—and thus the FDA— in the dual role of policeman and judge. Whereas now the agency is responsible for investigating and instituting action where a violation is believed to exist, the FDA would have the additional authority of actually deciding the questions at issue in the first instance. Thus, after having concluded in its enforcement capacity that action should be taken, the FDA would be empowered to sit in a judicial capacity to pass judgment on its own enforcement decision.

The closing of a fish processing plant, the prohibition of the use of labels and packages, or the condemnation of fishery products would become the subject of administrative decisions and rulings, and the courts would be relegated merely to the role of reviewing—in some instance, after the fact—the

determination and action of the agency. The net effect is to give to the agency a degree of discretion that is totally at odds with established principles of fairness and due process. No showing has been made that could justify this complete shift in regulatory approach for this one class of foods regulated under the Federal Food, Drug, and Cosmetic Act.

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(Mr. Robinson) At this point Dr. Somers will discuss the technical and scientific matters raised by the bill.

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(Dr. Somers) The two issues I have been asked to comment upon are the degree of inspection required, and the dangerous materials section.

PLANT AND VESSEL INSPECTION

As we understand the basic intent of the sponsors of S. 1528, it is to authorize the promulgation of regulations establishing sanitation requirements for establishments and vessels which process fish and fishery products, and to provide for effective inspection of those establishments and vessels to assure compliance. The National Canners Association does not oppose this approach.

Certainly everyone agrees that the inspection program must be effective. The only question is whether inspectors must, as a matter of law, be on hand at all times in all establishments, or whether a more flexible approach of inspections, varying with the need as seen by the Secretary would accomplish equally well the purposes of the Act.

The National Canners Asociation believes that every objective of the Act can be met by a system of inspection under which inspectors will be present in the establishment however frequently and for whatever period the Secretary believes necessary to assure compliance with the good manufacturing practice regulations and other requirements of the Act. A plant may be so designed, equipped, and operated that the inspector can be confident that his presence is unnecessary at all times to assure compliance. But if a plant is considered to have problems or difficulties, then the inspector can arrange to stay on hand during all operations.

We feel that this approach would provide the degree of flexibility that is responsive to the need and consistent with the responsibility that has been exercised by the Federal Food and Drug Administration under existing law. As we have already noted, we believe this approach would more surely result in equal treatment of imports and domestic production. Under any circumstances, we see no need for requiring that skilled inspectors be posted at each and every production line if that is not necessary for protection of the public health and achievement of the legislative purpose. Although the cost of the inspection program is of course secondary to the goal of assuring compliance, it is highly desirable to avoid inefficient use of trained manpower, wasteful effort, and unnecessary cost.

In previous hearings on fishery legislation the inference has been that because fish is a protein food it should be subjected to the same kind of inspection as required for red meat and poultry. If this is the basis for the present proposal for continuous inspection for seafood plants, we believe it is important to clarify the issue. In the case of red meat an inspection is made of both the live animals and the carcasses on a continuous basis. The primary purpose of this inspection is to check for signs of animal disease, tuberculosis, trichinosis, or brucillosis, which can be communicated to man. This is done to protect not only the consumer, but the workers in the plant who may handle the meat. There has been expert testimony in previous fishery legislation hearings to the effect that no such diseases occur in fish because they are cold blooded animals. In fact, when discussing this question before the Consumer Subcommittee in 1968. The then Commissioner of Food and Drugs said, "if you restrict the question to deep water ocean fish alone, I would have to say that they are one of the cleanest sources of human foods that we know of." In that same testimony, the Commisioner indicated that shellfish may be the means of transmitting disease-producing organisms to man, but in this case they are only the carriers of the organisms from polluted water to the consumer. But as he indicated, "there is no way in which an inspector can look at shellfish in the marketplace and tell whether it came

from a polluted or (an) unpolluted area." In fact, in the case of hepatitus, he said, "we have never recovered the hepatitus virus. It has not been isolated or cultured. We know its mode of transmission, but it has eluded us." He went on to say, however, that all these microorganisms are destroyed when the product is heated.

Thus, you see, there is no relationship between the need for continuous carcas inspection of red meat and poultry and continuous inspection of seafoods.

We would like to point out one other fact which seems to have been lost sight of in the comparison between red meat or poultry and seafoods. The USDA, which is the agency responsible for supervising meat and poultry inspection, has inspection programs that are considerably less than continuous when inspected carcasses are taken into a processing plant to be made into meat products. One of these is called "the minimal supervision plan" whereby the inspector comes in unannounced from time to time and makes a general inspection plus one thorough surveillance inspection approximately every two weeks. The operations permitted under "minimum supervision" include packing properly marked pre-inspected meat products into shipping containers bearing marks of inspection and shipping them; smoking and/or cooking operations where adequate records are maintained, and where the finished product is available for re-inspection; retorting of canned product providing the inspector has at some time observed the retorting operation and the canned product is available for inspection the following day; and labeling of properly coded canned products provided the labeled cans are available to the inspector the following day. USDA has also what they call "limited supervision" where unannounced visits are made, plus about twice a week surveillance. This may include broad coverage of many establishments by one inspector in a large metropolitan area. As you can see, once the safety of the carcass has been established, USDA does consider that much less than continuous inspection is sufficient to assure the quality and safety of meat and poultry products. We think the same should be true for seafoods where the safety of the carcass is also established by the fact that the fish are cold blooded animals coming from the sea and cannot be a carrier of human diseases with the exception of shell fish where the control has to be exerted on the fishing grounds rather than in the plant. There is indeed a direct parallel in taking inspected safe carcasses of red meat and safe carcasses of seafoods and converting them into canned meats and canned fish products. If surveillance for minimal inspection is sufficient for red meats, it should be for seafoods in similar cases.

We therefore propose the adoption of the inspection approach put forward in the bill introduced by Senator Hart in 1967, and by Senators Cotton and Magnuson in S. 700 this year, which would give to the Secretary the discertion to determine the degree of inspection needed in each plant or segment of the industry.

In this regard, one of the most puzzling aspects of S. 1528 is the inspection exemptions of Section 411(d) for retail dealers and fish houses, and the differing degree of inspection required for vessels than for other processing establishments. Whatever basis may exist for exempting from continuous inspection such operations with respect to fresh fish as unloading, icing or other refrigeration, shipment, and retail handling, also exists for canning operations where the fish are processed upon receipt and packed in hermetically sealed containers and sterilized, with virtually no opportunity for subsequent spoilage.

It is inconceivable to us that any legislation could provide for limited regulation and inspection of the entire whole fresh fish operation from boat through retail store, and at the same time require continuous inspection of processing operations. A further anomoly is that processing operations performed on boats or ships would be exempt from continuous inspection, whereas the same operations performed on shore would be fully covered.

We feel that these apparently carefully considered exemption provisions in the bill provide further justification for revising the inspection approach to give the Secretary complete discretion to decide how often inspectors should visit fishery establishments and vessels. The arbitrary and totally unnecessary requirement of continuous inspection in certain establishments cannot be justified in terms of need, cost, or fairness.

SURVEILLANCE FOR DANGEROUS MATERIALS

A significant difference between the fishery inspection legislation considered in prior years and S. 1528 now before the Committee is the inclusion of Section 410(j), which would direct the Secretary to establish an "intensive screening system for the detection of (dangerous) materials in fish and fishery products." Although we would not for a minute underestimate the vital importance of establishing that all segments of the American diet are free from materials that may be dangerous to health, as a scientist I am particularly concerned with the approach that is put forward in this new provision, Section 410(j), of the proposed legislation.

The issue that has been raised is whether there may be constituents in some foods, at extremely low levels, that are natural to the food or have found their way into it by some unidentified means, that may through cumulative impact result in some harm to consumers.

The absence of data makes it impossible to provide meaningful and responsible answers at this time. On the basis of presently available information, no segment of the American food supply presently on the market has been shown to contain any such substances at levels that would in fact be expected to cause immediate harm to the consumers. The absence of demonstrated harm should of course not give rise to complacency, or discourage further inquiry, but it does dictate that we should proceed in a careful and deliberate manner so as neither to overstate nor understate the significance of what we are doing.

At this stage there can be no authoritative decision as to what possible constituents should be investigated, or whether any constituent occurs at levels that might in fact cause injury. Indeed, adequate methods of analysis may not yet be available for finding significant levels of some of these constituents.

Under these circumstances, we believe that the facts cannot possibly justify the crash program of Section 410(j), under which the Secretary would be required as a matter of law to propose regulations within 90 days after enactment of the amendments specifying "all dangerous materials and indicating the intensive screening procedures that he will follow." There is no doubt in my mind that this crisis approach to this issue is totally contrary to the interest of the American consumer, has no rational basis in fact, and could well cause irrevocable and unnecessary harm. The issues need much careful scientific study and review by a qualified scientific body before moving ahead in such an absolute manner as proposed here. We agree the recent concern over the possible existence of low levels of toxic substances in our foods should not be overlooked but to move ahead without the facts may only confuse and unnecessarily alarm the consumers.

Forced to specify the dangerous substances, to establish toxic levels, and to develop an intensive screening program within a 90-day period would leave the Secretary no alternative but to adopt a program that would be based on little or no hard facts. Decisions made on the present state of knowledge could very easily destroy the public confidence in a segment of our food supply, direct attention away from other more legitimate issues, and deprive consumers of an important part of their food supply.

The Federal Food and Drug Administration has already undertaken a program designed to identify substances at possible toxic levels that may be found in any part of our food supply. We have every reason to believe that HEW is proceeding on the basis of established scientific principles, and is ordering its priorities in the light of available knowledge. No new authority is needed to augment these efforts—at least at this time. Further, if as a result of its studies the FDA does in fact identify any areas of possible concern, there is every reason to believe that its existing authority under the Federal Food, Drug, and Cosmetic Act is more than adequate to deal with the situation. There can be no doubt that the identification of a problem area will give rise to cooperative efforts by the FDA and the affected segment of industry to find an immediate and effective solution. If for any reason the Administration concludes that the voluntary approach cannot work, it has available the full range of enforcement provisions in the Act.

Accordingly, we believe that this Committee would be making a serious mistake to focus attention on merely one segment of the food industry, on a crash basis that could well cause misallocation of resources, public misunderstanding, and unnecessary harm.

We respectfully submit that Section 410(j) has no appropriate part in fishery inspection legislation, and that the only reasonable approach is that which is now being undertaken by the FDA in its attempt to assess on the broadest possible basis the scope of the problem, if any in fact exists.

Senator HART. Our concluding witness is the president of the Shellfish Institute of North America. I welcome Mr. Cranston Morgan.

STATEMENT OF CRANSTON MORGAN, PRESIDENT, SHELLFISH INSTITUTE OF NORTH AMERICA; ACCOMPANIED BY FRANK P. McGINNES, PRESIDENT-ELECT; ELIZABETH M. WALLACE, EXECUTIVE DIRECTOR; AND RICHARD H. LORING, LEGISLATIVE CHAIRMAN

Mr. MORGAN. I thank you for hearing us. My testimony is very brief.

My name is Cranston Morgan and I am representing the shellfish industry as president of its trade association, the Shellfish Institute of North America. Our family business is W. F. Morgan and Sons of Weems, Va. I am president of our firm. My brothers and I deal in a wide variety of seafoods.

The shellfish industry believes in a fisheries inspection program and have supported such a program for 46 years—when the 1925 U.S. Public Health Service, State shellfish sanitation departments and industry cooperative was formed. Currently six meetings have been or will be held in the major shellfish producing areas to prepare for the 7th National Shellfish Workshop in October 1971. At that time we will revise our manuals of operations in relation to changes that have evolved since the last workshop held in 1968.

We feel strongly that the fisheries of the United States need all of the help and encouragement possible from the Federal Government. Thus we support S. 1528 with some reservation and suggestions for modifications. We believe that continuing S. 700's surveillance is more realistic and will produce more compliance in the long run than mandatory continuous inspection. Furthermore, such a system can be put into operation faster and more effectively by getting the progressive plants certified. The personnel of FDA can then help the margin and substandard plants to qualify.

In passing, I would like to emphasize one of the greatest assets of the current shellfish sanitation program. It is faith among the partners—Federal—State—and industry. The checks and balances inherent in this triumvirate have worked. As an industry person, I testify that there is a degree of compliance that industry imposes upon its members in self defense and with pride. This process was and is a positive factor of "self-compliance" or "self-certification" and existed long before FDA adopted the concept. The philosophy of the legal approach never has worked. When an industry is pitted against a regulatory agency, the real goals can be forgotten in the cops and culprit game. It is far wiser to motivate industry in support of its own long range self-interest.

The State programs of shellfish sanitation are well established. The FDA is turning increasingly to State programs to regulate

food. In 1969 the State programs totaled $5 million with the Federal supervision costing $½ million—the ratio is 10 to 1. Thus the brunt of the costs of the nationwide program is borne by the States. Is the Federal Government really willing to take on this added burden? The need in these fiscally troubled times is for the Federal regulatory agency to help subsidize the existing State programs. This need becomes greater each day. The States as well as the major urban areas are already in dire straits. Financial assistance to States who cannot meet the costs of any inspection program is a must.

Loans or subsidies to the small fishery firms who cannot meet the minimum standards is also urged. It is in the best interest of this Nation to keep the small businesses viable to supply food and employment. These needs will get more critical rather than less with the return of our veterans of Vietnam and the increasing unemployment as the country changes the emphasis and direction of its technology. Our tax dollars are going to be applied to the priorities in the public's estimation. These are in the areas of environmental preservation and restoration. Let us not lose the seafood supervision we have already achieved by unwittingly abandoning the organization, structuring, compliance and conditioning we have in the shellfish certification program. We feel S. 700 gives much visibility to our cooperative program.

We respectfully suggest that attention be given to section 411(c) in S. 1528 and S. 700 in which a product may be detained for 20 days. Approximately 70 percent of our products are sold in the fresh state. The quality of these products is related to time and temperature. This section is tantamount to confiscation, and so we hope it will be modified to correct the obvious detrimental effects on all fresh seafood products. We recommend that "no more than 7 days" be the detention time specified for fresh seafood.

We believe that the surveillance for detaining materials, 410(j), is not complete. We recommend that this section be modified so that FDA will give surveillance for detaining materials for all food products in the interests of the consumers of the Nation.

The firms certified in the interstate shippers list are our testimony to the shellfish sanitation program. This list verifies to 6,000 food control officials that the firms are approved by responsible State and Federal food officials. We recommend the entire program as a prototype of the most effective way possible to regulate the fisheries.

I thank you very much for letting me testify. If you have questions, we have at my right our lovely Mrs. David Wallace, who is my boss and the executive director, and our president-elect, Mr. Frank McGinnes, and our legislative chairman from Massachusetts, Richard Loring.

Senator HART. Thank you, Mr. Morgan. Over the several years that we have been considering this, we wouldn't agree that we have not learned anything. Basically, the position this year that you are taking for the shellfish industry is consistant in all respects with the position earlier.

You made additional comment on the new section, 410(j). With respect to the holding time of 20 days, is it your judgment that the FDA in 7 days could make the analysis required to determine whether in fact adulteration was present?

Mr. MORGAN. In the field of misbranding and adulteration, with the exception of these trace metals that we have heard so much of today, I feel they could make their dispositions in much less than a week. The fish, which we do not represent, would have a perishable time much less than 7 days. We are testifying about the shellfish. I do feel that the FDA is willing to negotiate this time limit. We have talked to them in our seminars about it.

Mrs. WALLACE. Senator, we already have State programs already established.

Senator HART. I know you do.

Mrs. WALLACE. And each State is presumably qualified. I know that within 48 hours we can get almost any reading. Our States are equipped with the most advanced technological equipment. It is necessary for them to be certified. Seven days would be ample time and then we would have, properly treated, some life left for the product, some shell of life.

Senator HART. I guess at this hour, I should not open up another subject, but while you are here, I think we should consider this matter.

What progress are we making to increase the quantity of edible shellfish, particularly in oysters, in this country?

Mr. MORGAN. Would you like me to answer that?

Mrs. WALLACE. Yes.

Mr. MORGAN. We have had a technological breakthrough in what is known as clutch-free oysters, and we are doing the same thing with clams. This is a scientific breakthrough in bringing larvae from the extremely small stages to a baby covered with a shell without its attaching to any object such as it has to in nature. We feel this is the future of our industry.

We have operated a hatchery for 4 years under EDA funds and we now feel that we are commercially able to partially substitute nature in the production of baby oysters.

Mrs. WALLACE. And clams. Mr. Loring may like to speak to clams.

Senator HART. Was the EDA loan made to your company or to the institute?

Mr. MORGAN. This was to our cooperative composed of four companies which have banded together under matching funds to accomplish this.

Mr. LORING. Senator, we have been operating a hatchery in Massachusetts for about 12 years and have reached the point of overcoming biological problems to where we can actually plant young clams about a quarter of an inch in size and we hope that by the time they get to about two and a half years, they will be of the 2-inch legal size for sale, which is creating protein from the sea on an economical basis. Nationally, the whole program is in competition with our tidal waters, with recreational boating and all sorts of things, as well as the conservation movement of preserving of marshlands. But food supply can be enhanced this way.

Mrs. WALLACE. On Long Island, there are four commercial hatcheries right now. There are several other West Coast and you may be interested in the fact that the Lummi Indians, with the help of the Federal Government have made enormous breakthroughs in this concept. They are on Puget Sound.

Senator HART. As we close, I should note that you remind us again of the need to provide some assistance to smaller firms to adjust to meet standards. The bill introduced by Senator Kennedy, S. 296, specifically addresses that question.

Mr. MORGAN. We testified to this last year. We believed in Senator Kennedy's extention program. The National Marine Fisheries Service is trying to implement this. They have started a program which we hope will be nationwide as we develop extension service people on local levels.

Senator HART. Mr. Bickwit?

Mr. BICKWIT. I have no questions.

Senator HART. Perhaps we can close on a happy note. I think it was yesterday or the day before that I read of a man who ate 490 oysters at one sitting with no problem. Maybe we are indeed dealing just with the rare case that produces scare testimony.

Mr. MORGAN. Thank you. We hope to use that bit of information that we were not aware of.

Mrs. WALLACE. Senator, my mother admits to being 85 and she has sat through every minute of this. She has enjoyed it immensely and I would like the privilege of having you meet her at the close of the hearing.

Senator HART. We will adjourn at this time.

(Whereupon, at 5:15 p.m., the hearing was adjourned.)

HOPE COLLEGE,
Holland, Mich., March 15, 1971.

Hon. PHILIP A. HART,
U.S. Senate,
Old Senate Office Building,
Washington, D.C.

DEAR SENATOR HART: The staff of the Senate Commerce Committee has informed me that a new fish inspection bill is being drafted, and that a section of this bill prescribes a program of mercury analysis of fish intended for market. The discovery of elevated levels of mercury in some ocean fish, and the wide distribution of the problem in interior and coastal waters, are strong factors supporting such a program at the federal level. I hope that my comments and suggestions in this letter will be of use to you.

1) The analytical program should be expanded to include a number of elements other than mercury. A limited program of this kind has been begun by the Fisheries Research Board of Canada, at the Freshwater Institute of Canada, and I enclose a table of preliminary data from this program, as presented by Dr. E. G. Bligh at a recent mercury conference in Ottawa. As you can see, some of the samples are markedly enriched in arsenic, manganese, and tin, as well as mercury. While I am not competent to judge the direct hazard to humans from consumption of such fish, it is clear to me that these metals are accumulating in a segment of the human food chain, and thus there is sufficient reason to begin to monitor them. I would suggest that the list of metals to be monitored include arsenic, boron, cadium, chromium, copper, lead, manganese, nickel, selenium, silver, tin, and zinc.

Such a program would serve to detect potential hazards now, in an orderly way. Further, it would serve as an early-warning system, to detect environmental buildups of these metals before they reach the crisis stage, and so would provide the information necessary to take action to avoid another mercury debacle.

Although the proposed program would increase the available data twelvefold, the increase in effort required would be relatively minor. Because of the excellent analytical instruments now in common use, most of the time required for analysis is spent in obtaining the sample, cataloguing it, and preparing it for analysis, and much less time is spent in the actual determination of metal content. I would estimate that the greatly expanded program would require only 20% to 50% more dollar effort.

2) After evaluation of the data from about the first year of operation, the number of fish analyzed can be drastically reduced. The degree to which fish living in a given water body accumulate metals, depends upon their species. For example, in the Great Lakes, walleye accumulate mercury much more than do perch and other panfish. If the walleye from a given lake contain acceptable levels of mercury, then the other fish in that lake will also contain acceptable levels, and so would not need to be analyzed. The walleye thus can serve as in "indicator species" to provide an index to the general level of contamination in the lake. Data from the initial part of the proposed testing program can be evaluated by a competent scientific panel, to select one or two indicator species for each water body fished, and subsequent testing can then be confined to the indicator species, with an appreciable decrease in effort.

3) Provision should be made to insure that the fishermen are informed, as rapidly as possible, of the species found unacceptable and of the water body from which such unacceptable species were taken. Further, some provision should be made for presenting the same information to the governments of other countries fishing the same waters. Much of our present mercury problem seems to stem from poor international communications; hopefully this problem, at least, can be avoided.

I recognize that it may be difficult to write some of these provisions into law; I believe, however, that they are scientifically sound, and represent a reasonable approach to the problem. Thank you for your consideration of them.

Very truly yours,

DAVID H. KLEIN,
Professor of Chemistry.

HEAVY METAL ION CONCENTRATION IN COMPOSITE DRESSED FISH SAMPLES (IN PARTS PER MILLION WET WEIGHT)

	Pb	Ni	As	Cu	Sb	Cd	Zn	U	Hg	Mn	Se	Cr	Sn
Whitefish,[1] Moose Lake	<0.5	<0.2	0.09	0.50	0.0022	<0.05	14	<3	0.07	0.69	0.24	0.033	3.57
Northern pike,[2] Moose Lake	<0.5	<0.2	<0.05	.70	.0032	<0.05	19	<3	.11	2.98	.17	<0.035	5.43
Whitefish, Lake Ontario	<0.5	<0.2	0.70	.94	.0031	<0.05	12	<2	.17	.66	.38	<0.017	0.80
Northern pike, Lac St. Pierre	<0.5	<0.2	.09	.89	.0037	<0.05	19	<2	.70	3.16	.37	<0.026	.67
Northern pike, Lake Erie	<0.5	<0.2	<0.05	.70	.0043	<0.05	11	<1	.49	.93	.19	<0.031	.54
Smelt,[3] Lake Erie	<0.5	<0.2	.15	.78	.0035	.06	20	<2	.05	.02	.22	.034	1.22
Yellow perch,[4] Lake Erie	<0.5	<0.2	<0.05	1.28	.0031	<0.05	12	<1	.22	.21	.32	<0.065	.55

[1] Coregonus Clupeaformis.
[2] Esox Lucius.
[3] Osmerus Mordax.
[4] Perca Flavescens.

STATEMENT OF RANDOLPH HODGES, EXECUTIVE DIRECTOR, FLORIDA DEPARTMENT OF NATURAL RESOURCES

Florida, being one of the major seafood producers in the nation, has long been concerned with the sanitary practices relating to the catching, handling, processing, packaging, preserving, canning, smoking and storing of seafood for sale as human food.

There are three state agencies charged with the enforcement of the laws and rules regulating the seafood industry which leaves no phase of the process without total consumer protection.

The Florida Department of Health and Rehabilitative Services regulates the taking and processing of all shellfish within the waters of Florida. This includes the health requirements of all handlers and the construction and sanitation of shucking houses, canneries or other means of processing shellfish. Water samples are maintained in accordance with both state and federal requirements. Unapproved harvest areas are posted and policed by the Department of Natural Resources Marine Patrol with monthly reports submitted to the Federal Health Department.

For years the Florida Department of Agriculture and Consumer Services has provided enforcement of all seafood processors and covers any products or process that does not come under the jurisdiction of the Department of Health.

In 1965, the Department of Natural Resources established the Seafood Quality Control Code to insure that seafood produced in this state would be adequately covered by sanitary requirements from the time of harvest up to the processor. This code provides sanitary requirements for all boats and vehicles used in harvesting and transporting seafood, as well as dockside facilities. Eleven officers trained at the U.S.D.I., National Marine Fisheries Service Laboratory of Microbiology in Pascagoula, Mississippi, are assigned this responsibility. Each inspector has a radio-equipped patrol boat, and automobile to cover overlapping territories. Through their efforts, most of Florida's fishing fleet has complied with the requirements of sanitation. Seafood cargoes are constantly checked both while on fishing grounds and at dockside to see that proper icing and washing are being done. With few execptions, all dockside seafood houses have been rebuilt to a satisfactory condition and some 45,000 pounds of unwholesome seafood have been removed from the market in the last six months.

Florida has provided the leadership to see that proper standards have been provided to protect the health and wefare of the consumer.

We would like to go on record, as strongly favoring a national inspection bill for fishery products which would provide for inspection and enforcement by the state when the state program meets or exceeds the minimum requirements of federal standards. We also urge that any legislation setting quality standards for domestic seafoods provide that imported products be of equal quality.

RANDOLPH HODGES,
Executive Director.

STATEMENT OF DR. HENRY A. SCHROEDER, PROFESSOR OF PHYSIOLOGY, DARTMOUTH MEDICAL SCHOOL

Consideration of allowable limits of trace elements in shellfish must take into account the background concentration of the elements in sea water, the proximity of polluted rivers carrying industria and other effluents into the sea, the species of shellfish and its age, and the amount of the element absorbed from the human gastrointestinal tract when the shellfish is eaten, compared to that absorbed from food from other sources. The four trace elements considered are the metals cadmium, mercury, lead and chromium. The oyster appears to represent an extreme among the sellfish, in its proclivity to accumulate some metals from its marine environment. This is so problably because an oyster pumps many gallons of sea water through its gills during a 24-hour period; estimates have ranged as high as 20 gallons.

Cadium.—This metal aways occurs with zinc in nature. Oysters contain large amounts of zinc and copper and relatively large amounts of cadium, compared to other foods. In our analyses oysters had concentrations of zinc 20 times higher than any other food, concentrations of copper six times higher than other food, and concentrations of cadmium three times higher than most

other foods. Zinc in oysters, usually 250 to 1300 ppm, has run as high as 4100 parts per million (ppm), copper usually 9–71 ppm, have been reported as high as 1500 ppm—green oysters, green from copper, have been recorded as high as 3300 ppm—whereas cadmium levels reported and also found by us have run from 0.53 to 1.6 ppm, in terms of wet weight, with extreme values of 8.0 and 7.8 ppm, according to a recent FDA survey.

Sea water contains on an average 9–21 parts per billion (ppb) zinc, 1–25 ppb copper and 0.03–0.3 ppb cadmium, depending upon location and proximity to rivers. These low concentrations point out the avidity of oysters to accumulate metals from water. Zinc is a metal necesary for life and health.

Six oysters weighing about 100 grams (depending on size) used to be the usual serving. Today most restaurants serve five or even four. But let us consider six. They would provide on the average up to 120 milligrams of zinc and 0.16 milligrams of cadmimum (up to 0.78 mg cadmium and 410 mg zinc). Long-term diet analyses by Tipton *et al* have shown them to contain 0.1 to 0.22 mg cadmium and 11 to 19 mg zinc. Our diets have had 0.22 cadmium and 8 to 15 mg zinc. Thus one serving of oysters provides about ten times as much zinc and 73% as much cadmium as are in the whole diet. A diet largely of refined grains and sugar contains much less zinc, levels which are nutritionally marginal, but about the same amount of cadmium.

Animal experiments have indicated that the absorption of cadmium from the intestines into the body is lower when the zinc intake is high than when it is low. Although human studies have not been done, application of this principal to man suggests that little oyster cadmium is absorbed, because of their very high zinc contents.

There is no need to be concerned about overt cadmium poisoning in man from oysters, such as occurred in one local area in Japan 20 years ago. In that case, cadmium from a zinc mine polluted water heavily, and very high levels were found in locally grown irrigated foods and sea food; chronic poisoning resulted in decalcification of the bones, and deaths occurred. This poisoning was much more heavy and severe than that found in cadmium battery workers in Sweden. Basis of concern for such an occurrence here, as expressed in the press (The New York Times, Monday, April 12, 1971) is groundless.

Cadmium accumulates in the human kidney, liver and probably blood vessels with age and exposure. One innate toxic effect is a tendency to high blood pressure, which has been induced by cadmium in rats and rabbits. This condition comes on with small amounts continuously fed for life. The threshold level in man is not known, but it is probably low. For this reason we advise patients with high blood pressure not to eat oysters frequently, to be on the safe side.

Estimates have been made that up to three million tons of cadmium are added by rivers to the ocean annually, from natural and industrial sources. Most of it is precipitated by sea water, and the increment is not measurable. The sea is not contaminated by man. There is cadmium in all marine life—in all plant and animal life. Because of its tendency to accumulate in oysters, older and larger oysters would be expected to have more. Background levels are not known, but they may very well be high. To ascertain what levels are background and what increments are due to contamination of oyster beds, cadmium in oysters should be evaluated as to proximity to obvious sources of river pollution. Cadmium levels in rivers have been ascertained.

I believe that at this time it would be impossible to recommend a reasonable and logical limit to the amount of cadmium allowed in oysters as safe for human consumption, unless it is set fairly high (3 ppm, for example). More logical would be a limit of the ratio of cadmium to zinc in oysters. At present, this ratio is about 1 part cadmium to 350 parts of zinc, with a range of 250–1100. A ratio of 1 to 100 might be innately toxic, provided oysters were eaten daily for a great many years.

Cadmium does not usually deposit in muscle. Concentrations of cadmium in muscle of food fish taken from moderately contaminated Southern rivers were low, about 0.01 to 0.12 ppm, or less.

Mercury.—Great confusion and needless concern have come from the assumption that all forms of mercury in fish are poisonous, based on epidemics of methyl mercury poisoning in two local areas of Japan, Minimata Bay and Niigata, resulting from dumping methyl mercury directly into waters where

it entered the local seafood in large amounts. Methyl mercury and ethyl mercury are highly toxic; inorganic and most other organic forms of mercury are not highly toxic. An apt analogy can be found with lead and tin. Tetramethyl and tetraethyl lead and tin are highly toxic, entering the brain and causing damage. Most other forms of lead have fairly low orders of toxicity, and tin is only slightly toxic, if at all. Methyl mercury at 5 ppm mercury was toxic to mice; 1 ppm was not.

A tacit assumption seems to have been made that most or all of the mercury found in fish is methyl mercury. Or contrariwise, that all forms of mercury are as toxic as methyl mercury. Both assumptions are untrue.

Mercury is ubiguitous on this planet. It is found in every living thing. It occurs in soil, fresh water, sea water, rocks and air. It is in the food chain. The average human kidney contains 2.8 ppm, brain 1.0 ppm, lung 0.58 ppm, hair 2–10 ppm, fat 0.3 ppm. Shellfish and fish extract it from sea water. Fish eaters, whether fish, flesh or fowl, accumulate more mercury than non-fish eaters. Older and large fish accumulate more mercury than younger and smaller fish. Therefore, background levels in fish and shellfish vary widely, according to age and diet. People who eat much fish have more mercury in their hair than people who eat little or none.

It is inconceivable that man has contaminated the oceans with mercury. The few thousand tons of natural and industrial mercury washed annually into the 1.42 quintillion tons of ocean water could not be detected in 100 years. Much of the mercury in river water does not stay in solution in sea water. Therefore, the logical assumption can be made that mercury in ocean fish, especially deep water fish, represents background or natural levels. To my knowledge, no one has found it all to be methyl mercury; most of the Japanese values were in the range of 0.01 to 0.1 ppm.

Even in areas of very high pollution, mercury remains localized. The bottom mud just outside Minimata Bay had background levels, although the bay itself was highly contaminated.

Japanese scientists fed rats and cats the fish and shellfish polluted with methyl mercury and reproduced the disease of methyl mercury poisoning. To my knowledge, no one has caused methyl mercury poisoning by feeding animals swordfish, tuna, seal liver or any other marine animal, nor with fresh water game fish from Lake St. Clair or other lakes contaminated with mercury.

It is fairly difficult to measure total mercury in food with any degree of accuracy. It is very difficult to measure methyl mercury. No one really seems to know how much of the total mercury in shellfish and fish is methyl mercury, if any. To my knowledge, reports stating that most or all of the mercury in fish is methyl mercury are based on two sources. Methodological errors in the measurement of total mercury in foods have been revealed recently, showing ten times as much as was probably present. Methyl mercury in all types of food fish must be demonstrated beyond shadow of doubt, where methyl mercury is dumped in water, the assumption can be made and corroborated that fish and shellfish contain it. Where methyl mercury is not dumped, that assumption cannot be made at this time.

In the laboratory at 75 degrees temperature, certain bacteria can methylate mercury in the absence of oxygen and at relatively large concentrations of mercury. To assume that this reaction takes place in bottom muds to a great extent is most questionable, until it is proven beyond doubt. A recent Geological Survey Professional Paper (No. 713, 1970) states: "The tendency of mercury to sink rapidly and combine with sulfide in anaerobic bottom sediments to form cinnabar, which is slightly soluble, appears to be a major scavenging mechanism. Another mechanism which keeps content of dissolved mercury low is the relatively high reactivity of mercury with organic substances and the resulting uptake by living and non-living matter." Mercury "is assimilated by organisms living in environments which contain it. This process is thought to be enhanced through conversion of inorganic mercury by certain anaerobes to methyl mercury, a more soluble form. *However, there still is no proof that proper energy gradients exist to promote such reactions.*" (italics mine) If this reaction were universal, most of the 114 million tons of mercury in sea water would be methyl mercury, which is highly unlikely. Mercury can be methylated but the tendency is for methyl mercury to be demethylated into inorganic mercury, even in the bodies of animals.

There is urgent need to establish limits of methyl mercury in shellfish and fish as safe for human consumption. Japanese calculations have shown that a person must eat at least 4.0 mg of methyl mercury per day for a month to contract the disease. On this basis, allowing a ten to one margin for safety, 0.4 mg of methyl mercury should be reasonably safe. If one ate 2..2 lbs. of fish a day, a virtually impossible feat, containing 0.4 ppm methyl mercury, one would take in this amount. Six oysters with this level would provide only 0.4 mg methyl mercury, although to be completely safe the limit should be reduced further, perhaps to 0.3 or 0.2 ppm, methyl mercury. The FDA limits for total mercury are unreasonably low, considering the only moderate toxicity of inorganic and other organic forms. They should be raised at least to 5.0 ppm—thus allowing us to keep a 10 lb brown trout caught in an unpolluted reservoir in Vermont, which had 4.0 ppm total mercury in its flesh.

On this basis, there is need for a rapid and easy method for measuring methyl mercury, and fish should be banned for sale on the basis of methyl mercury levels, not on levels of total mercury.

Lead.—The proposed limit of 2.0 ppm lead in shellfish is acceptable and reasonable. We have been impressed with accumulation of lead by shellfish; it was not found by our laboratory ten years ago. Only about 10 percent of the lead ingested is absorbed (40–50 percent of the lead inhaled is absorbed by the body). Six oysters with 2.0 ppm lead would provide 0.2 mg of which 0.02 mg would be absorbed, at the most. Although food levels on the average provide 0.03 mg absorbed, this amount in oysters should provide less hazard than heavy automobile traffic.

The FDA survey showed 3.4 ppm lead in clams from two areas, with maximal values of 19 and 10 ppm. Occasional oysters had up to 17 ppm. The high values would provide 1.0 to 1.9 mg of lead in 100 g, levels which could be toxic to human beings eating such shellfish regularly for several years.

Chromium.—Concern with chromium is for the hexavalent form, for which there are limits in potable water of 0.5 ppm. The trivalent form is necessary for mammalian health, if not life. Hexavalent chromium tends to change to the trivalent form. Six oysters with 2.0 ppm would provide 0.2 mg, which is double the 0.1 mg found in average American diets. At the levels found, they would contain 0.03–0.05 mg, with a maximum of 0.3 mg. Surf clams would provide 0.7 mg with a maximum of 3.5 mg which high value is no cause for alarm.

Chromium is necessary for the metabolism of sugar and fat and for regulating blood cholesterol levels. Most Americans were deficient in chromium, compared to foreigners, in a survey of 26 tissues from 400 subjects, largely because chromium is virtually all removed from refined sugar and is partly removed from refined flour and fat. Chromium-deficient rats exhibit mild diabetes, hardening of the arteries and elevated blood cholesterol levels.

We have found nothing but beneficial effects from feeding 5 ppm, 10 ppm, and 12 ppm trivalent chromium to hundreds of rats and mice for life. These effects include increased longevity and smooth arteries. We have found no adverse effects from feeding 10 ppm hexavalent chromium to mice for life. The hazard from hexavalent chromium has been concerned with cancer of the lung in workers exposed to very high concentrations in dusts, which has given this substance a bad reputation ill-deserved at lower concentrations.

On this background I recommend no limit for chromium in shellfish. If a limit must be set, it should concern only hexavalent chromium. Any increase in human intake of naturally occurring chromium should be beneficial to man.

Cancer.—None of these trace metals has produced cancer in small animals fed for life. Among the common elemental contaminants and pollutants, the only one causing cancer was selenium.

Congenital abnormalities.—Paired young rats and mice fed cadmium at 10 ppm, lead at 25 ppm, or methyl mercury at 5 ppm in drinking water, and allowed to breed for three generations produced many still-births, runts and early deaths of offspring. The strains did not survive into the third generation. The doses used were larger than those expected in shellfish. Methyl mercury at 1 ppm has been tolerable.

STATEMENT OF DR. WILLIAM C. PURDY

I am here to speak in favor of the Fish Inspection Bill and the inclusion in that measure of a provision for the monitoring of toxic materials in fish.

In particular, I would like to focus for a few minutes on the problem of the determination of mercury in fish.

It is all well and good to set screening or tolerance levels for mercury in fish. However, this raises a very important problem, the means of assay for these levels in the fish sample.

The Official Final Action method of the Association of Official Analytical Chemists (AOAC) for the determination of mercury as a residue in foods involves an acid destruction of the sample. This process is called an acid digestion. It is agreed by almost everyone who has worked on mercury determinations that mercury is lost during this acid-digestion process. Also, the official method does not dissolve the fat in the sample, an additional source of error.

In a recent issue of the Journal of the Association of Official Analytical Chemists (JAOAC, *54*, 202 (1971)), FDA chemists Munns and Holland state that collaborative studies conducted in nine FDA laboratories indicate that the recovery from fish of added mercury was less than 50% using the official AOAC method. I quote from their article. "In some cases the unspiked fish gave results higher than those of the spiked. Variability in the data was too great to calculate a standard deviation." On the basis of this study, Munns and Holland recommended that their flameless atomic absorption method be adopted as "official first action." This recommendation has been accepted (JAOAC, *54*, 466 (1971)).

Although the method of Munns and Holland is clearly better than the official method, it leaves much to be desired. Recoveries of added mercury range between 76 and 92%, and the average mercury found for spiked samples has a standard deviation from the mean ranging between 12.5% and 30%. On unspiked samples, the standard deviation from the mean is 50%. A 50% standard deviation means that a sample containing 0.5 parts per million (p.p.m.) of mercury could be found by the method employed to contain 0.25 to 0.75 p.p.m. (a range which differs by a factor of three). From the point of view of the analytical chemist, this is unacceptable variability.

The Munns and Holland method uses a closed system, recirculating the mercury vapor through the absorption cell of the measuring instrument. Other investigators (Uthe, Armstrong, and Stainton, J. Fish Res. Bd. Can., *27*, 805 (1970)) have shown that with a similar dynamic system only 7% of available mercury may be present in the cell at the time of measurement. In essence, you are throwing away 93% of your sample and thereby proportionately reducing the sensitivity of the determination.

Munns and Holland make no statement about the purity of reagents used in their procedure. Other investigators in the trace metal analysis field have found their reagents to be a major source of contamination and interference. A means of correcting for reagent contamination is to run a reagent "blank". This is the complete procedure carried through in the absence of the sample. Any values obtained are due to the reagents, not the sample, and are subsequently subtracted from all sample runs. Munns and Holland do not do this. They choose a starting point well along in the assay and "correct" for reagent contamination from that point on. This excludes from their "correction" some of the reagents that they actually use and makes the concentrations of reagents in their "blank" quite different from what they would be in an actual sample. This same procedure will also change the viscosity of the final solution, affecting the efficiency of the vaporization of mercury.

There are several other points I question about the Munns and Holland Official First Action method. These are questions which need answers before this method should become official, first action or otherwise. This mercury methodology problem points up a significant flaw in the system by which a method is designated as official.

In the case of mercury in fish we have a procedure developed by the FDA, collaborated solely by the FDA, and accepted as official by an arm of the FDA, the AOAC. No laboratories outside of the FDA have participated in any way in this process. Were I to believe that the FDA was made up of the best analytical chemists in the country, I would still argue against this process. It is interesting to note that the article immediately following that of Munns and Holland (Thorpe, JAOAC, *54*, 206 (1971)) describes a procedure which appears to be more sensitive and gives higher recoveries than the Munns and Holland procedure. It was not developed by an FDA chemist and has

not been recommended nor accepted as an official first action method. The April issue of ANALYTICAL CHEMISTRY (*43*, 625 (1971)) contains a contribution from the Fisheries Research Board of Canada that also looks most promising. To my knowledge this method is not being considered for first action by the AOAC.

The technology of analysis is constantly changing. In order to choose the best methodology available for a particular determination, procedures should be sought from all possible sources, government, industry, and the university community. These procedures should be collaborated by an independent referee who possesses the analytical and statistical capabilities and expertise to conduct sound analytical research. Within the federal government, the organization which meets these specifications is the National Bureau of Standards.

However, the problem of mercury is not solely reserved to fish. There is serious mercury pollution of our lakes, river and streams. To monitor this pollution the Environmental Protection Agency will have to possess sensitive and accurate methods for the determination of mercury in waters. It would seem reasonable to suggest that the most suitable methods for these determinations could also be chosen by the same independent referee which should act on the mercury in fish assay. This would cut down on duplication of effort, eliminate the development of separate "official" methods for each regulatory agency, and stimulate that cross-fertilization of ideas which is so necessary for scientific progress.

STATEMENT OF DR. ARTHUR SCHULERT, PH.D., PRESIDENT, ENVIRONMENTAL SCIENCE AND ENGINEERING CORP., NASHVILLE, TENN.

In order to decide whether fish are suitable for human consumption with respect to possible mercury poisoning, we need the answers to two basic questions: 1) What is the concentration of mercury in the fish? and 2) What concentrations of mercury in fish make it unsafe for human consumption? My remarks will focus primarily on the first of these questions.

I am a biochemist and a good share of my research and experience involves analytical biochemistry, particularly in the area of trace minerals. Our laboratory has been heavily engaged in the mercury problem over the past year. I would like to give my assessment on the concentrations of mercury in fish that have been reported, the problems of the analytical determinations, what I recommend for the future, and what I recommend in relation to the analytical requirements if the laws under discussion today are put into effect.

A great many of the reported values for mercury concentration in fish are in error; they are low, frequently by factors of two or more. The situation appears to be getting better; the laboratories are gradually improving, but I feel that the problem is still a significant one.

Evidence for my statement is given in the accompanying table. The Tennessee Stream Pollution Control Board in cooperation with the Tennessee Game and Fish Commission and the Tennessee Valley Authority compared results from five laboratories, including our own, who received portions of the same fish specimens. These fish were taken from the Hiwassee River and Chickamauga Reservoir in Southeastern Tennessee, which has received waste from the Olin plant in Charleston, Tennessee.

The data of this table, except that in the last column, were presented at the public hearings the Tennessee Stream Pollution Control Board held in Cleveland, Tennessee last November. You will note that as you compare the six fish in the upper portion of the table, our average number is by far the highest of the group, being 0.54 parts per million. The next highest average is that of the Food and Drug Administration, 0.31 i.e., only about 60% of our value. From there they go down to 0.24 for Tennessee Stream Pollution Control Laboratory, 0.16 for the Stewart Laboratory, another private laboratory in Knoxville, Tennessee, and 0.14 for the Tennessee Valley Authority Laboratory in Chattanooga, Tennessee.

Why the great divergence? Most of the laboratories were losing large fractions, and usually major fractions of the mercury in processing the samples for analysis. Mercury in fish is predominantly in the form of methyl mercury. This methyl mercury is chemically bound to the fish tissue and does not escape for example if you fry the fish, but in most of the procedures for mercury assay, the first step is to digest the fish; the tissue is broken down and solubilized by digestion with hot acid. Once the tissue is digested in acid

the volatile methyl mercury readily escapes from the solution. Thus these published analytical procedures for total mercury are inadequate when the mercury is present in the form of methyl mercury. In fact, if you boil the mixture, as some procedures recommend, the escape is virtually 100%. If you keep the temperature down to 60°C, you can retain most of it. We never were able to retain more than 60% on average. I have discussed this recently with a number of laboratories still using this method and most agree that their best recoveries are about 80%. Thus if the analyst exercises great care, with this procedure, reasonably accurate answers can be obtained. But I believe the data shown in the accompanying table indicates the more common situation.

Subsequent to the November hearings, I sent portions of these same samples to Mr. Milton McLain of the Georgia Institute of Technology to be assayed by neutron activation with no radiochemistry and these results are included in the last column of the table. This is the ultimate procedure, but it is expensive when done commercially. You will note that whereas the individual values between the Georgia Tech Laboratory and our own laboratory fluctuate, the averages are very close at 0.54 and 0.53. Our precision at the present time is within 5%, but at the time these samples were run it was only 15%. The neutron activation precision for these samples is estimated by Mr. McLain to be ± 10%. Thus the individual fluctuations are well within statistical expectations and it is clear that we are in the proper range with these mercury assays and the others are distinctly low.

When we at our laboratory became aware of the problems of mercury loss from fish in the procedures involving acid digestion we sought alternative procedures, and found an adequate one at Wayne State University in Detroit which was devised by Professors Ralph Smith, Tom Mooney and others which we have adopted with minor modifications. The procedure involves the combustion of a small sample (about 0.1 gram) at 1800°F under a stream of oxygen and then detecting the vaporized mercury by the flameless atomic absorption technique which is common to most methods. We thus have a one-step process in an essentially closed system so the mercury has no chance to escape, and we commonly get higher values as noted.

In a subsequent quality check Mr. James Finger of the Regional Federal Water Quality Office in Athens, Georgia sent out aliquots from the same four fish to about 20 different laboratories. In this comparison we were not the high laboratory, but rather were close to the average. These samples were specifically stated to be check samples, and as such naturally were handled with great care. I noted earlier my feeling that under great care with methods most people use, you can get reasonably accurate values. It is my firm conviction, however, that in an assay procedures where losses occur so easily, this occurrance is highly probable in the routine samples which are being processed through the lab by the dozens. It is my conviction that whereas the problem is probably not as bad as the comparisons of last November would suggest, it is still very significant and mercury concentrations in fish are generally higher than recognized.

The question has been raised as to whether the combustion procedure should be the one required in the proposed fish surveillance. I would not recommend that the proposed law be tied to any single procedure for mercury assay. I realize that administering the law might be much simpler if such a prescribed standard method were specified, but from a scientific point of view, I strongly object. I propose rather that a good quality control system be built into the law. I propose that the law specify that a certain fraction of the specimens, perhaps 5 or 10%, must be assayed by two entirely independent analytical procedures, and the results of these two procedures must agree within 15%. This way you would have good assurance that your numbers are real numbers. You don't tie yourself to a static situation, but you allow for the fact that methods can improve and hopefully get better. Something this important should not be tied to a single method. Too much is at stake, not only with regard to potential hazard to population but to the economy of the industry as well.

As noted in the beginning, my remarks have centered on the question of total mercury concentration and not on the hazards of any given concentration. It should be noted that the hazard is highly dependent on the chemical form of the mercury. From the work of Swedish investigators and others, it

is generally accepted that the mercury in fish is present predominantly as methyl mercury which is the most toxic form known. Whether, and to what extent this is true needs to be established for various species of fish in their differing environments. It may well be that the surveillance assays should be for methyl mercury rather than just total mercury in some cases.

INTERLABORATORY COMPARISONS OF ANALYSIS OF MERCURY IN FISH MUSCLE

This tabulation gives the analytical values for mercury concentration in parts per million obtained by six laboratories on samples from the same fish. The data for four laboratories (Stewart, TVA, ESEC, and SPC) were distributed by the Tennessee Stream Pollution Control Board at a public hearing held on November 19, 1970 in Cleveland, Tennessee. This hearing was held for the purpose of presenting data on the water quality of the Hiwassee River and the Chickamauga Lake area with regard to mercury levels in fish in these waters. The data for the FDA laboratory were presented orally at this meeting. The Georgia Tech assays were subsequently performed by neutron activation using instrumental counting without radiochemical separation.

Sample number	Species	Mercury parts per million					
		Stewart[1]	FDA[2]	TVA[3]	ESEC[4]	SPC[5]	GT[6]
2	Spotted bass	0.10	0.21	0.08	0.44	0.23	0.50
5	Largemouth bass	.10	.46	.11	.74	.24	.55
111	do	.38	.37	.28	.66	.36	.86
112	Spotted bass	.02	.25	.08	.45	.10	.42
78	Largemouth bass	.06	.17	.07	.29	.13	.33
99	Buffalo	.30	.42	.25	.67	.41	.53
	Average of six fish	.16	.31	.14	.54	.24	.53
DM-1	Rainbow trout			<0.05	.08	<0.05	
DN-2	Brown trout			<0.05	<0.03	<0 05	
DM-3	Rainbow trout			<0.05	.05	<0.05	
DM-4	do			<0.05	.08	<0.05	
DM-5	do			<0.05	.16	<0.05	

[1] Stewart Laboratories, Knoxville.
[2] U.S. Food and Drug Administration.
[3] Tennessee Valley Authority Laboratory, Chattanooga.
[4] Environmental Science & Engineering Laboratory, Nashville.
[5] Stream Pollution Control Laboratory, Nashville.
[6] Georgia Institute of Technology.

WASHINGTON, D. C.

HON. PHILLIP A. HART,
Chairman, Subcommittee on the Environment,
Senate Commerce Committee.

DEAR SENATOR HART: The need for effective legislation to protect the consumer from disease and contamination in fish products has not diminished since Mr. Nader first appeared before this committee in 1967. On the contrary—the testimony before the committee concerning contamination of fish products by Mercury, Cadmium, and Arsenic emphasize the need for action.

One need is to establish an effective shellfish sanitation program. Dr. Mitchell Perry has testified that shellfish are one of the food products which concentrates cadmium.

The present shellfish sanitation program is a "voluntary" program among the industry, state regulatory bodies and the federal government. The federal government enforces the program by providing certification to state programs and to growing areas. Guidelines by which certification is determined are developed periodically by National Shellfish Sanitation workshops. The consumer's reliance upon federal certifications rests upon the strength of these guidelines.

The procedures for developing these guidelines are defective. The guidelines are approved at Shellfish Sanitation workshops whose participants contain representatives of the industry to be regulated. The Shellfish Sanitation workshops are not simply advisory bodies; approval of the workshops is necessary for the approval of guidelines.

The workshops have operated under a "voting" procedure which insures that groups least concerned with consumer protection are given a veto. De-

cisions in the workshops have been made by application of the "law of the situation" or by "consensus" rather than by compromise of majority rule. Mr. Eugene Jensen, at the time, Chief of the Shellfish Sanitation Division quite candidly has stated the obvious effects of such a procedure. "This law has the effect of each of the major participants having a veto power." (Proceedings of the 5th National Shellfish Sanitation, November 17–19, 1964, Public Health Service, Department of Health, Education and Welfare, p. 12.) In such a climate, the consumer has little hope that a necessary public health guideline opposed by a significant portion of the industry will be approved.

An example of how the membership, procedures, and philosophy of the workshop have served to prevent the approval of guidelines is found in the attempt to establish temperature standards for packed oysters. This example clearly illustrates the failure of the Shellfish Sanitation Workshop. The importance of adequate temperature standards are stated in a report presented to the 1964 Shellfish Sanitation Workshop. That report concluded, "it is evident from results presented in this report and those of other investigators that 50°F. is not a satisfactory temperature for prolonged holding of shucked oysters because of the rapid increase in microorganisms observed at that temperature. The frequent multiplication of fecal coliforms at 50°F is of particular concern in view of the demonstration of parallel behavior of Salmonella organisms." The report also found that spoilage occurred almost five times as quickly at 50° than at the proposed temperature. The report clearly stated "it is quite obvious that the current Mannual requirement at 50° may be adverse from a public health viewpoint and certainly is not satisfactory to prevent spoilage over the period of time that shucked oysters normally are in transit from the shucking house to distribution point." (The Temperature Effect on Biological Quality of Stored Oysters by C. B. Kelly, Shellfish Sanitation Branch, Public Health Service, 1964 Proceedings of the Shellfish Sanitation Workshop, Appendix Y, p. 193)

At the 1961 Shellfish Sanitation Workshop in response to a recommendation that a cooling temperature for shellfish of 40°F. be required, the Public Health Service recommended no change. The Public Health Service felt "there seems to be no public health justification" and (we) do not believe the 'public health' lever should be used to force industry to adopt the better quality control practices." The proposed change was not accepted by the workship. (Proceedings of the 1961 Shellfish Sanitation Workshop, p. 28).

At the 1964 Shellfish Sanitation, the Kelly report stating the public health justifications proposed that to avoid adverse bacterial multiplication shucked oysters be refrigerated immediately after shucking to 40° or lower. Several states and some portions of the industry were opposed to this on the basis that it would create undue hardship. The Public Health Service recommended the guideline be approved. (Proceedings of the 1964 Shellfish Sanitation Workshop, p. 41–46)

During the discussion, industry and the states felt that an immediate cooling temperature of 45°F. was more attainable. Industry spokesmen accepted the 45°F. temeprature but opposed the establishment of an unrealistic time limit for the 45°F. temperature to be reached. Mr. Kelly pointed out "that according to the charts a temperature of 45°F. would not do the job desired, and that it was merely a compromise figure between 40°F. and 50°F." However, Mr. Kelly's efforts to remind the workshop of its public health responsibility were in vain. Instead of a 40° temperature immediately after shucking, the workshop approved a 45° temperature *five hours* after shucking.

After this object lesson in the operation of the principle of consensus, the Public Health Service proposed to the 1968 Shellfish Sanitation Workshop that a new guideline be approved. Shucked shellfish shall be cooled to an internal temperature of 45°F. or less within 2 hours after delivery to the packing room and shall not exceed 40°F. during storage. (Proceedings of the 1968 Shellfish Sanitation Workshop, p. 19)

The approval of the proposed guideline was recommended. Phillip Parker of the Pacific Coast Oyster Growers Association spoke: "I am emphasizing the serious attitude the Pacific Oyster Growers has with respect to the temperature recommended — and we would like very much to discuss it further." (p. 20)

Mr. P. S. Brinsfield of the Maryland State Department of Health stated what has already entered the minds of all of us who have read these pro-

ceedings. "I admit there was a lot of talk the last time (1964) and we certainly did the shellfish industry and the consuming public a disservice when we put through, after many objections, the figures you had for the last two years. The majority know that 40°F. is certainly the logical temperature and that is what I would like to see." (p. 20)

The majority may have known that 40°F. was the logical figure which should have been adopted in 1964 but they had yet to deal with the principle of consensus. When the Chairman of the Workshop called for a show of hands on the proposal, Mr. Parker objected on the grounds that there was a division of opinion and a vote would be improper because it could "occur because there wasn't enough hands showing that it could be interpreted by this body that it was not a clear division of opinion." (p. 21)

Eventually, the Chairman capitulated "I don't believe we can spend more time discussing this at this point. A lot of this discussion we hoped would take place in the Task Force. I don't think there is a consensus of opinion on it. I hate to wait another two years to see this situation corrected but unless we have a consensus of opinion on it, that is what has to be done."

At this point a victory unintentional was given to the Shellfish Sanitation Division. It was suggested that the subject be discussed again after a break. If it had not been for this suggestion, a proposal less stringent than one which should have been adopted in 1964, would have been delayed for at least two more years. After the break the proposed guideline was approved. Yet the approval of the guideline was not a clear victory for the consuming public. The 1964 guideline indicated a temperature of 45° F. five hours after shucking. The 1968 standard applied to oysters only after they had reached the packing room.

If it requires at least four years to gain the approval of a guideline clearly based on public health justifications, the consumer and the public have reason to question the efficacy of the Shellfish Sanitation Workshop in developing guidelines on more complex yet equally important issues.

Despite the inaction of the 1964 workshop on the temperature standards, the Division of Shellfish Sanitation took no interim action. The attitude of the Shellfish Sanitation Division was expressed to the 1964 workshop. (Mr. Jensen) "He reported that when an incident which requires program action occurs, he tries to get in touch with Mr. Tyrgg, as Chairman of the Marine Foods Committee of the Conference of Sanitary Engineers, and with Mrs. Wallace, representing the Shellfish industry, to work out a course of action that can stand until the workshop as a whole has the opportunity to consider the problem and make changes deemed necessary." (Proceedings of the 1964 Shellfish Sanitation Workshop, p. 13–14)

The procedures of the 1968 Shellfish Sanitation Workshop delegated the development of guidelines to individual task force groups. No minutes were published of the deliberations and discussions of these task force groups thus depriving the public of the ability to understand and attach responsibility for decisions that were reached by the task force groups. No longer was the public given a record of the decision-making process.

Both S700 and S1528 provide a mandatory basis for the present shellfish sanitation program. However, in providing such a mandatory basis it is important that Congress understand the failure of the composition and procedures of the present shellfish sanitation program. According to the testimony of Dr. Charles C. Edwards, before this Committee, "the present procedures for guaranteeing that shellfish are harvested from unpolluted areas and processed and handled under sanitary conditions would be continued and strengthened." Dr. Edwards' testimony indicates that the Food and Drug Administration will rely upon the present Shellfish Sanitation Workshop as a means of fulfilling its responsibilities to Congress and to the public.

More is required than the mandatory provision and cosmetic changes in the voting procedures of the Shellfish Sanitation Workshop. Hopefully, a private body such as the Shellfish Sanitation Workshop will no longer be able to establish governmental policy. However, the Shellfish Sanitation Workshop may well remain in the guise of an advisory body.

The Shellfish Sanitation Workshop as such an advisory body will contain a large number of industry representatives, with no voice given to consumers and consumer groups. Without change in the composition of the group, the inertia of existing policies of accommodation and vacillation which have

developed in the present Shellfish Sanitation program will continue in the Food and Drug Administration's implementation of a mandatory program. Under a new law the Shellfish Sanitation Division should not be allowed to proceed with businss as usual.

If the Secretary wishes to consult with an advisory group concerning his obligations under the act, he should be required to consult with a group of which at least half of its members are representatives of consumer groups. Otherwise, the Shellfish Sanitation Workshop may continue as the spectre of a discredited voluntary program. Of course, any advisory committee should meet th requirements of Executive Order 11007.

If Congress does not promptly act to pass effective legislation regulating fish and fishery products, the committee is under a special obligation to insure that the policies and procedures governing the development of guidelines for shellfish sanitation and control are adequate to protect the consuming public from delay and abdication. Included in this responsibility will be the obligation to assess the legal status of this private body and to establish the measure of responsibility which its participants owe to the public.

ROBERT G. VAUGHN,
Attorney-at-Law.

WESTERN NEW YORK NUCLEAR RESEARCH CENTER, INC.
Buffalo, N. Y., 14214, April 27, 1971

Subject: Heavy Metal Levels in Fish.

Mr. LEONARD BICKWIT,
Subcommittee on Energy, Natural Resources and the Environment,
Old Senate Office Building,
Washington, D. C.

DEAR MR. BICKWIT: The following information is being offered in response to a request on April 23rd from Senator Hart's office.

We are currently carrying out a research project sponsored by the Bureau of Sports Fisheries and Wildlife. The program involves an investigation of the levels of mercury in Lake Erie fish, sediments, plankton/algae and water, and the biochemical aspects of the uptake of mercury by fish. As part of this program we have been investigating the levels of other heavy metals in Lake Erie fish.

To date we have developed highly reliable neutron activitation analysis procedures for the determination of mercury, arsenic and selenium and are currently working on procedures for cadmium. We have applied the procedures to the analysis of edible tissue from 11 species of fish from the three basins of Lake Erie. The samples analyzed were composites prepared from nearly 700 individual fish. In general, 25 fish of about the same size were used for each composite. Thus, the results represent the average level in a group of similar fish and the levels in the individual fish will range from below to above the average level.

The mercury levels in a given species of Lake Erie fish tended to decrease in a west to east direction; that is, the highest levels were found in fish from the Western basin and the lowest were in those from the Eastern basin. The values for the composite samples for the various species ranged from a low of 0.20 ppm to a high of 0.79 ppm. Thirteen samples out of a total of 28 samples (representing a total of 11 species of fish) had levels above 0.5 ppm. These 13 samples consisted of 7 different species of fish with 6 of the samples coming from the Western basin, 6 from the Central basin and one from the Eastern basin. In general the mercury levels were highest in predatory fish.

The arsenic and selenium levels in the same composites did not show the marked geographical trend shown by the mercury levels. The arsenic levels ranged from a low of 0.04 ppm to a high of 0.4 ppm. The selenium levels ranged from a low of 0.28 ppm to a high of 0.58 ppm.

The analysis of mercury in fish is extremely difficult. The cold atomic absorption and neutron activitation analysis techniques, when used properly, are found to be highly reliable. However, it is widely recognized that the processing of the fish to provide a sample that is suitable for analysis is fraught with difficulties. In particular, mercury can be lost from the sample during the normal wet-ashing step unless extreme caution is taken to control

the parameters affecting the sample recovery. The use of internal standards to estimate the losses is only reliable in the neutron activation analysis technique since the irradiation of the sample converts the organic mercurials to an inorganic form; that is, to the form of the normally used internal standard. In other techniques we face the problem of differences in the behavior of the form of the mercury in the fish and that of the internal standard. Our work has also shown that other techniques for preprocessing of samples, such as freeze-drying, low temperature ashing, and low temperature over-drying, results in mercury losses. The results of round robin analysis of fish and soil samples illustrate the problems inherent in the analysis of mercury and are shown in Tables 8 and 9. The wide variance in results from laboratory to laboratory indicates a serious need for well coordinated interlaboratory comparison to establish the precision and accuracy of procedures used in each individual laboratory currently conducting mercury analysis.

A paper describing our mercury analysis procedure, the mercury loss problem and the results of analysis of fish, plankton/algae and sediment samples was presented at the American Chemical Society Meeting in Los Angeles, March 31, 1971 and has been submitted for publication. A copy of the paper may be obtained from Dr. Oliver Cope of the Bureau of Sport Fisheries and Wildlife, Washington, D.C.

If I can be of further assistance, please feel free to contact me at 716-831-2826.

Very truly yours,

C. C. THOMAS, Jr.,
Research Manager.

Enclosures.

TABLE 8.—RESULTS OF MERCURY ANALYSES METHODS EVALUATION PROGRAM USING FISH HOMOGENATES [1]

Analytical method used	Number of laboratories participated	Sample D, range of reported values in p.p.m. Hg	Sample E, range of reported values in p.p.m. Hg	Sample G, range of reported values in p.p.m. Hg
Flameless (cold) atomic absorption	13	0.93–1.80	0.03–0.18	2.80–5.21
Flame atomic absorption	5	0.70–1.80	<0.05–0.49	2.26–5.40
Dithiozone colorimetry	1	1.31	0.05	3.98
Dithiozone titration	1	0.09	<0.03	0.09
Pyrolysis	2	0.47–1.52	0.04–0.10	2.00–4.25
Neutron activation analysis	6	0.95–1.77	0.04–0.19	2.83–4.60
Cold atomic absorption following acid digestion (Fresh Water Institute, Winnipeg, Canada)		1.46	0.04	4.53
Neutron activation analysis with postirradiation chemical separation (Western New York Nuclear Research Center)		1.77	0.12	4.56

[1] Trace mercury analyses evaluation program sponsored by the Fresh Water Institute of the Canadian Fisheries Research Board.

TABLE 9.—RESULTS OF MERCURY ANALYSES METHODS EVALUATION PROGRAM USING SOIL SAMPLES [1]

Analytical method used	Number of laboratories participated	Sample Hg 1, range of reported values in p.p.m. Hg	Sample Hg 2, range of reported values in p.p.m. Hg	Sample Hg 4. range of reported values in p.p.m. Hg
Flameless atomic absorption after acid digestion	5	<0.2–1.46	<0.2–0.35	<0.2–6.00
Flameless atomic absorption after direct thermal vaporization of mercury	5	1.40–1.90	0.23	1.60–5.90
Flame atomic absorption after acid digestion	3	0.56–2.90	<0.1–0.23	4.87–9.40
Dithiozone colorimetric	2	2.70	<0.1	4.50–8.90
Flameless atomic absorption after acid digestion (Colorado School of Mines)		1.46	0.35	5.93
Neutron activation analysis with post-irradiation chemical separation (Western New York Nuclear Research Center)		1.47	0.41	5.70

[1] Trace mercury analyses evaluation program sponsored by the Department of Chemistry, Colorado School of Mines Golden, Colo.

STATEMENT OF THE AMERICAN SHRIMP CANNERS ASSOCIATION

Part I

The association for whom we speak is made up of shrimp and oyster canners in the Gulf area, and we speak with an unique voice of experience gained because of the fact that we are the only segment of the commercial fishing industry ever to have utilized Voluntary Continuous Inspection under the Direct Supervision of the U. S. Food and Drug Administration. Such inspection is available under Sec. 702a of the Federal Food, Drug and Cosmetic Act.

It is this background of actual firsthand experience under Continuous FDA Inspection which necessitates our detailed comments and suggestions regarding the proposed amendments to the Federal Food, Drug and Cosmetic Act as embodied in S. 1528—The Wholesome Fish and Fishery Products Act of 1971.

It is significant that S. 1528 is substantially the same as S. 1092, The Wholesome Fish and Fishery Products Act of 1969. The major differences are the addition of Section 410 (j) calling for Surveillance of Dangerous Matrials, the addition of a clause in Section 411 (b) which specifies that records will be maintained reflecting "the source waters of such fish or fishery products", (which appeared in the Congressional record, Wednesday, April 14, 1971, page S4758, but does not appear in the printed version of the bill) and the addition of Section 412 (c) "Regulations" to specifically incorporate the provisions of Section 701 (e), (f), and (g) which are concerned with administrative provisions.

As near as we can ascertain, this latter point is the only point as brought forth during the hearings in July, 1969, on S. 1092 which have been incorporated into the present Act.

As was pointed out by Senator Hart when he introduced S. 1528, "the two principal high protein foods—meat and poultry—have for several years been the subject of laws designed to protect their wholesomeness." The logic is that our third high protein food—fish—should be the subject of comparable legislation. There are some very basic differences between meat and poultry on the one hand as compared with fish. Among these differences is the fact that meat and poultry as consumed in the United States is primarily produced in the United States and a limited number of foreign nations, whereas the bulk of the fish and fishery products as consumed in the United States is produced abroad and imported into the United States from approximately 120 foreign nations.

For this very reason, S. 1528 must be considered as legislation of an "International" nature since it will affect so many foreign nations. Often time, words which we use have a different meaning abroad—and a recognition of this actual problem of communications should be given careful attention during your deliberations on this Act.

Under DEFINITIONS, lines 11–14, on page 3, we find:

> "(2) The term 'shellfish', as used in sections 402 (f), 421, and 423, means any species of oyster, clam, or mussel, either shucked or in the shell, and either fresh, or frozen or otherwise processed, or any part thereof."

It is understandable that this should have been so written in view of the Shellfish Sanitation Program which has existed for so many years under the Public Health Service. That program was primarily domestic in nature and affected only a few foreign nations who were well informed and cooperative.

S. 1528 will affect every nation on this earth who presently or in the future may desire to export fish or fishery products to the United States. For this reason we suggest that the use of the term "shellfish" will be misleading and widely misunderstood because of the international acceptance and understanding of the term "shellfish" to include not only bivalve mollusks such as oysters, clams, and mussels, but also such crustaceans as shrimp, crabs, lobsters, crawfish, and a vast array of lesser known products. To eliminate the chance of misunderstanding, we recommend a change, as follows:

> Eliminate the word 'shellfish' throughout the bill, substituting the phrase 'oyster, clam, or mussel' in lieu thereof.

Were this suggestion to be followed, it would then be fitting and proper that definition (y) (2) be striken from the bill.

Under DEFINITIONS, beginning on line 15, page 3, we find:

"(z) The term 'fishery products' means any product capable of use as human food which is made wholly or in part from any fish or portion thereof, except products which contain fish only in small proportions or historically have not been, in the judgment of the Secretary, considered by consumers as products of the commercial fishing industry, and which are exempted from definition as a fishery product by the Secretary under such conditions as he may prescribe to assure that the fish or portions thereto contained therein are not adulterated and that such products are not represented as fishery products."

A substantial portion of that definition is concerned with an exemption for which we see no justification nor need. In discussion amongst ourselves, we are unable to name any product which we felt would qualify for the exemption. We view the exemption as being ambiguious and discriminatory, and recommend its deletion so that the definition would then read

"(z) The term 'fishery products' means any product capable of use as human food which is made wholly or in part from any fish or portion thereof."

Under DEFINITIONS, beginning on line 3 of page 4, we find:

"(aa) The term 'capable of use as human food' applies to any fish or part or product thereof, unless it is denatured or otherwise identified as required by regulations prescribed by the Secretary to deter its use as human food, or unless it is naturally inedible by humans."

We believe that a clarification is necessary with regard to "pet foods" particularly as regards cat and/or dog food. Obviously, they cannot be denatured . . . for denatured implies rendering them unfit for consumption by humans or by animals. The identification "as required by regulations prescribed by the Secretary to deter its use as human food" might result in a label warning "not for human consumption", and while this could satisfy the identification requirement it almost certainly would arouse the anger of millions of pet owners. If statistics are to be believed, we yearly spend more to feed pets than we do to feed infants, so we can hardly look upon this point as being of little concern. It is our suggestion that this definition be changed to read as follows:

(aa) The term 'capable of use as human food' applies to any fish or part or product thereof, unless naturally inedible by humans, or unless specifically labeled in accordance with regulations as prescribed by the Secretary to indicate that the product is for other than human consumption.

Under DEFINITIONS, beginning at line 8 on page 4, we find:

"(bb) The terms 'process', 'processed', and 'processing", with respect to fish or fishery products, mean to harvest, handle, store, prepare, produce, manufacture, preserve, pack, transport, or hold such products."

We note that the word "preserve" appears in this definition in lieu of the word "process" which formerly was used in this definition, and editorially is a worthwhile clarification.

This definition appears aimed at covering any and all steps involved in the commerce of providing fish and fishery products as food for human consumption, yet it specifically omits "growing areas" for oysters, clams, and mussels.

Depending upon how one reads and interprets the above definition, it may or may not cover the relatively new and rapidly expanding sciences of "mariculture" and "aquiculture". The growing importance of these sciences makes it imperative that they be covered. Trout farming and catfish farming are probably the two best known products, however, there are many others which are rapidly growing in commercial importance. To illustrate, in the State of Louisiana in 1970 over 20,000 acres were devoted to crawfish, which is up from practically nothing only a few years ago. This now emerging area of commercial fish production cannot be overlooked and must be provided inspection equal to that of the more conventional fisheries.

Instead of trying to name each presently recognized step by name, we suggest that this definition might read

(bb) The terms 'process', 'processed', and 'processing', with respect to fish or fishery products, mean any one or more steps involved in the commerce of providing such food for human consumption.

Under DEFINITIONS, beginning at line 12 on page 4, we find:

"(cc) The term 'official mark' means the official inspection legend or any other symbol prescribed by regulations of the Secretary to identify the status of any fish or fishery product under this Act."

"(dd) The term 'official inspection legend' means any symbol prescribed by regulations of the Secretary showing that an article is in accordance with the provisions of this Act."

The provisions of the Fair Packaging and Labeling Act, and the regulations issued to implement same, are presently applicable to our products. The consumer is amply safeguarded as to the truthfullness of labels. It is a well known fact that many labels had to be changed to provide the mandatory information in the proper place and in the proper size of printing.

The addition of a symbol or legend to the labels of fish or fishery products is not necessary, and would certainly constitute an unnecessary added expense to industry. There is some question as to whether it would be proper to so utilize a symbol or legend should the inspection be less than continuous.

We have grave reservations concerning the possible extension of the use of any symbol or legend to products produced in a foreign country. Even the implication that such products were produced under supervision of FDA would be morally wrong and legally inexcusable.

Under DEFINITIONS, beginning at line 4 on page 5, we find:

"(hh) The term 'continuous inspection' means the application of inspection by a full time inspector."

The question "what does continuous inspection mean?" has been asked and discussed at many industry gatherings. On occasions there have been statements which might leave a reasonably prudent man to believe that 'continuous' does not now mean that which it used to mean. It is our contention that the above quoted definition leave no room for doubt as to the intent—for it specifies the application of inspection by a full time inspector to effect 'continuous inspection'. We define 'continuous' as meaning 'without cessation or interruption.' If it is the intent and desire of Congress that the Government provide 'inspection by a full time inspector without cessation or interruption' at every establishment within the United States, and equally require that every foreign nation provide 'inspection without cessation or interruption' at each establishment—then the above definition is valid.

At the time of introducing this bill, Senator Hart stated:

"The bill I introduce today—as did last year's version—specifies "continuous inspection," or a man in every processing plant, as the inspection level required."

(Apr. 14, 1971, Congressional Record pg. S 4755)

We can only conclude that Senator Hart expressed the intent and meaning of "continuous inspection" beyond the least shadow of a doubt.

Realistically, we must closely examine and study the regulation and inspection of foreign production to ascertain what can and what cannot be done. It is immediately evident that the United States cannot have FDA inspectors in every foreign establishment. Few, if any, nations would agree to such a proposal. The bill anticipates this and provides

"That whenever it shall be determined by the Secretary, in the case of any foreign country, that the system of plant and vessel inspection of fish and fishery products is at least equal to all the inspection, good manufacturing practices, and other provisions of this Act and the regulations issued thereunder, and that reliance can be placed on certificates . . . the Secretary may accept such certificates as compliance with the comparable requirements of this subpart"

This clearly places the burden of providing an equal inspection system upon each foreign nation. Thus, if the bill specifies for US industry continuous inspection, then each nation must establish a continuous inspection system, and the qualifications of their inspectors must be equal to those of our own. There is serious doubt as to whether we can provide the thousands of highly trained and competent inspectors that will be required—there is no doubt as to this being impossible for all of the nations from whom we presently import fish and fishery products.

The provisions of S. 1528 therefore must be so written as to be equally achievably and within the ability and resources of all, or at least a majority

of the 120 foreign countries with whom we are now trading and from whom we import. If this is not so—then we either disrupt our world relations, or we establish two sets of standards. This latter possibility is neither desirable nor equitable. We do not recommend a lowering of our standards, but neither do we recommend setting our standards so impractically high that we end up denying to ourselves the imports which presently provide 60% of the fish and fishery products consumed in this country.

As the bill now stands, the domestic industry will be regulated and inspected far more stringently than is possible regarding foreign producers. Paramount attention must be given to insuring that the domestic commercial fishing industry is not subjected to excessive and undue hardship because of regulations which we can apply at home but which cannot be applied throughout the rest of the world.

We concede that such continuous inspection might be accomplished with respect to domestic establishments, but we strongly emphasize that it cannot be accomplished throughout the entire world. If it is impractical and impossible for the rest of the world to do this—then we either subject domestic industry to harsher treatment than their foreign competition, or we cut off all imports not produced under continuous inspection. Neither result is pleasant to contemplate.

It is our recommendation that the term 'continuous inspection' be deleted from this definition and also deleted throughout the entire bill. In its place we suggest the use of the term 'adequate inspection' which we would define as

> (hh) The term 'adequate inspection' means the application of inspection by an inspector at such frequency as determined by the Secretary as necessary, even to the point of continuous if required, to insure that the provisions of this Act, and the regulations issued to implement same, are effectively carried out.

Our suggestion will not prevent the government from imposing continuous inspection as necessary. On the other hand, it would permit less than continuous inspection if such would achieve the desired results. Our suggestion would not bind the government by law to an ever increasing budget requirement and manpower requirement to implement this program. Should the Congress pass S. 1528 in a form that calls for "continuous inspection" the manpower needs to implement such inspection will be tremendous.

Based upon Current Fishery Statistics No. 5600, entitled FISHERIES OF THE UNITED STATES, 1970, (NOAA NMFS CFS-5600), we find that there are 3,967 establishments and 80,611 vessels. Assuming that approximately 1% of the vessels carry on processing operations to an extent greater than icing and refrigeration, a total of 4,773 "establishment inspectors" will be needed, if only one man is assigned to each plant (and many plants would need more than one inspector). This would also call for an extended force of 478 supervising inspectors, 50 chief inspectors, and utilizing the present FDA district set-up, 17 assistant administrators and 17 administrators; Washington administration of a minimum of 10 administrators, an over-all personnel for clerical work of 500; and laboratory personnel consisting of a minimum of 6 microbiologists per district and 6 chemists per district for a total of 204, plus a chief microbiologist and chief chemist for each district for a total of 34; which would add up to a total trained work force of 6,083 people.

This figure in no way takes into consideration the needs for scientific and laboratory personnel whose services would be necessary if present F. D. A. laboratories are expanded or new laboratories built and equipped for the tremendous number of samples both of domestic products and of imports which would need to be examined and passed upon before shipments could be permitted entry into Commerce. Neither does the personnel figure take into consideration the personnel required to travel to and inspect 120 foreign nations.

The new requirements of S. 1528 which call for "Surveillance of Dangerous Materials" will undoubtedly require considerable additional scientific and laboratory personnel, as well as demanding that new and/or expanded laboratories will have to be provided.

The qualifications for microbiologists and chemists have undoubtedly been described by the Civil Service Commission. Each scientific employee would have to have a minimum of a Bachelor's degree from an accredited college, in the field of the employee's specialty.

While FDA was operating a continuous inspection program in the Shrimp and Oyster industry in the Gulf and South Atlantic areas, during the 1930's and 40's, it was necessary to have highly trained plant inspectors. Of necessity the inspectors would have to have a minimum of a Bachelor's degree, preferably in one of the basic sciences, in order that he might be effectively trained in methods of food handling, plant sanitation, and field methods of certain laboratory procedures for final product inspection.

Remembering that inspectors would have authority over all plant operations, they must then be equipped with personal traits which will provide them with an ability to carry out the functions of their job while at the same time working harmoniously with plant management and personnel. Each inspector would have to be an extremely alert individual to be always cognizant of and to have the ability to recognize problems of today, including such things as pesticide residues; and to anticipate many problems, and prevent the shutting down of the plant and cessation of operations.

A great majority of these men would have to have families which can stand up under the rigors of life in small isolated communities, since most fisheries establishments are not located in urban areas. Finally, the inspectors employed in this program must possess characters of unquestionable integrity.

Before departing from the subject of DEFINITIONS we must point out that throughout this bill the term 'establishment' is used, often in conjunction with the term 'vessels'. This bill defines 'vessels'. Neither this bill nor the Federal Food, Drug and Cosmetic Act, which this bill amends, contain a definition for 'establishments'. We strongly urge that this defect be remedied by the addition, on page 5 after line 9 and before line 10, of the following

> (jj) The term 'establishment' means any land based operation or any vessel wherein any processing other than icing or other refrigeration of fish is performed.

Believing that a definition is required, we have suggested the above which is consistent with the exemption for a 'fish house' as found beginning on page 21 of the bill.

Under PROHIBITED ACTS, on page 5, beginning at line 14, and continuing on page 6, we find:

> "(r) Without authorization from the Secretary or contrary to regulations prescribed by him, casting, printing, lithographing, or otherwise making, simulating, using or failing to use, altering, defacing, detaching, or destroying any form of official mark, official inspection legend, official inspection certificate, or official device; possessing, without promptly notifying the Secretary thereof, any forged, counterfeited, simulated, or improperly altered form of official mark, official inspection legend, official inspection certificate or official device; forging, counterfeiting, simulating, improperly altering any form of official mark, official inspection legend, official inspection certificate, or official device; making any false statement in any shipper's or other certificate provided for in regulations; or falsely or misleadingly representing that any fish or fishery product has been inspected and passed or exempted from such inspection."

The prohibited acts include reference to both the "official mark" and the "official inspection legend," and we will not again comment since both were discussed in connection with the definitions of these terms.

It is our understanding that all fish and fishery products are subject to the provisions of this bill. If that be true, then we suggest that the last five words of the above definition should be deleted since there are no exemptions.

We respectfully suggest that if our recommendation as to "adequate" inspection rather than "continuous" inspection were adopted, it would mean that much of the above would be unnecessary.

On the other hand, if continuous inspection is specified, and should for any reason the program not be properly funded or should the FDA not be able to provide the necessary inspectors to continuously inspect each establishment, then grave legal questions arise. Should the government fail to provide inspectors through no fault of the establishment, could the establishment operate and move its products in interstate commerce, or must it close its doors because it does not have an inspector? If the law says continuous, but the government can only provide less than continuous inspection, we question the legality as well as the moral right to utilize a symbol or legend which implies to the consumer that which was not.

The above prohibited acts can only be interpreted as contemplating an inspection system that is without cessation or interruption and which will be accompanied by an abundance of paperwork in the form of certificates, records, reports, etc. Although not discussed at length before, the more paperwork that is built into a system the larger the clerical staff must be to handle same. We recognize that no present day activity can be without a certain amount of paperwork, however, the more extensive this becomes because of law, or the regulations issued to implement same, the greater the cost upon both industry and government.

The prohibited acts include reference to "official inspection certificate" and to "any shipper's or other certificate," and since such terms have been used in the bill, we believe you might be interested to see examples of such certificates as used by the Food and Drug Administration with respect to Canned Shrimp and/or Canned Oysters when these items were produced under their direct continuous supervision.

For your perusal, several forms have been reproduced, including:

Certificate of Inspection
Application for Warehousing
Warehousing Permit
Export Permit

F. D. 602—Seafood Inspection Form
Revised November 1939

UNITED STATES DEPARTMENT OF AGRICULTURE

FOOD AND DRUG ADMINISTRATION
SEAFOOD INSPECTION SERVICE

CERTIFICATE OF INSPECTION

Establishment No. _____

To: _____
(Name and address of packer)

This is to certify that the { ☐ extra large ☐ medium ☐ large ☐ small } _____ (Quality)
☐ wet pack ☐ dry pack } shrimp comprising the parcel of _____ (Number, size, and type units) { ☐ glass ☐ cans
identified by code mark _____ labeled as _____ brand,
and stored in _____ warehouse,
_____ (City and State) has been inspected and passed as conforming to all requirements of the Federal Food, Drug, and Cosmetic Act; to section 10A of the Food and Drugs Act of 1906; amendments thereto and regulations thereunder.

_____
Seafood Inspector.

_____, 19____

FEDERAL SECURITY AGENCY

FOOD AND DRUG ADMINISTRATION

APPLICATION FOR WAREHOUSING

Food and Drug Administration,
223 U.S. Customhouse,
New Orleans, La.

GENTLEMEN: Application is hereby made for permission to store unlabeled shrimp and/or oysters, packed in accordance with the regulations under Section 702A of the Federal Food, Drug and Cosmetic Act, in _____,
(Name of warehouse)
located at _____, _____, _____.
(Street & number) (City) (State)

Applicant hereby agrees that if this application is approved by the Food and Drug Administration, the United States of America and its agents shall be held harmless and released from all responsibility for any damage to such sea food

incident to, because of, or resulting from the inspection thereof by inspectors of the Food and Drug Administration.

_____
(Name of applicant)

Signed by:*_____
Official Title_____

P.O. Address_____
_____, 19____

WAREHOUSE AGREEMENT

The undersigned hereby agrees that if the above application is approved by the Food and Drug Administration, inspectors of such Administration shall have free access at all times to any lot of shrimp and/or oysters stored pursuant to such application in _____. The undersigned further agrees that conditions which will preserve the identity in such warehouse of all such lots so stored will be continuously maintained.

_____
(Name of warehousing concern)

Signed by*_____
Official Title_____

P.O. Address_____
_____, 19__

F. D. 601
SEAFOOD INSPECTION FORM
Revised June 1940

FEDERAL SECURITY AGENCY

FOOD AND DRUG ADMINISTRATION

SEAFOOD INSPECTION SERVICE

WAREHOUSING PERMIT

Establishment No. _____

To: _____
(Name and address of packer)

The parcel of _____ { ☐ glass / ☐ cans
(Number, size, and type units)

☐ extra large ☐ medium / ☐ large ☐ small } _____ (Quality) { ☐ wet pack / ☐ dry pack } shrimp identified by code mark _____ may be removed from _____ and
(Primary warehouse)

stored in _____ warehouse at _____
(City and State)

_____
Seafood Inspector.

_____, 19____

F. D. 603
SEAFOOD INSPECTION FORM
(Revised June 1940)

FEDERAL SECURITY AGENCY

FOOD AND DRUG ADMINISTRATION

SEAFOOD INSPECTION SERVICE

EXPORT PERMIT

Establishment No. _____

To: _____
(Name and address of packer)

The shrimp comprising the parcel of _____
(Number and kind of units)

_____ identified by code mark _____

*For partnerships, the signature of a member thereof is required. For cooperations and cooperative associations, the signature of a duly authorized officer thereof, designating his official title, is required.

stored in _____
(Name and address of warehouse)
labeled _____ brand _____
accords with the specifications and directions of _____
(Name and address of foreign purchaser)
was packed under sanitary conditions, is wholesome, and may be exported to such purchaser.

_____
Seafood Inspector.

_____, 19____

Under ADULTERATION, beginning at line 17 on page 6, we find:

"(f) (1) If it is, or it bears or contains, any fish or fishery product, and it has been processed, stored, or handled in violation of section 410 or 411 or any regulations issued by the Secretary under such sections."

The deletion of authority to the Secretary to issue regulations is recognized as not unusual, yet we would appreciate some restrictions in this area since past experience under FDA Seafood Inspection clearly demonstrated that the regulations issued by the Secretary were far more detailed and restrictive than necessary.

In testimony before The Consumer Subcommittee of The Commerce Committee on April 25, 1968, we provided it with examples of the magnitude and detail to which FDA went as regards its inspection of Canned Shrimp. Considering the difference in the amount of paperwork between thirty years ago and today, we shudder to think about the mass of regulations that probably will be issued to implement the provisions of this bill.

We suggest that this Committee might properly consider the insertion of a reasonable safeguard for industry by changing the above paragraph to read:

(f) (1) If it is, or it bears or contains, any fish or fishery product, and it has been processed, stored, or handled in violation of section 410 or 411. Regulations issued by the Secretary under such sections will not be so detailed and restrictive as to impede, deter, restrict or preclude the right of industry to initiate or implement advanced technology.

Under GOOD MANUFACTURING PRACTICES, beginning on page 7, and continuing on page 8, a survey of establishments and vessels is prescribed. We urge that such survey should be conducted with the cooperation and participation of industry, and state agencies.

Incorporation of authority for industry advisory committees should be included in the bill. Such a suggestion does not appear out of order since advisory committees are discussed beginning on line 10, page 26, in relation to State and Federal cooperation. In addition to assisting with the survey, such advisory committees should be utilized as the drafting of regulations takes place—and possibly at this stage representatives of consumers should also be included on such committees.

Under CERTIFICATION OF ESTABLISHMENTS AND VESSELS, beginning on page 8, it is specified that certificates of registration for all establishments and vessels are required within sixty days after the effective date of such regulations.

We do not object to certificates of registration, however, we tender the thought that such certificates should be permanent rather than annual. The clerical job involved with the issuance of nearly 100,000 certificates lends support to our proposal.

Vessels and establishments who have made proper application for a certificate should not be denied the right to operate because of a delay in their receipt of such certificate.

If identification numbers for establishments and vessels are provided by the certificates, such numbers should remain constant even if certificates are issued on a periodic basis rather than a permanent basis.

Under INSPECTION, on page 10, lines 17–20, we find the requirement

". . . the Secretary shall cause to be made, by inspectors appointed by him for that purpose, a continuous inspection of each establishment where fish or fishery products are processed . . ."

which is subsequently followed by the requirement, page 10, lines 21–24,

". . . the Secretary, at his discretion, may require that adequate inspections be made, by inspectors appointed for that purpose, of vessels processing fish or fishery products . . ."

and we find these two requirements to be discriminatory and unequal to the extent that many vessels perform the same processing as shore establishments, thus the principle of equal treatment should necessitate equal inspection. If our recommendation as to "adequate" rather "continuous" inspection is followed, it eliminates all problems in this regard.

Under INSPECTION, on page 10, beginning at line 24, ending on line 2 of page 11, we find:

"Any inspector appointed for the purposes of this title shall at any time have access to any establishment or vessel where fish or fishery products are processed for interstate commerce."

We believe several changes are required. First, we believe that access to any establishment or vessel should be "at any reasonable time". Second, we suggest the deletion of the last three words since this bill is designed to cover both intra as well as interstate commerce—and should any State not establish an equal system, it is provided that the FDA would take over, and they might legally be stopped by the above statement. Thus, we recommend that this sentence be changed to read as follows:

Any inspector appointed for the purposes of this title shall at any reasonable time have access to any establishment or vessel where fish or fishery products are processed.

Under INSPECTION, beginning at line 19 on page 11, we find:

"An appeal under this subsection from the determination of condemnation shall be at the cost of the appellant if the Secretary determines that the appeal was frivolous."

While we can appreciate the possible need for some such provision, we find it difficult to concur that this is the way to achieve the desired result. It makes the Secretary both judge and jury as to what is "frivolous", and it is our suggestion that this could just as well be accomplished through due process of law, with the government entitled to sue to recover all costs when it can prove to a court that an appeal was "frivolous". We recommend the deletion of the above quoted sentence, together with the deletion of all words on lines 23, 24, and 25, page 11, which are within the parenthesis.

Under LABELING AND PACKAGING, beginning on page 12, we find provisions which in actuality amount to pre-approval requirements for labels and packages. The Fair Packaging and Labeling Act adequately insures truth in packaging. To further complicate labeling and packaging of fish and fishery products by additional regulations seems an undue burden on industry. The provisions as to official marks or official inspection legends could only be valid and applicable should the inspection be without cessation or interruption.

Under STORAGE OR HANDLING REGULATIONS, page 13 beginning on line 16, we find the provision that products stored or handled in violation of such regulation "shall be deemed adulterated" (line 2, pg. 14). This is a positive requirement which appears to leave no room for review. In many instances, due to mechanical failures or Acts of God, storage temperatures in freezers might rise above the prescribed upper limit, yet it is possible that the wholesomeness of the food would not be impaired. Equally, due to floods canned foods could be subjected to flooding, yet the wholesomeness of the food not be impaired. We believe that the merits of the matter should have a bearing upon the final determination. Accordingly, we recommend that on line 2, page 14, the word "shall" be changed to "may".

The IMPORTATION OF FISH AND FISHERY PRODUCTS is dealt with beginning on line 14, page 14. We emphasize that because fish and fishery products are now imported from about 120 foreign nations, the regulations dealing with imports are critical.

In testimony before the Consumer Subcommittee of the Senate Committee on Commerce with regard to S. 1472 in July, 1967, Mr. Harold E. Crowther, then Director, Bureau of Commercial Fisheries, U. S. Department of the Interior, pinpointed the problem with regard to imports by his statement, which we quote:

"Since the United States imports fish and fishery products from some 116 different countries, maintenance of uniformly high sanitation con-

ditions in vessels and establishments in foreign countries presents some unique problems."

On page 15 it is provided that imports must originate from areas where the inspection program "is at least equal to" that applicable to our domestic industry. This section further provides "That whenever it shall be determined by the Secretary, in the case of any foreign country, that the system of plant and vessel inspection . . . is at least equal to . . . the . . . provisions of this Act . . . and that reliance can be placed on certificates . . . the Secretary may accept . . ." The key word is "reliance". We cannot envision "reliance" on such certificates unless FDA has the right and authority, with consent of the foreign nation, to send inspectors abroad for the purpose of observing and inspecting vessels and establishments to ascertain compliance with standards at least equal to our own. This thought is consistent with provisions presently in effect for both meat and poultry which enter this country from foreign sources.

There is no question but that this delicate subject of our relations with 120 different nations involves our trade relations, our diplomatic relations, matters of cost, and probably will ultimately involve assistance to less developed nations to aid in raising their standards to at least equal to ours. Concern over this has been voiced by many parties, and was well summarized in the remarks by Senator Hart which appeared in the Congressional Record on Feb. 8, 1968, as follows:

"In connection with this new bill which we are today introducing, I wish to comment that section 410 (i) on "Importation of Fish and Fishery Products" concerns me very much. I doubt that it is feasible to require that conditions in the 116 countries from which we presently import fish meet U. S. standards within 2 years. I believe we will need to give further consideration to this provision both in the interest of price to the U. S. consumer and in the interest of our trade relations with the countries involved, particularly the lesser developed nations."

The practical problem involved here can be illustrated by the fact that this Act provides for domestic inspection under Federal control for interstate activities, and further provides that if the States do not exercise control over intrastate activities "at least equal to" the Federal program, then the Federal inspection will be extended as it applies to intrastate activities. Thus, in effect, this Act says that there is a question as to relying upon our own 50 states to implement programs at least equal to the Federal program. This being the case, how are we going to rely upon 120 different foreign nations to do it?

There is a serious deficiency in the bill which we believe must be corrected. Foreign nations may be certified by the Secretary, however, we find no provision for withdrawing such certification should the need arise. We suggest the correction of this by inserting after the word "subpart" in line 9, page 15, the following:

Provided further, that certification by the Secretary in accordance with the requirements of this section shall not be deemed to in any way limit the Secretary's authority to condemn or prevent the importation of fish or fishery products which are adulterated within the meaning of Section 402 (a), (b) or (c), and that whenever the Secretary finds that the system of establishment and vessel inspection in a certified foreign country is no longer equal to all inspection, good manufacturing practice, and other provisions of this Act and regulations issued thereunder, he may suspend or cancel such certification until such time as he is assured that the foreign inspection system has again been brought into compliance with the requirements of this Act;

Sec. 410 (i) (1) (3) of the bill, lines 10–15 on page 16, seems somewhat harsh and restrictive as it limits importation to those ports as named by the Secretary with the approval of the Secretary of the Treasury. We find this to be the opposite of that which we would expect. The importation of fish and fishery products is an established fact and we would think that any port now satisfactory to the Secretary of the Treasury should remain a port of entry for fish and fishery products. Accordingly, we suggest a revision of Sec. 410 (i) (1) (3) to read:

(3) The importation of fish and fishery products into any port in the United States as approved by the Secretary of the Treasury and cus-

tomarily used at the time of enactment of this Act will be permitted to continue, and the Secretary will provide the necessary facilities and personnel to carry out the provisions of this Act. Application for entry at any other port may be approved by the Secretary with the concurrance of the Secretary of the Treasury.

We envision that domestically produced fish and fishery products will be subject to examination prior to their being allowed to enter into commerce. Such a practice should be equally applied to foreign produced products. We suggest that on page 16, after line 15 and before line 16, a new paragraph be added to read:

(4) All imported lots of fish and fishery products shall at the port of entry be subjected to examination substantially equal to that performed with regard to domestically produced products before they are allowed to enter into commerce, and no foreign produced product will be allowed to enter into commerce unless so examined and certified.

We now come to Sec. 410 (j) SURVEILLANCE OF DANGEROUS MATERIALS which is an entirely new subject not present in the Wholesome Fish & Fishery Products Act of 1969. We know that there is a growing awareness and concern as the result of the recent findings on "mercury" in fishery items, never-the-less, we strongly feel that the inclusion of this surveillance requirement should not be in this bill.

The implication of this requirement is that it is a problem limited to fish. Nothing could be further from the truth. The problems arising from our improved technology for detection of trace elements in rearing its ugly head in connection with everything that we ingest, regardless of whether it originates on land, from the seas, or from the air.

It is frightening to consider that as our technology for detection has increased, it has outpaced our knowledge of affects and interactions. One aspect of the investigation of toxicity problems which is of the greatest scientific and practical importance has been the revelation that the metabolism, and hence toxicity, of an element can be markedly influenced by the degree to which other elements, combinations of elements, or nutrients are present in the diet.

Scientific evidence indicates that should we examine our total food supply for the presence of elements on a one-by-one basis, we would end up finding some element in every food item that was considered "high" by some agency on the basis of our present knowledge. There is a real need for acclerated research by scientists from all applicable fields, including enzymologists and nutritionists, working together—research aimed at determining the ultimate biochemical lesions which exist because of trace metal deficiencies, excesses, or imbalances. We must arrive at a full understanding of their mode of action and interactions within the body.

Our Association can inform your Committee that we are sufficiently concerned and aware of the need for information and knowledge on this subject that our members, at their annual meeting in March of this year, authorized and funded an investigative program to moniter the 1971 pack, as well as to study the levels of trace elements present in the past to the extent such is possible.

This very action indicates our awareness of the seriousness of the problem. Thus, our earlier comment that this "surveillance" requirement has no place in this bill simply reflects that we consider the problem to have application to the entire food field—not just application to the fisheries. We respectfully recommend that the Congress authorize a general program aimed at our total food supply, for it is only in this manner that the sorely needed knowledge will be acquired. Accordingly, we recommend the deletion of Sec. 410(j) in its entirety, and further recommend that this be the subject of new legislation designed to provide a surveillance of our total food supply.

Since it is reasonable to presume that our general views as expressed above may not prevail, we find it necessary to comment upon the specific provisions as set forth under SURVEILLANCE FOR DANGEROUS MATERIALS. [Sec. 410(j)]

As we read the language of this section it becomes our impression that the intent of the "surveillance" is to establish an "intensive screening" program targeted at the detection of micro-constituents which may be present

in the fish or fishery products in such quantity as to constitute a threat to human health.

In 410(j)(3) on page 17, beginning at line 5, we find the requirement

> "Not more than ninety days after the date of enactment of this subsection, the Secretary shall propose regulations specifying all dangerous materials and indicating the intensive screening procedures that he will follow in carrying out this subsection."

We must first point out that the time limit as set forth in this requirement is so short that it insures that serious errors will arise, for judgments and decisions will have to be made on the basis of the incomplete and fragmentary knowledge now available. You are directing that the Secretary specify all dangerous materials. To specify a material as dangerous he must establish a level at which the specific material changes from "safe" to "toxic." Since this is information not readily available, the decisions which result in establishment of such a level will have to be made in haste and without the usual and expected scientific research and investigation. This brings us face to face with several real dangers: (1) the possibility that the level will be too high, thus defeating the purpose of this provision; or (2) that the level will be too low, which will result in real damage to segments of the fish and fishery products industry.

We fail to find any provision which would require the Secretary to consider and to relate into his "proposed regulations specifying all dangerous materials" the amount as normally ingested by the average human being. To illustrate, the recent "mercury" findings substantially resulted in the elimination of the swordfish segment of the industry. The hard fact is that the average human does not ingest swordfish as a regular and recurring part of his diet, whereas the average human does ingest many other food items on a more regular basis which will cumulatively contribute more "mercury" to his body that he would ever require from eating swordfish.

We further fail to find any provision which would require the Secretary to build into the "proposed regulations" any relationship between one element and other elements or nutrients which are present. Examples of scientifically established trace element interactions are the protective effect of arsenic against selenium toxicity, the significance of the calcium level to the incidence of zinc deficiency, etc.

We recommend that the Secretary should be both authorized and directed to consult with other agencies or bodies, for example the National Academy of Science, before issuance of the "proposed regulations specifying all dangerous materials."

While we have included the above comments specifically about Sec. 410(j), we restate our position which is that the proposed "Surveillance" should not be restricted solely to fish and fishery products but should be made applicable to the total food supply.

On pages 18 and 19 the subject of WITHHOLDING, WITHDRAWING, AND REINSTATING CERTIFICATES is covered. The approach as utilized is somewhat unsual, and we seriously question the Constitutional legality of these requirements. Although we may applaud the obvious objective of such regulations, we cannot concur with the attitude that because a man has been in trouble he is no longer fit to be in the fish or fishery products business, nor can we concur with the attitude that because such a man is employed his employer is put out of business. Desirable as they are, high standards should not be so defined as to pre-judge any individual or firm. We strongly urge that this entire provision be deleted. Aside from the above, the provisions as written could well open the door to economic blackmail, for an unsavory character need only acquire 10% of the stock of a firm in order to put it out of business. Many large firms are listed on the stock exchanges and, for example, underworld elements could buy up 10% of the stock. They would then be in position either to extract tribute from the firm or let it be known that they own this stock, thus effectively putting the firm out of business. We cannot too strongly urge the deletion of such provisions.

Under MAINTENANCE AND RETENTION OF RECORDS, beginning on page 19, we note that the bill does not contain a clause reading

> "the source waters of such fish or fishery products,"

which does appear in the Congressional Record—Senate, April 14, 1971, pg. S 4758.

Although this was probably a clerical omission at the time the bill was printed, we would be happy if it remained out. We view this requirement as an unnecessary burden upon fishermen, and one which would not serve any really useful purpose, at least as regards shrimp, since the area of catch is rather restricted and limited in comparison with other fishery items, as for example, tuna.

A further problem that we envision which has wide applicability to domestic fisheries is that created by the fact that catches are landed at "fish houses" and then transported to the processor. Since the "fish house" is exempt from the provisions of this bill, that exempts them from the necessity of maintaining such records. For practical purposes, all the processor will know is the name and location of the fish house that delivered the merchandise.

Under INSPECTION EXEMPTIONS, which begins on page 20, we suggest the deletion on line 25 of the words "in commerce." We also suggest that beginning on page 21, line 3, after the word "(em-)ployees" all subsequent words on lines 3, 4, and 5 be deleted. This paragraph would then read:

> (d) INSPECTION EXEMPTIONS.—(1) The provisions of this subpart shall not apply to the processing by any person of fish of his own raising or harvesting, and the preparation by him and transportation of the fish or fishery products exclusively for use by him and members of his household and his nonpaying guests and employees.

Continuing under INSPECTION EXEMPTIONS, subpart (2) provides that retail dealers may be exempt and subpart (3) provides that a "fish house" may be exempt. Since these are permissive exemptions subject to regulations as prescribed by the Secretary, we cannot object. We do point out, however, that under the combination of these two exemptions it is possible for fish to be landed, transported to a retail dealer possibly even in another State, and sold to the consumer—all without ever having been subject to any inspection. We suggest that such regulations as issued by the Secretary not preclude adequate inspection to insure that sanitary standards, practices, and procedures are complied with.

Under INSPECTION EXEMPTIONS, beginning on line 4, page 22, it is specified that inspection shall not be provided to any establishment or vessel processing fish or fishery products which are not intended for use as human food. We point out that this is an area of possible conflict as to whether or not inspection should apply, for many establishments process both for human consumption and "not for human consumption." We thus have the possibility of exempt and non-exempt operations within the same establishment. A further consideration is that many establishments whose prime product is "not for human consumption" do, at the time of receipt of raw materials, segregate out those items suitable and more valuable when diverted to human consumption, and do move same into commerce. We suggest that this might be resolved by giving the Secretary authority to issue regulations applicable to establishments who, under this bill, carry on both exempt and non-exempt operations.

This completes our comments and suggestions with regard to specific provisions of S. 1528—The Wholesome Fish and Fishery Products Act of 1971.

Part 2

S. 700—THE WHOLESOME FISH AND FISHERY PRODUCTS ACT OF 1971

The two principal high protein foods—meat and poultry—have for several years been the subject of laws designed to protect their wholesomeness. The logic is that our third high protein food—fish—should be the subject of comparable legislation. There are some very basic differences between meat and poultry on the one hand as compared with fish. Among these differences is the fact that meat and poultry as consumed in the United States is primarily produced in the United States and a limited number of foreign nations, whereas the bulk of the fish and fishery products as consumed in the United States is produced abroad and imported into the United States from approximately 120 foreign nations.

For this very reason, S. 700 must be considered as legislation of an "International" nature since it will affect so many foreign nations. Often time,

words which we use have a different meaning abroad—and a recognition of this actual problem of communications should be given careful attention during your deliberations on this Act.

Under DEFINITIONS, lines 13–16, on page 3, we find:

"(2) The term 'shellfish', as used in sections 402(f), 421, and 423, means any species of oyster, clam, or mussel, either shucked or in the shell, and either fresh or frozen or otherwise processed, or any part thereof."

It is understandable that this should have been so written in view of the Shellfish Sanitation Program which has existed for so many years under the Public Health Service. That program was primarily domestic in nature and affected only a few foreign nations who were well informed and cooperative.

S. 700 will affect every nation on this earth who presently or in the future may desire to export fish or fishery products to the United States. For this reason we suggest that the use of the term "shellfish" will be misleading and widely misunderstood because of the international acceptance and understanding of the term "shellfish" to include not only bivalve mollusks such as oysters, clams, and mussels, but also such crustaceans as shrimp, crabs, lobsters, crawfish, and a vast array of lesser known products. To eliminate the chance of misunderstanding, we recommend a change, as follows:

Eliminate the word 'shellfish' throughout the bill, substituting the phrase 'oyster, clam, or mussel' in lieu thereof.

Were this suggestion to be followed, it would then be fitting and proper that definition (y)(2) be striken from the bill.

Under DEFINITIONS, beginning on line 17, page 3, we find:

"(z) The term 'fishery products' means any product capable of use as human food which is made wholly or in part from any fish or portion thereof, except products which contain fish only in small proportions or historically have not been, in the judgment of the Secretary, considered by consumers as products of the commercial fishing industry, and which are exempted from definition as a fishery product by the Secretary under such conditions as he may prescribe to assure that the fish or portions thereof contained therein are not adulterated and that such products are not represented as fishery products."

A substantial portion of that definition is concerned with an exemption for which we see no justification nor need. In discussion amongst ourselves, we are unable to name any product which we felt would qualify for the exemption. We view the exemption as being ambiguous and discriminatory, and recommend its deletion so that the definition would then read

"(z) The term 'fishery products' means any product capable of use as human food which is made wholly or in part from any fish or portion thereof."

Under DEFINITIONS, beginning on line 3 of page 4, we find:

"(aa) The term 'capable of use as human food' applies to any fish or part or product thereof, unless it is denatured or otherwise identified as required by regulations prescribed by the Secretary to deter its use as human food, or unless it is naturally inedible by humans."

We believe that a clarification is necessary with regard to "pet foods" particularly as regards cat and/or dog food. Obviously, they cannot be de natured . . . for denatured implies rendering them unfit for consumption either by humans or by animals. The identification "as required by regulations prescribed by the Secretary to deter its use as human food" might result in a label warning "not for human consumption," and while this could satisfy the identification requirement it almost certainly would arouse the anger of millions of pet owners. If statistics are to be believed, we yearly spend more to feed pets than we do to feed infants, so we can hardly look upon this point as being of little concern. It is our suggestion that this definition be changed to read as follows:

(aa) The term 'capable of use as human food' applies to any fish or part or product thereof, unless naturally inedible by humans, or unless specifically labeled in accordance with regulations as prescribed by the Secretary to indicate that the product is for other than human consumption.

Under DEFINITIONS, beginning at line 8 on page 4, we find:

"(bb) The terms 'process', 'processed', and 'processing', with respect to fish or fishery products, mean harvesting, handling, storing, preparing, producing, manufacturing, preserving, packing, transporting, or holding thereof."

This definition appears aimed at covering any and all steps involved in the commerce of providing fish and fishery products as food for human consumption, yet it specifically omits "growing areas" for oysters, clams, and mussels.

Depending upon how one reads and interprets the above definition, it may or may not cover the relatively new and rapidly expanding sciences of "mariculture" and "aquiculture." The growing importance of these sciences makes it imperative that they be covered. Trout farming and catfish farming are probably the two best known products, however, there are many others which are rapidly growing in commercial importance. To illustrate, in the State of Louisiana in 1970 over 20,000 acres were devoted to crawfish, which is up from practically nothing only a few years ago. This now emerging area of commercial fish production cannot be overlooked and must be provided inspection equal to that of the more conventional fisheries.

Instead of trying to name each presently recognized step by name, we suggest that this definition might read

(bb) The terms 'process', 'processed', and 'processing', with respect to fish or fishery products, mean any one or more steps involved in the commerce of providing such food for human consumption.

Under DEFINITIONS, beginning at line 12 on page 4, we find:

"(cc) The term 'official mark' means any symbol prescribed by regulations of the Secretary to identify the status of any fish or fishery product or of any processing establishment or vessel under this Act."

"(dd) The term 'official certificate' means any certificate prescribed by regulation of the Secretary for issuance by an inspector or other person performing official functions under this Act."

The provisions of the Fair Packaging and Labeling Act, and the regulations issued to implement same, are presently applicable to our products. The consumer is amply safeguarded as to the truthfulness of labels. It is a well known fact that many labels had to be changed to provide the mandatory information in the proper place and in the proper size of printing.

The addition of a symbol to the labels of fish or fishery products is not necessary, and would certainly constitute an unnecessary added expense to industry to ultimately be borne by consumers. There is some question as to whether it would be proper to so utilize a symbol should the inspection be less than continuous unless such symbol merely identified the establishment—and this would seem redundant since this information now appears on the label under existing law.

We have grave reservations concerning the possible extension of the use of any symbol to products produced in a foreign country. Even the implication that such products were produced under supervision of FDA would be morally wrong and legally inexcusable.

Under ADULTERATION, beginning at line 8 on page 8, we find:

"(f)(1) If it is, or it bears or contains, any fish or fishery product, and it has been processed in violation of section 410 or 411 or any regulations issued by the Secretary under such sections."

The delegation of authority to the Secretary to issue regulations is recognized as not unusual, yet we would appreciate some restrictions in this area since past experience under FDA Seafood Inspection clearly demonstrated that the regulations issued by the Secretary were far more detailed and restrictive than necessary.

In testimony before The Consumer Subcommittee of The Commerce Committee on April 25, 1968, we provided it with examples of the magnitude and detail to which FDA went as regards its inspection of Canned Shrimp. Considering the difference in the amount of paperwork between thirty years ago and today, we shudder to think about the mass of regulations that probably will be issued to implement the provisions of this bill.

We suggest that this Committee might properly consider the insertion of a reasonable safeguard for industry by changing the above paragraph to read:

(f)(1) If it is, or it bears or contains, any fish or fishery product,

and it has been procesed in violation of section 410 or 411. Regulations issued by the Secretary under such sections will not be so detailed and restrictive as to impede, deter, restrict or preclude the right of industry to initiate or implement advanced technology.

Under CERTIFICATION OF ESTABLISHMENTS AND VESSELS, beginning on page 10, it is specified that certificates of registration for all establishments and vessels are required within sixty days after the effective date of such regulations.

We have no objection to certificates of registration, however, we tender the thought that such certificates should be permanent rather than annual since, for cause, a certificate may be suspended by the Secretary. At the very least, if identification numbers are assigned plants and vessels, the number should remain constant even if re-registration annually remains a requirement. To accomplish our recommendation it would be necessary only to

delete the words "an annual" which appear in line 18, page 10, and insert in lieu thereof the word "a"

and in so doing we cannot see how the authority of the Secretary would have been altered or affected in any way. Our suggestion would accomplish the elimination of an annual clerical job which serves no useful purpose.

As the bill is now written, application for a certificate cannot be made before the regulations are issued, and a certificate cannot be issued until an "intensive inspection" has been made. It is reasonable to anticipate that many vessels and establishments will be close to the time deadline before they are in compliance with the regulations. The requirement for an "intensive inspection" could result in a heavy workload as the time deadline approaches, and the real possibility exists that many establishments and vessels may not be inspected through no fault of their own. This then raises the question as to the legality of their operations on and after the 60th day following the effective date of the regulations. The real problem that will undoubtedly arise further supports our contention that the certificate should be primarily for identification purposes.

Under SURVEILLANCE, INCLUDING INSPECTION, we find the provision for the appropriate degree of inspection as determined by the Secretary for any establishment or vessel. This is in keeping with our views on this subject and we approve this approach. On page 13, beginning at line 8, we find:

"Any inspector appointed or commissioned for the purposes of this part shall at any time have access to any establishment or vessel where fish or fishery products are processed for interstate commerce."

We believe several changes are required. First, we believe that access to any establishment or vessel should be "at any reasonable time." Second, we suggest the deletion of the last three words since this bill is designed to cover both intra as well as interstate commerce—and should any State not establish an equal system, it is provided that the FDA would take over and they might legally be stopped by the above statement. Thus, we recommend that this sentence be changed to read as follows:

Any inspector appointed or commissioned for the purposes of this part shall at any reasonable time have access to any establishment or vessel where fish or fishery products are processed.

The requirement that an inspector "shall at any time have access" to the establishment can be related to the sentence beginning on line 13, page 13, which states

"The Secretary, whenever processing operations are being conducted, . . ."

and it is our thought that whenever an establishment or vessel is processing, regardless of the hour of the day or night, it is and should be subjected to being inspected. Our recommendation for a change to "any reasonable time" would not lessen or restrict inspections when processing operations were being carried on.

On page 14, beginning at line 3, we find:

"An appeal under this paragraph from the determination of condemnation shall be at the cost of the appellant if the Secretary determines that the appeal was frivolous."

While we can appreciate the possible need for some such provision, we find it difficult to concur that this is the way to achieve the desired result. It makes the Secretary both judge and jury as to what is "frivolous," and it is our suggestion that this could just as well be accomplished through

due process of law, with the government entitled to sue to recover all costs when it can prove to a court that an appeal was "frivolous." We recommend the deletion of the above quoted sentence.

Under LABELING AND PACKAGING, beginning on page 15, we find provisions which in actuality amount to pre-approval requirements for labels and packages. The Fair Packaging and Labeling Act adequately insures truth in packaging. To further complicate labeling and packaging of fish and fishery products by additional regulations seems an undue burden on industry.

The IMPORTATION OF FISH AND FISHERY PRODUCTS is dealt with beginning on line 5, page 16. We emphasize that because fish and fishery products are now imported from about 120 foreign nations, the regulations dealing with imports are critical.

In testimony before the Consumer Subcommittee of the Senate Committee on Commerce with regard to S. 1472 in July, 1967, Mr. Harold E. Crowther, then Director, Bureau of Commercial Fisheries, U.S. Department of the Interior, pinpointed the problem with regard to imports by his statement, which we quote:

> "Since the United States imports fish and fishery products from some 116 different countries, maintenance of uniformly high sanitation conditions in vessels and establishments in foreign countries presents some unique problems."

There is no question but that this delicate subject of our relations with 120 different nations involves our trade relations, our diplomatic relations, matters of cost, and probably will ultimately involve assistance to less developed nations to aid in raising their standards to at least equal to ours. Concern over this has been voiced by many parties, and was well summarized in the remarks by Senator Hart which appeared in the Congressional Record on Feb. 8, 1968, as follows:

> "In connection with this new bill which we are today introducing, I wish to comment that section 410(i) on "Importation of Fish and Fishery Products" concerns me very much. I doubt that it is feasible to require that conditions in the 116 countries from which we presently import fish meet U.S. standards within 2 years. I believe we will need to give further consideration to this provision both in the interest of price to the U.S. consumer and in the interest of our trade relations with the countries involved, particularly the lesser developed nations."

The practical problem involved here can be illustrated by the fact that this Act provides for domestic inspection under Federal control for interstate activities, and further provides that if the States do not exercise control over intrastate activities "at least equal to" the Federal program, then the Federal inspection will be extended as it applies to intrastate activities. Thus, in effect, this Act says that there is a question as to relying upon our own 50 states to implement programs at least equal to the Federal program. This being the case, how are we going to rely upon 120 different foreign nations to do it?

The approach to this problem as embodied in S. 700 is far superior to that of S. 1528 since it provides for at least an annual investigation and evaluation, as well as providing for termination of certification when justified.

Sec. 410(i)(3) of the bill, lines 16–23 on page 17, seems somewhat harsh and restrictive as it limits importation to those ports as named by the Secretary with the approval of the Secretary of the Treasury. We find this to be the opposite of that which we would expect. The importation of fish and fishery products is an established fact and we would think that any port now satisfactory to the Secretary of the Treasury should remain a port of entry for fish and fishery products.

We envision that domestically produced fish and fishery products will be subject to examination prior to their being allowed to enter into commerce. Such a practice should be equally applied to foreign produced products. We suggest that on page 17, after line 23 and before line 24, a new paragraph be added to read:

> (4) All imported lots of fish and fishery products shall at the port of entry be subjected to examination substantially equal to that performed with regard to domestically produced products before they are allowed to enter into commerce, and no foreign produced product will be allowed to enter into commerce unless so examined and certified.

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This would then require that on line 24 the paragraph designated (4) be changed to (5).

On pages 18 and 19 the subject of WITHHOLDING, WITHDRAWING, AND REINSTATING CERTIFICATES is covered. The approach as utilized is somewhat unusual, and we seriously question the Constitutional legality of these requirements. Although we may applaud the obvious objective of such regulations, we cannot concur with the attitude that because a man has been in trouble he is no longer fit to be in the fish or fishery products business, nor can we concur wtih the attitude that because such a man is employed his employer is put out of business. Desirable as they are, high standards should not be so defined as to pre-judge any individual of firm. We strongly urge that this entire provision be deleted. Aside from the above, the provisions as written could well open the door to economic blackmail, for an unsavory character need only acquire 10% of the stock of a firm in order to put it out of business. Many large firms are listed on the stock exchanges and, for example, underworld elements could buy up 10% of the stock. They would then be in position either to extract tribute from the firm or let it be known that they own this stock, thus effectively putting the firm out of business. We cannot too strongly urge the deletion of such provisions.

Under RECORDS AND REPORTS, beginning on page 19, we note that S. 700 goes far beyond S. 1528 as to the records which must be retained and made freely available to the Secretary. The opening of quality control, sanitation, and other such records could result in the divulgance of trade secrets to the determent of the establishment or vessel, while serving no truly useful purpose for the Secretary. Since the records are required to be opened to the Secretary, the further requirement concerning reports seems unwarranted and we recommend its deletion.

Under PERSONNEL—APPOINTMENT AND TRAINING, beginning on page 34, we note the first instance of legislative proposals dealing with the qualification and training of personnel. As pointed out in our comments relating to S. 1528, of necessity the inspectors should have a minimum of a Bachelor's degree, preferably in one of the basic sciences, in order that he might be effectively trained in methods of food handling, plant santiation, and field methods of certain laboratory procedures for final product inspection. If the program of fish inspection is administered by the Food & Drug Administration then the inspectors can be efficiently utilized in other inspection work when their services are not required for inspecting fish.

On page 35, under NATIONAL ADVISORY COMMITTEE, we find the requirement that "The chairman . . . and a majority of the members shall be drawn from the public . . . , from the fields of the environmental, and other relevant sciences, and from persons especially conversant with State programs, and shall have no economic interest in the commercial fisheries industry."

The above requirement can easily be interpreted to mean that the commercial fisheries industry could not and would not be allowed any representation on the "National Advisory Committee."

The idea of "advisory committees" is a good one, however, we must object to the above provision which eliminates industry. We feel that the approach to advisory committees as set forth in S. 1528 on page 26, lines 10 thru 21, is far better, more realistic, and more apt to result in sound contributions coming from the committees. To regulate the commercial fishing industry and not even permit it representation upon the advisory committee is certainly contrary to the normal American way of doing things, and is not warranted by any facts that we have knowledge of.

We recommend the modification of this requirement to permit industry to have representation upon the advisory committee.

This completes our comments and suggestions with regard to specific provisions of S. 700—The Wholesome Fish and Fishery Products Act of 1971.

Part 3

S. 296—THE FISHERY PRODUCTS PROTECTION ACT OF 1971

We have up to this point been discussing The Wholesome Fish and Fishery Products Act of 1971—the title of both S. 1528 and S. 700. Both of these bills would amend the Federal Food, Drug, and Cosmetic Act to include

specific provisions relating to "fish inspection." Thus, the program of fish inspection would come under the Department of Health, Education and Welfare, and would be administered by the Food & Drug Administration.

S. 296 takes an entirely different approach to "fish inspection" as it would amend the Fish & Wildlife Act of 1956 and would place "fish inspection" under the Department of the Interior. In 1970 the commercial fisheries were transferred from the Department of the Interior to the Department of Commerce. At the very least, S. 296 should be corrected to reflect that the "Secretary" as therein defined would be the Secretary of the Department of Commerce.

The paramount question which arises when considering S. 296 is whether the proposed fish inspection program should be administered by some Department of government other than HEW and its Food and Drug Administration. While we recognize that this was an open question several years ago, we thought that it had been rsolved that fish inspection should come under the Food and Drug Administration.

Should the question of which Department of government would administer "fish inspection" now be reopened, then it becomes imperative that we examine and closely study one of the major issues—the effective utilization of the many inspectors who will be hired to administer this program. When they are not engaged in the inspection of fish or fishery products how will they be utilized?

By the very nature of the fisheries, many of the segments of the commercial fishing industry must operate on a feast or famine basis, subject to the whims of Mother Nature. Because so many of the fisheries are seasonal in nature, the fish must be processed when available. In many instances, establishments (and even vessels) are utilized at peak capacity for limited periods, at part capacity for other periods, and, in terms of production, not utilized at all during other periods.

Under the provisions of S. 296 we understand what the inspectors would be doing while processing was being conducted, but we fail to find any provisions to tell us how they would be utilized when there was nothing to inspect. It is obvious that trained inspectors cannot be hired only for limited periods as needed, then discharged. To have trained, good inspectors it is necessary that they be year-round employees. Yet, it is equally obvious that large numbers of trained inspectors cannot be maintained on the payroll of the government when there is nothing for them to do. Our point is that they cannot be utilized for anything but fish inspection if the program is administered by either the Dept. of the Interior or by the Dept. of Commerce. On the other hand, if the program of fish inspection is administered by the Food and Drug Administration then the inspectors can be efficiently utilized in other inspection work when they are not required for inspecting fish.

Turning to the specific provisions of S. 296, we are immediately struck by the fact that this bill seems to be aimed solely at interstate commerce and not to be concerned with intrastate commerce. This first becomes evident in the definition of the term "commerce" (beginning on page 1, line 6), and in the provisions of Sec. 4 and Sec. 8 of the bill. In coastal States a very sizable segment of the fisheries are local in nature and conducted as intrastate activities, yet by our understanding of the bill are exempt from inspection by omission. If there is to be an effective national fish inspection program, this segment must also be covered by the program administered either by the State or by the Federal government should the State fail to provide an adequate and comparable program of its own.

It is noted that "vessels" as covered by this bill would be only those of 5 net tons and upward, which is comparable to S. 700 and far more lenient than S. 1528. We point out that this means, in terms of numbers, that the largest part of the commercial fishing fleet would be exempt from the provisions of the bill, and this should not be.

Sec. 4 of the bill provides that regulations will be issued within one year for both domestic producers and for foreign producers. While obviously the issuance of regulations is necessary, we do recommend that such regulations be promulgated under formal rule-making procedures with full opportunity for participation by all interested parties. As we see no provisions in the bill for this, we further recommend that should S. 296 be enacted it be amended to include provisions comparable to those embodied in Sec. 701(e), (f), and (g) of the Federal Food, Drug, and Cosmetic Act which reads:

(e)(1)[29] Any action for the issuance, amendment, or repeal of any regulation under section 401, 403(j), 404(a), 406, 501(b), or 502(d) or (h) of this Act shall be begun by a proposal made (A) by the Secretary on his own initiative, or (B) by petition of any interested person, showing reasonable grounds therefor, filed wtih the Secretary. The Secretary shall publish such proposal and shall afford all interested persons an opportunity to present their views thereon, orally or in writing. As soon as practicable thereafter, the Secretary shall by order act upon such proposal and shall make such order public. Except as provided in paragraph (2), the order shall become effective at such time as may be specified therein, but not prior to the day following the last day on which objections may be filed under such paragraph.

(2) On or before the thirtieth day after the date on which an order entered under paragraph (1) is made public, any person who will be adversely affected by such order if placed in effect may file objections thereto with the Secretary, specifying with particularity the provisions of the order deemed objectionable, stating the grounds therefor, and requesting a public hearing upon such objections. Until final action upon such objections is taken by the Secretary under paragraph (3), the filing of such objections shall operate to stay the effectiveness of those provisions of the order to which the objections are made. As soon as practicable after the time for filing objections has expired the Secretary shall publish a notice in the Federal Register specifying those parts of the order which have been stayed by the filing of objections and, if no objections have been filed stating that fact.

(3) As soon as practicable after such request for a public hearing, the Secretary, after due notice, shall hold such a public hearing for the purpose of receiving evidence relevant and material to the issues raised by such objections. At the hearing, any interested person may be heard in person or by representative. As soon as practicable after completion of the hearing, the Secretary shall by order act upon such objections and make such order public. Such order shall be based only on substantial evidence of record at such hearing and shall set forth, as part of the order, detailed findings of fact on which the order is based. The Secretary shall specify in the order the date on which it shall take effect, except that it shall not be made to take effect prior to the ninetieth day after its publication unless the Secretary finds that emergency conditions exist necessitating an earlier effective date, in which event the Secretary shall specify in the order his findings as to such conditions.

(f)(1) In a case of actual controversy as to the valadity of any order under subsection (e), any person who will be adversely affected by such order if placed in effect may at any time prior to the ninetieth day after such order is issued file a petition with the Circuit Court of Appeals of the United States for the circuit wherein such person resides or has his principal place of business for a judicial review of such order. A copy of the petition shall be forthwith transmitted by the clerk of the court to the Secretary or other officer designated by him for that purpose. The Secretary thereupon shall file in the court the record of the proceedings on which the Secretary based his order, as provided in section 2112 of title 28, United States Code.

(2) If the petitioner applies to the court for leave to adduce additional evidence, and shows to the satisfaction of the court that such additional evidence is material and that there were reasonable grounds for the failure to adduce such evidence in the proceeding before the Secretary, the court may order such additional evidence (and evidence in rebuttal thereof) to be taken before the Secretary, and to be adduced upon the hearing, in such manner and upon such terms and conditions as to the court may seem proper. The Secretary may modify his findings as to the facts, or make new findings, by reason of the additional evidence, so taken, and he shall file such modified or new findings, and his recommendation, if any, for the modification or setting aside of his original order, with the return of such additional evidence.

(3) Upon the filing of the petition referred to in paragraph (1) of this subsection, the court shall have jurisdiction to affirm the order, or to

set it aside in whole or in part, temporarily or permanently. If the order of the Secretary refuses to issue, amend, or repeal a regulation and such order is not in accordance with law the court shall by its judgment order the Secretary to take action with respect to such regulations, in accordance with law. The findings of the Secretary as to the facts, if supported by substantial evidence, shall be conclusive [now covered by U.S.C. title 28, sec. 1254].

(4) The judgment of the court affirming or setting aside, in whole or in part, any such order of the Secretary shall be final, subject to review by the Supreme Court of the United States upon certiorari or certification as provided in sections 239 and 240 of the Judicial Code, as amended.

(5) Any action instituted under this subsection shall survive notwithstanding any change in the person occupying the office of Secretary or any vacancy in such office.

(6) The remedies provided for in this subsection shall be in addition to and not in substitution for any other remedies provided by law.

(g) A certified copy of the transcript of the record and proceedings under subsection (e) shall be furnished by the Secretary to any interested party at his request, and payment of the costs thereof, and shall be admissible in any criminal libel for condemnation, exclusion of imports, or other proceeding arising under or in respect of this Act, irrespective of whether proceedings with respect to the order have previously been instituted or become final under subsection (f).

Sec. 5 of the bill provides that regulations as issued under the authority in Sec. 4 will become effective 2 years later, which we would think provides ample time for vessels or establishments to be brought into compliance. We point out that within this 2 year period both establishments and vessels could, if necessary, make application for loans which are provided for in Sec. 7 of this bill. Of the three bills being considered today, this is the only one which provides for possible assistance through loans.

Sec. 5(1) deals with the need for "certificates of registration" and due to the subsequent provisions of Sec. 6(a) and (b) regarding suspension of the "certificate" we feel that the "certificate" is intended to be more than just a means of identification. We do not object to "certificates of registration," however, we tender the suggestion that such certificates should be permanent and that any identification numbers be permanently assigned to the establishment or vessel.

Sec. 5(2) and (3) deals with imports and specifics (Page 6, line 24) that standards and practices in foreign countries "must be consistent" with those regulations promulgated by the Secretary. The use of the word "consistent" results in something less precise than the use of the phrase "at least equal to" which appears in both S. 1528 and S. 700. The provisions of S. 700 are considered best since they are more precise and also make mandatory at least an annual inspection of the foreign establishments and vessels.

Sec. 6(c) provides for inspectors having access to "any establishment" and we note the omission of inspectors having access to "any vessel," which omission we recommend be corrected. It is also noted that while access is provided for, there is no stipulation as to time, and we recommend the inclusion of the phrase "at any reasonable time." Thus, our recommendations would result in Sec. 6(c) being changed to read

(c) Any inspector shall at any reasonable time have access to any establishment or vessel for the purpose . . .

Sec. 7 provides for technical assistance to the fishing industry, and provides an additional 35-million dollars into the fisheries loan fund. Such a provision has merit regardless of the type of inspection legislation finally adopted.

Sec. 8 deals with the encouragement of States to provide a system of inspection so that they may administer the Act. We find no specific statements concerning who would bear the cost of such an inspection system. If the States are expected to bear the full cost we doubt that many will be interested. On the other hand, if the provisions of Sec. 16 can be interpreted that the entire cost will be borne by the United States, then we suspect that all States would enact a program of their own. Clarification of this important point should be achieved.

Sec. 9 deals with and sets forth conditions under which "fish and fishery products shall be deemed to be adulterated. We suggest that this section is not necessary since "fish and fishery products" will be deemed to be adulterated if they do not comply with the Federal Food, Drug, and Cosmetic Act. Nothing in this bill limits the application of the FD&C Act to fish and fishery products.

Sec. 10 deals with vessels and requires that they be "constructed, equipped, operated, and maintained, to meet such sanitary standards and practices as the Secretary may prescribe." We recommend that this section be amended to require the Secretary to consult with other interested federal agencies and departments, including but not limited to the Coast Guard, before the issuance of regulations.

Sec. 12 deals with labeling and packaging, including the use of the official inspection mark. The provisions of the Fair Packaging and Labeling Act, as well as the provisions of the Food, Drug, and Cosmetic Act, are both fully applicable to fish and fishery products intended for human food. The consumer is amply safeguarded as to the truthfulness of labels.

The addition of a symbol or mark to the labels of fish and fishery products is not necessary. All such a mark would accomplish is a duplication of the identification of the responsible firm, which information is already on the label. With a degree of inspection anything less than "continuous" the use of any mark which might convey to the consumer the impression that the item was produced under government supervision would be misleading and dangerous.

Sec. 15 contains several exemptions to the provisions of this bill, and here again we note the weakness of the system as evidenced by the exclusion of the intrastate activities. We find it difficult to believe that the health and welfare of the consumer only becomes affected and a matter of concern when the fish and fishery products move across a State boundary line.

This completes our comments and suggestions with regard to specific provisions of S. 296—The Fishery Products Protection Act of 1971.

JULY 19, 1971.

Hon. PHILIP A. HART,
Chairman, Subcommittee on the Environment, Senate Committee on Commerce, U.S. Senate, Washington, D.C.

DEAR SENATOR HART: Once again your Subcommittee has under consideration several bills to improve the quality and wholesomeness of fishery products sold to the American consumer.

Industry groups have bemoaned the coming of this legislation since your Subcommittee's first hearings in 1967. Over the years—and throughout the hearings held in 1967, 1968, 1969 and in May of this year—they have sung their own praises and condemned suggestions that any substantial changes are necessary in the regulation of fishery products.

Again and again spokesmen of the National Canners Association which represents 90% of the canning industry have told us about their "voluntary" and "cooperative" efforts at "quality improvement and quality assurance" for canned fish products.

In 1969, Dr. Ira I. Somers, Director of the N.C.A.'s Research Laboratories, made a most remarkable statement about the products of the canning industry: "We are not aware of bad canned fish being on the market. And I think it is quite important to emphasize the precautions and controls that are used by the canning industry." Unfortunately, one may search in vain the more than 1,000 pages of hearings held by your Subcommittee since 1967 to find a scintilla of support for this statement and others like it. One does find evidence of half-hearted gestures to respond to crises like the salmonella scare in the 1930's and the defective salmon can crisis of 1966. But where is the evidence that these "voluntary efforts" have proven effective?

The Canners privately operate a controlled consumer claims handling system that appears unprecedented. Indeed, from the moment a retailer turns a complaint over to his insurer or to his canned foods distributor, the N.C.A.'s Claims Division swings into action.

This claims handling mechanism ought to be the subject of separate scrutiny by your Committee and by other appropriate agencies of the government, such as the Antitrust Division of the Justice Department. It presents in microcosm many of the anti-consumer and anti-competitive biases which corporate or trade association "consumer relations" efforts ought to avoid, or be compelled to avoid.

I have submitted today a formal request for investigation of the antitrust aspects to Mr. Richard W. McClaren, Assistant Attorney General, Antitrust Division. My letter to Mr. McClaren is attached.

A 1966 secret brochure[1] sets out the purposes and outlines the method of operation of the N.C.A. Claims Division. "The fundamental purpose of all Association activity with respect to consumer claims is to protect the reputation and integrity of canned foods." So begins the brochure's statement of purpose. It then proceeds to describe the "erroneous" and "unfounded reports of illness", the "falsely exaggerated stories of injured" and the "unchecked and unchallenged rumors" which the Claims Division was created to counter.

Thus the N.C.A. begins, as it has at all the Fish Inspection hearings since 1967, with the unfounded assumption that the industry is near-perfect and that the consumer is in effect a rumor-mongering scoundrel given to exaggeration, deceit, and avarice. Certainly the consumers who have complained to fish canners and, through the claims mechanism, indirectly to the N.C.A. about the very conditions which led to the hearings receive short shrift. In fact, one can search the four years of N.C.A. testimony in vain for the slightest indication that consumer satisfaction or dissatisfaction or consumer feedback is of any concern to the association or that the association has any specific knowledge of such feedback.

The "fundamental purpose" of the Claims Division and all of the research facilities and "voluntary efforts" which support it boils down to image-making. If the N.C.A. wishes to demonstrate otherwise, it must make its voluminous complaint files available to this Subcommittee and to the public.

Unfortunately, a sampling of such correspondence suggests strongly that this may be an impossible burden. For example, the N.C.A. wrote Libby, McNeil & Libby Inc. in March, 1965 concerning a complaint for which the consumer had obtained legal counsel: "Certainly the fact that the beans were spoiled at the time they were examined by the [Municipal] Division of Health has *no relation* to the incident forming the basis of this complaint and of course we do not believe that your product was the causative factor in any illness that may have occurred" (emphasis added). The N.C.A. may have had a sound basis for such an opinion in this particular case. One wonders, however, why this case was pursued by plaintiff's counsel for at least five years if the matter was so simple. But the fact is that the N.C.A. uniformly maintains such a posture with respect to its members. The issue is never, "How can we clean up the canning process to avoid this kind of thing," but is rather, "How can we put this fellow off." This isn't "self-regulation" it is, in the words of the brochure, "industry protection".

A number of the complaints which have been brought to my attention involve consumer allegations of the discovery of and often injury by pieces of glass in canned fish. The N.C.A. response is uniformly to assume that the crystals are not glass but "harmless struvite" crystals, "magnesium ammonium phosphate."

The N.C.A. brochure "Crystals in Canned Sea Foods and Fish"—usually sent to consumers who allege the discovery of or harm caused by pieces of glass in canned seafoods—explains that struvite is sometimes formed *after* canning from elements present in all fish and seafood. The crystals dissolve when boiled with vinegar or lemon juice. The brochure assures the consumer that the crystals "are too soft to do any harm."

In one case, N.C.A.'s heralded Northwest Laboratory in Seattle wrote the N.C.A. Washington office concerning its "investigation" of a reported injury from glass found in a can of Rubinstein brand tuna packed by Whitney-Fidalgo Seafoods, Inc. of Seattle: "This appears to be another instance involving struvite although the complainant stated that his wife was treated by an oral surgeon for profuse bleeding and removal of slivers of glass from her mouth."

Not only the complainant, but his oral surgeon confirmed the extent of the damage. But the complainant was subsequently told:

"We have received and thank you for your recent letter enclosing some of the particles so that we might examine them. They have been examined in our laboratory and we believe that you and Mrs. ——— will be pleased to learn that the particles actually are harmless magnesium ammonium phosphate crystals which are occasionally found in most types of canned seafoods. Individuals not familiar with these crystals sometimes mistake them for glass.

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[1] Citizens requesting information on the Claims Division are told it is a confidential affair. Attempts to obtain the latest version of the brochure are politely rebuffed with a noticeable amount of incredulity that an outsider would know of its existence. I have atached a copy of the brochure for your examination.

We are enclosing a copy of the pamphlet "Crystals in Canned Sea Foods and Fish" which explains the harmless nature of these crystals in more detail, together with copy of an FDA Memo for Consumers issued by the Food and Drug Administration.

We trust you can appreciate that the packer therefore feels it must take the position that this is not a matter of liability. Nevertheless, it does appreciate your having brought this matter to its attention as it provides the opportunity to allay any fears that you and Mrs. ———— may have had in the mistaken belief that the particles are glass.

The company is of course desirous of retaining your goodwill as a consumer of its products and to that end, noting that you did have certain out-of-pocket expenses, informs us that it is agreeable to amicable adjustment of this matter in the amount of $50.00.

Unfortunately, the N.C.A.'s agents display an equal lack of concern for consumer injury. Counsel, retained by the Canners to ward off one persistent complainant who found and became nauseous at the sight of a dead fly packed in his can of Bumble Bee tuna, a product of a division of Castle and Cooke, Inc., commented that the recommended settlement would serve "primarily as a hedge against the occasional haywire verdict prompted by a jury's irrational desire to penalize a canner for allowing a repulsive object to appear in its product."

In response to another reported case of "harmless struvites" in which a small child choked, gagged and went into convulsions, the Canners head office wrote to the Ralston Purina Company, packers of Chicken of the Sea brand tuna: "These crystals are among the largest I have seen, and I am certain they could cause the reported reaction . . . Under the circumstances I feel we should advise the good woman of the nature of the crystals and send her a gift package for her troubles."

The most disturbing aspect of these and other insights into the canner's Claims Division is not, however, this appalling condescension towards the consumer. It is, rather, the apparent absence of any real concern for rooting out the causes of complaints. What have the N.C.A. laboratories done to supply new processing techniques and quality control methods or detection instruments so as to obtain effective action on the part of its members? In the letter last cited, the N.C.A. spokesman indicated that he considered the anticipated acceptance of the gift package to be the "final disposition of the complaint." He assumed, apparently without checking, that the packer was doing all it could to eliminate the cause of the complaint. If this is industry self-regulation or if this is the kind of conduct we can expect between those "occasional" visits of government inspectors the industry has called for in its legislative compromise, I suggest this Committee ought to reconsider and substantially discount the N.C.A.'s testimony. Industry self-regulation is a cipher to be ignored in the final draft of the legislation.

Even when canned seafood does in fact contain glass, the N.C.A. and its members seem to behave in the same manner as they do when only "harmless struvite crystals are involved." Another consumer of Ralston Purina's Chicken of the Sea tuna reported the fracture of her upper left second bicuspid while eating the product. At the request of the N.C.A. she sent in the glass fragment into which she had bitten. The N.C.A. lab reported it to be "a small chunk of glass approximately 1/16'' thick by 1/8'' in diameter."

In its offer of settlement to the consumer (to reimburse her only for her dental bill plus $5.00) the N.C.A. wrote, "Being mindful of the great care used in the packing of its products the company is at a loss to account for an incident of the type reported." A few weeks later, with the executed release in hand, the N.C.A. wrote Ralston Purina, "When you have forwarded your check it will be in order to close your file on the case and we trust it has been handled to your satisfaction." Yes, to everyone's satisfaction except, perhaps, the complainant and certainly those who in the future will bite down on a broken piece of glass hidden in the canned seafood of this company. Here again we see not the slightest indication of any attempt on the part of the N.C.A. to determine the cause of the mishap. Instead, they were satisfied to pat themselves and the member on the back for a job well done.

In case after case this pattern repeats itself. The investigators for the N.C.A. go beyond what may seem the relevant issues to others. *Some reports note with thinly vieled bigotry the racial background of the claimant: One complaint file begins "Incident 4/23/67 Negro. Usual worm in corn hogwash".* Another investigator's report notes. "The writer was unable to understand him [the consumer] when he gave the name of the grocery which he pronounced and spelled as 'Jant's' grocery. . . ." The consumer had purchased Gerber's baby food at the

"Giant" grocery store. Others describe in condescending fashion the unkempt appearance (to the investigator) of the consumer's home or neighborhood: "The small, stove-heated apartment, is dingy, dirty and disorderly with papers and debris on the floors, dirty clothes draped on all the furniture and countless half-empty jars of baby food standing around the end tables and chairs in the living room."

One report draws conclusions about the sexual proclivities of the claimant: "He is extremely effeminate and without question is a homosexual." None of this, of course, bears the slightest relation to the quality of canned foods, nor to the merits of the consumer's claim. It does help the association set a price on each claim to recommend to its member.

This whole process raises a number of serious questions which your Subcommittee ought to consider:

1. *What does the industry mean by self-regulation?* And what does it mean by "cooperative efforts" with appropriate federal agencies? Does it hope to harness the aid of government in its efforts to defend itself from the consumer? The practices of the N.C.A. Claims Division, its complete failure to reveal the activities and data of the Division to your Subcommittee and to the fish-consuming public strongly support the inference that this last question should be answered in the affirmative.

2. *To what extent does the whole process run afoul of the antitrust laws.* Surely, competition in the satisfaction of consumers extends to complaint handling if it extends to advertising and other practices not related to price.

3. *How should a Congressional Committee respond to an important witness who withholds from its consideration important and relevant data at his disposal?* Does not the witness especially when that witness represents an important and influential industry, have an affirmative obligation to do more than submit a public relations brief to support its position? To do less is an affront to the legislative process and an affront to the dignity of any committee so treated.

4. *Most importantly, how has the concealment of this information distorted the four years of hearing records built up on the fish inspection legislation?* What compromises have been won based on such suppression of information regarding complaints, industry conditions, and unused capabilities for safer and more wholesome fishery products? What is the extent of the delay in the final passage of effective legislation in this area as a direct or indirect result of this incomplete public record occasioned by the grossly misleading testimony of the N.C.A.

These last two items raise serious questions about the behavior of the N.C.A.'s counsel and sometime chief spokesman at your hearings, Edward Dunkelberger of the Washington law firm Covington and Burling. Mr. Dunkelberger is a protege of H. Thomas Austern of the same firm who was one of the architects of the N.C.A.'s Claims Division. In 1967, in 1968 and again in 1969, Mr. Dunkelberger referred to the three N.C.A. reserach laboratories. Not once did he indicate that an important if not a primary function of these laboratories is to investigate consumer complaints from practically the entire canning industry as funneled through the Claims Division.

In each of his four appearances before this Subcommittee, Mr. Dunkelberger was accompanied by Dr. Ira Somers, director of all N.C.A. laboratories. Not once did Dr. Somers indicate this function of the laboratories. Presumably, Mr. Dunkelberger counseled him not to do so. It is understandable, though hardly commendable, that the Canner would want to concel their claims mechanism from the public. It is reprehensible that their legal counsel would systematically conceal even the existence of the division from this Subcommittee.

Empty references to "quality improvement" and "quality assurance" programs at the N.C.A. are sprinkled throughout Mr. Dunkelberger's testimony. These, he said in 1968, "[I] indicate the emphasis the canning industry places on providing the consumer with wholesome and good quality fishery products." But what details did he provide? In 1967 he told the Subcommittee about "training company personnel and advising on individual sanitation problems" and about the effectiveness of "slide-tape visual aids in plant sanitation." I imagine the Subcommittee was somewhat intrigued with the N.C.A.'s visual aid program, but I am certain you would have readily traded this knowledge for hard data from their complaint files.

In the latest of his appearances before your Subcommittee, Mr. Dunkelberger bemoaned the "unreasonable and arbitrary burdens" that the proposed bills would impose on the industry. The burden Mr. Dunkelberger and his clients have imposed on the consuming public in the clandestine operation of the Claims Divi-

sion and on you and your Subcommittee in their deliberate and inexcusable concealment of even the existence of the Division seems not to have concerned them in the slightest.

Dr. Somers told your Subcommittee last May that no legislative action would be appropriate on dangerous substances such as mercury because of "the absence of data", the inadequacy of "methods of analysis" and the need for "much study by a qualified body." He failed to tell the Subcommittee, again presumably under Mr. Dunkelberger's counsel, that the N.C.A.'s Berkeley (California) Research Laboratory has been devoting substantial efforts to demonstrate that existing tolerance levels for mercury in tuna are too strict and need lifting. Moreover, the Berkeley Laboratory has rejected a proposed development of cheap monitoring instruments which could permit fishermen to sample their catch to determine whether mercury levels are within present tolerances.

The industry is remarkably intransigent with respect to hazardous substances. They have systematically mislead your Subcommittee by suppressing not only the information at their disposal concerning these materials but also by attempting to suppress research efforts to supply the very data which they claim are unavailable. It is imperative therefore that the final bill contain stringent provisions for the detection and prevention of these substances from reaching the consumer.

The situation has changed dramatically since your 1967, 1968 and 1969 hearings which concentrated on sanitation and spoilage. The environmental contamination of the waters of the world which has been building for years, but only recently and partially disclosed to the public, requires a much more comprehensive regulatory approach than in the original formulations of this legislation prior to the 1970 version.

I urge you and your Subcommittee to take immediate action to complete the record on this important issue and to erase the misleading and distorted picture of industry self-regulation which Mr. Dunkelberger and the National Canners Association have painted by investigation the activities of the N.C.A., its Claims Division, and its Laboratories.

Sincerely,

RALPH NADER.

NATIONAL CANNERS ASSOCIATION,
Washington, D.C., August 6, 1971.

Senator PHILIP A. HART,
Chairman, Subcommittee on the Environment, Senate Committee on Commerce, U.S. Senate, Washington, D.C.

DEAR SENATOR HART: Thank you for your letter of July 27th concerning a letter of July 19th to you from Mr. Ralph Nader about the activities of the National Canners Association. It is understood that his letter will be included in the record of the recent hearings on fish inspection.

Your willingness to hold the record open for two weeks to permit this response and its inclusion in the record is sincerely appreciated, and is interpreted as additional verification of your eminent reputation for always seeking the whole truth.

In your letter you observe that I had probably learned of Mr. Ralph Nader's letter concerning the activities of the National Canners Association. You are correct, yet until receipt of your letter I was not aware that his assault upon the NCA was framed in the form of a challenge as to the veracity of the testimony which NCA presented with regard to fish inspection legislation.

So that there will be no misunderstanding about the organization and functioning of the National Canners Association I would point out that I am not an employee of NCA, nor do I receive compensation from NCA for any current activities in its behalf. My home is in Metairie, Louisiana, a suburb of New Orleans, and I am engaged in the shrimp canning business, being President of the

Robinson Canning Co., Inc., of Westwego and New Orleans. I am a member of the NCA Fishery Products Committee, and am this year serving as Chairman of the committee. The other members of the NCA Fishery Products Committee are also drawn from private enterprise. There is a full-time paid staff member who serves as Director of the NCA Fishery Products Program. His salary and that of his administrative assistant come from the general funds of the NCA, which are, in turn, received from dues as paid into the association by its members.

Proposed fish inspection legislation has been the subject of considerable attention for the past six years. It is not at all strange or unusual that this subject has received far more than cursory attention by the fish and fishery products producing members of NCA. Numerous meetings of the NCA Fishery Products Committee have been held in Washington and other cities for the primary purpose of developing the NCA position on fish inspection legislation. I bring this out to refute the innuendo by Mr. Nader that the NCA position is that of the association counsel, the law firm of Covington and Burling, with whom Mr. Nader is certainly not enamored.

In the past Mr. Nader testified in support of fish inspection legislation. The only real surprise originating from him has been his prior lack of din and bustle on this subject. It does not come as a surprise that this present attack upon the testimony of the National Canners Association concerning fish inspection legislation should primarily strike at everything but the testimony that was given. This method of attack is comparable to that of a youngster who can hit everything but the head of the nail with a hammer.

A careful study of the allegations and innuendos contained in his letter of July 19th reveal that he has not, for the most part, assaulted the testimony of NCA, but rather has built his assault upon the fact that NCA did not testify about consumer complaints. His statement is correct—we didn't! For that matter, neither did NCA testify about consumer compliments—so, at least, we are not guilty of only presenting one side of a picture.

He states that NCA has suppressed from you information on consumer complaints. The innuendo is that this is something which we carefully and deliberately hid in an elevator to deceive you. Nothing could be further from the truth! Certainly, if Mr. Nader harbored such thoughts, he had ample opportunity to appear as a witness and to raise the point.

It possibly is closer to the truth that Mr. Nader has been having difficulty in finding flaws in the NCA testimony on fish inspection, thus he has now resorted to the subterfuge of endeavoring to discredit NCA as a witness by means of the present accusations on a point not germane to the issue which is fish inspection. Anyone who entertains the thought that a fish inspection program would eliminate consumer complaints is naive, and would do well to recall that when Christ walked upon the earth he could not please everyone.

Mr. Nader in his letter of July 19th to you, and by separate letter of the same date to the Department of Justice, called for an investigation of the NCA, its Claims Division, and its Laboratories. NCA was made aware of Mr. Nader's attack by the news media, and issued a response which read as follows:

"A spokesman for the National Canners Association stated today that there is no basis in fact for the charges levied by Ralph Nader in his letter of July 19, 1971 to Mr. Richard W. McClaren, Assistant Attorney General for Antitrust, and to Senator Philip A. Hart, Chairman of a Subcommittee of the Senate Committee on Commerce.

Both the Consumer Claims Division and the Research Laboratories of the Association have been in existence for many years, and have provided substantial benefits to the public and to the canning industry.

The Association is confident that these programs, or any other programs of the Association, will withstand the scrutiny of any Congressional Committee or Federal Agency."

If the subject of consumer complaints is germane to the issue of fish inspection, then all other facets of the subject of consumer relations including but

not limited to consumer compliments should also be relevant. No one is probably better versed than Mr. Nader on the ease with which complaints can be registered, as well as being aware that it is much more usual to file a complaint than to compliment. Perhaps Mr. Nader could provide to your Committee information on the numerical relationship between complaints and compliments—for over the years I have heard various figures on this point, 5 to 1, 10 to 1, etc. Such information would be of value in truly evaluating the performance record of the fish canning industry should you decide to digress from fish inspection legislation.

Of necessity, there are various statements in which Mr. Nader's letter to you of July 19th about fish inspection which must be commented upon to set the record straight.

He begins by stating that "industry groups have bemoaned the coming of this legislation" about fish inspection. If "bemoaning" means that we have appeared to testify and to offer constructive suggestions regarding such legislation, then he is correct. The position of NCA has constantly been that it would support legislation designed to improve the wholesomeness of fish and fishery products. The fact that we have tendered suggestions as to changes which we believed necessary is hardly "bemoaning" the issue.

Mr. Nader assails the testimony of Dr. Ira I. Somers, Director of the NCA Research Laboratories, concerning the canning industry "voluntary and cooperative efforts at quality improvement and quality assurance", and asks "where is the evidence that these 'voluntary efforts' have proven effective?" The answer is on the shelves of every grocery store in the nation, for good quality and wholesome fish and fishery products have been made available and accessible to all the people of this nation. It is a part of the overall achievement of the American food industry which has provided for the American consumer the greatest variety and abundance of foods available to any people of any nation, and which is available to the American consumer at a lower cost based upon food cost as a percentage of disposable income than any other people on this earth.

Mr. Nader accuses the NCA Laboratories of suppressing development of cheap monitoring instruments for use in determining mercury levels. The truth of the matter is that there are instruments which can be purchased for less than a thousand dollars, however, like most laboratory equipment it is not the piece of equipment but rather the operation and interpretation of the results that presents the problem. They don't work like a thermometer which anyone can read and know the temperature, even if Mr. Nader has some notion that they do.

Legal counsel for the National Canners Association is provided by the law firm of Covington and Burling, and a member of that firm, Mr. Edward Dunkelberger, has served as counsel to the NCA Fishery Products Committee throughout the entire course of our concern with fish inspection legislation. Mr. Dunkelberger has testified on behalf of NCA regarding fish inspection, and in each instance his testimony was as approved by the Fishery Products Committee. The fact that Mr. Nader does not like our legal counsel has no bearing on the position of our industry and probably explains his efforts to cloud the issue by assaults and innuendos in this direction.

The National Canners Association has over the years established for itself a reputation for truthfullness and has demonstrated its willingness to cooperate with you. The very assault by Mr. Nader utilizing issues not germane to fish inspection provides mute evidence of the veracity of the testimony presented to you.

I have replied to deal with the challenge to the testimony of NCA about fish inspection, and not to answer the unfounded, inaccurate, and virulent charges about the National Canners Association which are included in the letter which Mr. Nader wrote. At an appropriate time I am confident that the remainder of the distorted charges in his letter to you and to the Department of Justice can be demonstrated to be but another example of reckless and careless criticism.

Sincerely yours,

H. R. ROBINSON,
Chairman, Fishery Products Committee.

STATEMENT OF THE NATIONAL CONSUMERS LEAGUE

The National Consumers League has for many years been in the forefront of the campaigns to assure safe, sanitary, and wholesome food supplies for American consumers. Along with the General Federation of Women's Clubs, we spearheaded the drive to establish the Pure Food and Drug Administration in the first decade of this century, and in the sixty years since then have on numerous occasions testified for more effective regulation of our food supplies. In more recent years we have supported legislation to extend meat and poultry inspection to intrastate supplies and to modernize the Meat and Poultry Inspection Acts.

In 1968, the League testified in favor of fish inspection, and again in 1969, but the need is clearly greater today. The situation which has been allowed to develop in the fish industry cries out for immediate action, both to give the consumer greater protection, and to strengthen an industry which is not growing as rapidly as it might in competition with other sources of protein.

Fish products actually could be a preferred source of protein for a number of reasons, not the least of which is that they are less expensive than many other animal protein products. In addition, for a large group in our diet-conscious country, the fact that fish is lower in calories than many meats, also adds to its desirability. Nevertheless, per capita consumption of fish products has not kept pace with its competition. It is our belief that this is due in large part to two factors: (1) the difficulty of obtaining consistently good quality, good tasting fish, and (2) the fear of unwholesome and unsafe fish products. Fish is, if anything, even more perishable than meat. The October 1963 outbreak of botulism caused by smoked fish, and the larger number of cases of illness caused by salmonella in smoked white fish in 1966, together with this year's findings on the mercury content in tuna and sword fish, have increased the consumer's lack of confidence in the product. The effect on sales of fish after each such outbreak is clear evidence that the consumer confidence is destroyed. After the 1963 outbreak, annual smoked chub sales dropped drastically (over a million pounds). The recent mercury scare was bad enough so that practically all swordfish was removed from retail outlets. It is quite obvious that present State and Federal regulation is not good enough. We, therefore, urge that you enact mandatory inspection legislation of the kind which has proved to be so effective in the meat and poultry industries.

Only by continuous inspection, as proved in Senator Hart's Bill—S. 1528—is it possible to prevent the deterioration of quality which has led so many consumers to give up trying to include fish in their regular menus. Only by continuous inspection, is it possible to secure safe and wholesome fish supplies. By having an inspector always present, any fish which has deteriorated on the way to the plant would be rejected before processing. This would give a better control over the way the catch is handled on the ship, where lack of cleanliness and poor temperature controls can result in substantially lowered quality as well as increased possibility of bacterial hazard. Continuous inspection at the plants is like preventive medicine. It could immediately spot and stop the conditions which lead to potentially dangerous procedures. Spot checking as provided in the Administration Bill, S. 700, would not accomplish this.

I remember that one of the FDA officials during the 1967 hearings reported that 13 out of 15 plants processing smoked fish operated under "potentially dangerous" conditions, and that 6 of these plants had conditions which were "imminently hazardous."

"Continuous inspection is much better than the present system," was the response to a question asked of the FDA official, even though he added that the cost would be excessive for such increased consumer safety.

Whether the cost would in fact be so excessive depends on one's point of view. The cost of even one person's life, or of illness suffered by a number of persons, looms large to those who are personally involved. The cost to an industry which has not been able to grow as it should and could, is also a factor to be considered. As far as consumers are concerned, the cost of providing a safe product

is money well spent—and rightly spent by government. As consumers develop more confidence in fish products, and as the quality improves, increased demand will result in lower per unit costs for continuous inspection, and should prove to be good business practice. Truly effective spot checking (which we obviously do not now have) might prove to be almost as costly as continuous inspection. At a previous hearing one witness testified that in his plant the cost of continuous inspection amounted to only 1½ cents per case of 48 cans.

Since both quality and wholesomeness of the product can also deteriorate during the storage and handling which occurs after leaving the plant and before arriving at the check-out counter in the retail outlets, the League urges adoption of the Frozen Food Code of the Food and Drug Officials of the U.S. (AFDOUS). Consumers would also buy with more confidence if some dating system—perhaps an expiration date such as presently used on some brands of coffee or milk—were adopted. Additionally, if there were an effective grading system, this too would assist consumers in making more rational purchasing decisions.

In this era of growing consumer dissatisfaction and distrust, a measure that does not give strong, adequate protection, can only deepen suspicion and discontent. Spot checks—even those labelled "continuous supervision" as in the Administration measure, cannot solve the problems in the industry and will not bolster the consumer's eroding confidence in fish products.

The League commends Senator Hart for his continued and dedicated interest in consumer protection. It was his bill that we supported in 1968, and again in 1969, and now it is the Hart Bill, with its provision for full-time inspection, that we support. We, therefore, respectfully urge the Committee to act favorably on S. 1528 to assure a safe and wholesome supply of fish and fish products. American consumers will gain confidence in this potentially valuable protein, and the resulting increased purchases will help strengthen an industry which is sorely in need of expansion.

(The following material was referred to on p. 186:)

The attached reports are listings of foodborne disease outbreaks for 1970, 1969, and the last six months of 1968. The data was taken from publications of the National Communicable Disease Center, Public Health Service, covering the above listed periods.

An explanation of most of the symbols used in the charts is also attached. The columns headed "Vehicle" identifies the foods involved in the outbreaks. Episodes of food poisoning reported as individual cases were not included in the tabulation of data except for botulism in 1970 and botulism and mushroom poisoning in 1969. The data for 1968 and the first half of 1969 contains individual cases involving botulism in the main body of the charts and individual cases involving other etiologies at the end of the multiple case data.

No deaths were reported in 1970. Two incidents each involving the death of one person were reported in 1969 and two episodes each involving the death of one person were reported in the last half of 1968. The causative agent in each case was *Clostridium botulinum*. The foods involved were chicken and chicken soup, chopped chicken liver, mushrooms and pumpkin.

It should be emphasized that most health authorities agree that there is a gross discrepancy between the number of foodborne disease outbreaks and the number of incidents actually reported. In addition, there is considerable variation in the completeness and depth of reports. For these reasons, it is difficult to draw definitive conclusions about patterns of foodborne illness from available data.

SECTION E—EXPLANATION OF LINE LISTING

Explanation of line listing:

Listing is by specific etiology. Under each etiology confirmed outbreaks are listed first in chronological order. Unconfirmed outbreaks are listed next in chronological order, denoted by the prefix "probable" (prob.).

For all instances in which there was any question as to the accuracy of information, a question mark is included.

Onset—the month is followed by the day of the month. In some outbreaks involving continual exposure over a period of time, the onset is expressed as a range between onset of the first and last case.

Lab data—usually refers to cultural confirmation.

P—patient
V—vehicle
H—food handler

Symptoms:

N—nausea	D—diarrhea	H—headache
V—vomiting	F—fever	LFT—liver function tests
C—cramps, abdominal pain	A—anorexia	
	O—other	

Reporter—see Table 1 for explanation of abbreviations.

Other symbols and abbreviations:

x—mean
med.—median
—approximately

Explanation of code letters in parentheses—(A), (B), (C), (D)—in line listing under column headed "Comment". These letters refer to data presented in Table 9.

(A) "Food processing establishments"—Site or place of food improperly handled in preparation for marketing.

(B) "Food service establishments"—Site or place of food improperly handled during food processing in a commercial establishment for public consumption.

(C) "Homes"—food mishandled in homes.

(D) "Unknown—Unspecified"—Information lacking, precluding classification.

ETIOLOGY	ONSET	REPORTED FROM	VEHICLE	LAB DATA			CLINICAL DATA				REPORTER	COMMENT
				P.	V.	H.	# ill (at risk)	incub. period (hrs.)	Duration of dis. (hrs.)	Symptoms		
BACTERIAL												
CLOSTRIDIUM BOTULINUM												
C. botulinum	2-1	Hermiston, Ore.		+			4(6)			V, dysarthria, ptosis, diplopia, ataxia, skeletal weakness	DH	Home (C)
C. botulinum type E	6-3	Point Hope, Alaska	mikiyak (whale delicacy)		+		1(3)	24		N,V,diplopia, dysphonia, dysphagia, weakness, respiratory depression	DH	Home (C)
C. botulinum type A	6-6	Stockton, Calif.	olives		+		2(2)	36-48		Dysphagia, dysphonia, blurred vision	DH	Home (C)
C. botulinum type A	6-21	Colorado Springs, Colo.	chili	+	+		1(1)	12		N,V,H,dysphagia, dysphonia, resp. insufficiency	DH	Home (C)
CLOSTRIDIUM PERFRINGENS												
C. perfringens	1-8	Maple Shade, N.J.	veal	+	+		60(127)	3-22 x̄ 12	2-24 x̄ 18	D,C,N,V,F	DH	Nursing home (D)
C. perfringens	1-30	Watchung, N.J.	meatballs	+			?(>50)	9-13 x̄ 13	4-72 x̄ 30	C,D,V,F,N	DH	Restaurant (D)
C. perfringens	2-14	Las Cruces, N.M.	chili dip	+			22(53)	1-24 x̄ 12.5	8-36	N,V,C,D	DH	Restaurant (B)
C. perfringens	2-25	Amherst, Mass.	roast beef & gravy		+		654(167?)	2-22 x̄ 12-15	[illegible]	N,C,D	Ind. FDA	School (B)
C. perfringens	2-?	Washington, D.C.	turkey		+		35(540)	7-15 x̄ 11	x̄ 36	N,V,C,D	AF	Cafeteria (B)
C. perfringens	3-4	Old Bridge, N.J.	meat sauce	+	+		21(23)	6-14 x̄ 8	12-72 x̄ 24	N,C,D	DH	Home
C. perfringens	3-14	N. St. Paul, Minn.	tenderloin tips & gravy	+	+		150(200)	7-15 x̄ 11½	x̄ 4	N,C,D,V	DH	Restaurant (B)

C. perfringens	4-5	Bellevue, Wash.	turkey salad	+	+	22(45)	11-19 x̄ 13	4-48	C,D	DH	Cater (B)
C. perfringens	4-27	Seattle, Wash.	beef	+	+	291(670)	x̄ 15	12	C,D	DH	Resta (B)
C. perfringens	5-13	Trenton, N.J.		+		266(312)	2-32 x̄ 13	1-144 x̄ 24	N,C,D	DH	Resta (D)
C. perfringens	5-16	Yakima, Wash.	lunch meat		+	4(4)	x̄ 10	x 48	N,C,D,F	DH	Home
C. perfringens	5-17	Colebrook, Conn.	chili		+	70(150)	≥ 90		D,V,C	DH	Summe camp
C. perfringens	5-18	Albuquerque, N.M.	avocado-egg salad	+		+ 33(73)	2-21 x̄ 13	6-8	D,C	FDA, DH	Resta (B)
C. perfringens	5-31	Charleston, W. Va.	roast beef		+	5(7)	11½-13½ x̄ 11°	5°-8°	N,C,D	DH	Home
C. perfringens	5-?	Honolulu, Hawaii	turkey	+		35(106)			D,C	Ind.	Nursi home
C. perfringens	6-28	Trenton, N.J.	roast beef	+	+	25(33)	5-15 x̄ 11	8-24 x̄ 17	D,C,N,F	DH	Resta (D)
prob. C. perfringens	2-16	Port Orchard, Wash.	meat loaf			4(5)	x̄ 9	x̄ 5	N,C,V,D	DH	Home
prob. C. perfringens	3-4	Chency, Wash.	?gravy			~ 900(1532)	12	x 24	C,D	DH	Schoo
prob. C. perfringens	3-7	Olympia, Wash.	steak			3(4)	12	24	N,V,C,D	DH	Home
prob. C. perfringens	3-10	Chattanooga, Tenn.	stew (beef)		+	76(90)	x̄ 9			DH	Schoo
prob. C. perfringens	3-?	Longview, Wash.	gravy				x̄ 9		N,V,C,F	DH	Resta (B)
prob. C. perfringens	4-22	Vancouver, Wash.	chicken, gravy				x̄ 7		N,C,D	DH	Resta (D)
prob. C. perfringens	5-2	Moorhead, Minn.	roast turkey			169(237)	x̄ 12	x̄ 12	D,C,>H,N	DH	Resta (B)
prob. C. perfringens	5-12	Bedford, Va.	french dressing and/or salad			2(?)	6-10 x̄ 8	x̄ 36	N,V,C,D	DH	Resta (D)
prob. C. perfringens	5-24	Oak Brook, Ill.	?veg. soup			46(84)	x̄ 11	x̄ 24	D,C,N	DH	Resta
ESCHERICHIA COLI											
E. coli	2-7	Squaw Valley, Calif.	water		+	43(56)	4-93 x̄ 46	x̄ 24	N,V,C,D,F	DH	Resta (B)
E. coli	2-7	Placer County, Calif.	water		+	44(44)	22-71 x̄ 44		N,V,C,D,F	DH	Ski (B)

ETIOLOGY	ONSET	REPORTED FROM	VEHICLE	LAB DATA			CLINICAL DATA				REPORTER	COMMENT
				P.	V.	H.	# ill (at risk)	incub. period (hrs.)	Duration of dis. (hrs.)	Symptoms		
E. coli	2-27	New York City, N.Y.	rice		+		3(3)			N,V,C,D	DH	Restaur (D)
prob. coliforms	3-18	Penueles, Puerto Rico	veal stew & liver		+		21(29)	½-6 x̄ ½	x̄ 12	C,D,V	DH	Cafeter (B)
prob. coliforms	4-?	Franklin Township, N.J.	soda		+		38(101)	x̄ 36		V,C,D	DH	Picnic
prob. coliforms	6-7	Kensington, Md.	potato salad	-	-?	-	>59(250)	x 11	1-2 dy.	N,V,C,D,F	DH	Picnic
SALMONELLA												
S. paratyphi B	1-1	Seattle, Wash.	raw fish	+			2(5)	36-54	7-21	N,V,D,C,F,chills	DH	Restaur S. Amer
S. newport	1-4	Sacramento, Calif.		+			6(6)	36-48 x̄ 36	x̄ 36	N,V,C,D,F	DH	School
S. heidelberg and S. typhi-murium var. copenhagen	1-?	Montana	?turkey	+			2(3)				Salm.	Home (D
S. san diego	2-?	Oregon		+			3(?)				DH	Restaur
S. infantis	3-12	Santa Barbara, Calif.	beef jerky				4(6)	x̄ 24	3-6 dy.	N,C,D	DH	Home (C
S. infantis	3-12	California	beef jerky		+		13(?)				FDA	Home (A
S. weltevreden	3-?	Louisiana		+			10(11)				DH	Home (D
S. heidelberg	3-?	Pennsylvania	turkey	+	+		145(412)				DH	Banquet
S. typhi-murium var. copenhagen	5-5	Nashua, N.H.	eclairs, eggs	+			11(23)	24°			DH	Bakery
S. typhi-murium	5-14	Hawaii	?potato salad	+			72(34)				Ind.	Restaur
S. weltevreden	5-22	Hawaii		+		-	10				Ind.	Restaur
S. infantis	6-7	Hawaii	chicken & chicken soup	+			46				DH	Hospita
S. enteritidis	6-8	Columbia, S.C.	potato salad	+			336(725)	12-96 x̄ 28		C,F,D,N,V	DH, MMWR	Picnic, commerc prepare
S. infantis	6-13	Nashville, Tenn.	lemon tart	+	-	-	5(8)	18-22 x̄ 20	72-96 x̄ 96	N,V,C,D,F, general malaise	DH	Restaur (B)

S. minnesota	6-?	Nebraska	chicken salad	+	+		130(200)				DH	Private party (D)
prob. salmonella	2-9	Erie, Penn.	onion rings				3(5)	15-16	$\bar{x}$ 32	N,V,D,F	FDA	Restaurant
prob. salmonella	4-23	San Francisco, Calif.	chicken liver parts	-	-		13(17)	2-72 $\tilde{x}$ 24-48	1-48	N,V,C,D,F	DH	Other (D)
SHIGELLA												
S. sonnei	1-27	Norfolk, Va.		+			28(42)		$\bar{x}$ 3.5 dy.	N,V,C,D,F, mucus in stool	DH	Cafeteria (B)
S. sonnei	6-17	Raventon, Ark.	prob. water	+			50(118)				DH	Camp (B)
prob. shigella	6-13	Prairie Village, Kan.	hamburger pizza	+			3(3)	12			FDA	Home (D)
STAPHYLOCOCCUS												
S. aureus	1-1	Ypsilanti, Mich.	ham, turkey, stuffing, & dressing		+		12(25)	1-4 $\bar{x}$ 2½		N,V,C,D,F	DH	Home (C)
S. aureus & enterococci	1-26	Pittsburgh, Penn.	baked Alaska, bean soup, roquetford dressing		+	+	47(115)	$\bar{x}$11-12	$\bar{x}$ 24	N,D,C	DH	Banquet (C)
S. aureus	1-27	Pittsburgh, Penn.	?chicken		+		318(576)	$\bar{x}$ 4		N,V,D	DH	School (D)
S. aureus	2-19	Honolulu, Hawaii	?eggs & bacon	+			13(52)	$\bar{x}$ 5½	$\bar{x}$ 24	N,V,C,D	DH	Airline (B)
S. aureus	2-20	Boise, Idaho	pastrami		+	+	11(?)	2-5 $\bar{x}$ 20		C,N,V,D,F	DH	Cafeteria (B)
S. aureus	3-13	Tumon, Guam	chicken	+	+		272(850)	1-48 $\bar{x}$ 4	$\bar{x}$ 6	V,C,N,D	DH	School (B)
S. aureus	3-19	Pikeville, Tenn.	roast pork	+		+	40(71)	1-17 $\bar{x}$ 3-4	$\bar{x}$ 18	N,V,C,D,F	DH	Institution (B)
S. aureus	3-22	Bellevue, Tenn.				+	2(2)				DH	Restaurant (B)
S. aureus	3-28	New York City, N.Y.	beef		+		3(?)	½		D	DH	Home (C)
S. aureus	3-31	New Iberia, La.	coconut pie		+		2(3)	2	2	N,V,D	DH	Bakery-Home (B)

ETIOLOGY	ONSET	REPORTED FROM	VEHICLE	LAB DATA			CLINICAL DATA				REPORTER	COMMENT
				P.	V.	H.	# ill (at risk)	incub. period (hrs.)	Duration of dis. (hrs.)	Symptoms		
S. aureus	4-4	San Leandro, Calif.	custard cake		+		10(21)	2-5	x̄ 2	V,D,N,C	DH	Home (D)
S. aureus	4-7	Phenix City, Ala.	butter		+		24(?)	x̄ 40			MMWR	Restaurant (A)
S. aureus coag. +	4-17	San Francisco, Calif.	spaghetti	+	+		2(30)	3-4		N,V,D	DH	Restaurant (D)
S. aureus	4-21	Mundy Township, Mich.	ham		+		16(34)	4-5 x̄ 4	x̄ 48	N,V,C,D,F	DH	Home (B)
S. aureus	4-21	Spokane, Wash.	ham		+		14(115)	x̄ 2	x̄ 12	C,V,N,V	DH	Jail (B)
S. aureus	4-28	Culloden, W. Va.	precooked ham		+	+	2(5)	2-5°		N,V,C,D,F	DH	Home (C)
S. aureus	5-5	Pullman, Wash.	ham		+	+	5(26)	x̄ 3	x̄ 10	N,V,C,D,F		Caterer (B)
S. aureus	5-6	Denver, Colo.	tacos		+	+	70(75)	3-4		N,V,D	FDA DH	School (B)
S. aureus	5-22	St. Louis, Mo.	turkey		+	+	?(135)	~8°			FDA	Banquet (B)
S. aureus	5-?	Ramey Air Force Base	creme puffs		+		3(?)	1½-4°			FDA	AF Base (D)
S. aureus	6-10	Huntington, Ind.	ham		+		25(63)	x̄ 4	8-31	V,D,C	DH	Club house (B)
S. aureus	6-11	Chapel Hill, N.C.	ham		+		6(52)	2¾-6½ x̄ 4	x̄ 2	N,V,D	DH	Institution (B)
prob. staph.	1-5	Wenatchee, Wash.	shrimp				3(4)	5	12	C,N,D	DH	Home (D)
prob. staph.	1-12	Bellingham, Wash.	corned beef				2(4)	5		N,V,D	DH	Delicatessen (B)
prob. staph.	2-1	Spokane, Wash.	hamburger				2(4)	3	22	N,C,D	DH	Home (C)
prob. staph.	3-8	Spokane, Wash.	taco meat				3(4)	x̄ 3		N,V,C	DH	Restaurant (D)
prob. staph.	4-8	Brooklyn, N.Y.					8(10)	3-10 x̄ 4	12-24	N,V,C,D,F	DH	Home (D)

prob. staph.	5-10	Joliet, Ill.	potato salad		8(11)	x̄ 2	x̄ 6	N,V,D,C	DH	Home (C)
prob. staph.	5-12	Quinay, Wash.	fishsticks		5(5)	x̄ 7½	x̄ 20	C,V,N,D	DH	Home (D)
prob. staph.	5-24	Nashville, Ind.	ham		2(4)	3½-4	x̄ 38	N,V,C,D	DH	Restaurant (D)
prob. staph.	5-31	Pasco, Wash.	fried chicken dip	+	2(?)	x̄ 2½	x̄ 24	N,V,D	DH	Restaurant (B)
prob. staph.	6-5	Des Moines, Wash.	fried rice & pork	-	2(4)	2	2	N,V,C	DH	Restaurant (D)
prob. staph.	6-6	Salt Lake City, Utah	canned corned beef		3(5)	6		N,V,D, dizziness	USDA	Picnic (D)
prob. staph.	6-8	Longview, Wash.	tacos		2(?)	1½	x̄ 18	N,C,D,V	DH	Restaurant (D)
prob. staph.	6-?	Idaho	?turkey		3(5)	2	24	N,V,D,C	DH	Home (D)
VIBRIO PARAHEMOLYTICUS										
prob. Vibrio parahemolyticus	4-18	Bremerton, Wash.		+	161(297)	x̄ 36	x̄ 26	N,H,C,V,F	DH	Country Club (D)
prob. Vibrio parahemolyticus	5-11	Burlington, Wash.	crab meat	+	5(5)	x̄ 3½	x̄ 36	N,V,D,F		Restaurant (D)
CHEMICAL										
prob. chemical	1-24	Park Rapids, Minn.	fruit cocktail		2(2)	2		N,V,blurred vision, dizziness	DH	Home (D)
tin poisoning	2-1	Spokane, Wash.	tomato juice		2(2)	3/4°		N,D	DH	Home (A)
prob. chemical	2-2	Houston, Tex.	orange juice		2(2)	x̄ ½	x̄ 6	N,V,D	FDA	Home (D)
Chinese restaurant syndrome--MSG	2-13	New York City, N.Y.	won ton soup		2(2)	½°		N,H,flushing	DH	Restaurant (B)
sodium hydroxide poisoning	2-23	New York	pretzels		2(2)	< 5 min.		Burning, swelling, vesiculation of mouth	DH	Home (B)
?petroleum contamination	4-6	Seattle, Wash.	milk		3(4)	3-5 min.	2-8°		DH	Home (A)

ETIOLOGY	ONSET	REPORTED FROM	VEHICLE	LAB DATA			CLINICAL DATA				REPORTER	COMMENT
				P.	V.	H.	# ill (at risk)	incub. period (hrs.)	Duration of dis. (hrs.)	Symptoms		
PARASITIC												
Trichinella spiralis	2-21	Rhode Island	pork	+			2(6)	~14 days		F,periorbital edema, myalgia, eosinophilia	MMWR	Home (A)
Trichinella spiralis	3-2	Baltimore, Md.	?pork	+			2(3)			Periorbital edema, myasitis, hemiplegia, eosinophilia, diarrhea	DH	Home (A)
Trichinella spiralis	3-23	Madison, N.J.	?pork	+			2(2)			Periorbital edema, eosinophilia	DH	Home (A)
Trichinella spiralis	4-13	California	pork sausage	+	+		9(?)	7 days		Periorbital edema, eosinophilia, myalgia, F	MMWR	Home (A)
Trichinella spiralis	6-17	Methuen, Mass.	?pork or raw hamburger	+			4(9)	14-18 days		Periorbital edema, eosinophilia	DH	Home (A)
VIRAL												
infectious hepatitis	5-13	Hatfield, Ark.	water				77(?)				MMWR	Restaurant (D)
UNKNOWN												
	1-14	Wenatachee, Wash.	cheese spread				2(2)	4½		N,V,C	DH	Home (D)
	1-23	Spokane, Wash.	sausage or eggs				2(?)	2		N,D,V	DH	Airplane (D)
	1-29	Brooklyn, N.Y.	veal & peppers				4(4)	$\bar{x}$ 5	$\bar{x}$ 30	N,V,C		Home (C)
	1-31	Brooklyn, N.Y.	Chinese food				2(2)	5-12	$\bar{x}$ 9	C,D,N,V	DH	Restaurant (B)
	2-9	Buffalo, N.Y.	onion rings				3(5)	$\bar{x}$ 14	15-24	N,V,D,F	DH	Restaurant (D)
	2-22	New Orleans, La.	cake				14(20)	$\bar{x}$ 28	$\bar{x}$ 24	N,V,F	DH	Home (D)
	2-24	Ames, Iowa	chicken & noodles				187(1,092)	5-6		D,N,C	FDA	School cafeteria (D)

2-26	New York City, N.Y.	sausage and/or lasagna	4(5)	2-15½ x̄ 10½	x̄ 36	V,D	DH	Home (D)
3-18	Worthington, Minn.	sour cream	75(113)	x̄ 36	x̄ 36	N,D,C,V,F	DH	Restaurant (D)
3-21	Shakopee, Minn.	fish	14(30)	x̄ 33	x̄ 13	N,V,C,D,F	DH	Restaurant (D)
3-24	Titusville, Fla.	milk	2(2)	1		Burning lips and mouth	DH	Home (D)
3-28	Titusville, Fla.	egg nog	4(5)	3		V,D,F	DH	Home (D)
3-28	Baton Rouge, La.		14(30)	2½-?		N,V,C,D,F	DH	Cafeteria (D)
4-11	Swisher, Iowa	salmon dip	18(98)	6-45 x̄ 25	x̄ 2-3	N,V,D,F,H	DH	Restaurant (D)
4-12	Atlanta, Ga.	catfish	2(7)	12-36	several days	Pruritis, urticaria, N,V	DH	Home (D)
4-14	Guayanilla, Puerto Rico	?fish	3(4)	5-13		D,H,V,C	DH	Home (C)
5-2	Dundas, Ill.		43(84)	~24°		N,V,C,D,F	DH	School (D)
5-5	Livingston, Mont.	frozen TV fish dinner	2(3)	1	18	C,D	FDA	Home (D)
5-13	Seaside, Calif.	strawberry short cake	4(5)	3-4	24	N,V,D	DH	Bakery-Home (D)
5-19	Stroudsburg, Pa.		120(250)	9-48 x̄ 24	18+ x̄ 48	V,C,D,F	DH	Vacation lodge (D)
5-21	Stroudsburg, Pa.		128(176)	x̄ 30	x̄ 31-36°	H,N,V,D,C,F	DH	Vacation lodge (D)
5-30	Middlesbury, Conn.		~30(?)	~ 12°		V,D	DH	Nursing home (D)
6-1	Boca Raton, Fla.	meat loaf	3(3)	3-5°		V,C	DH	Home (D)
6-1	Leesburg, Va.		3(5)	7-8 x̄ 7		N,V,C,D	DH	Restaurant (D)
6-16	Tampa, Fla.		31(81)	6-30°		D,C,N,F	DH	Juvenile home (D)

ETIOLOGY	ONSET	REPORTED FROM	VEHICLE	LAB DATA	CLINICAL DATA				REPORTER	COMMENT
				P, V, H,	# ill (at risk)	incub. period (hrs.)	Duration of dis. (hrs.)	Symptoms		
	6-17	Kelso, Wash.	powdered milk		4(4)	$\bar{x}$ 1	4-24	N,V,C,D,F	DH	Home (D)
	6-18	Albuquerque, N.M.			~200(279)	$\bar{x}$ 10½		D,C	FDA	Restaurant (D)
	6-22	Las Vegas, Nev.	?round of beef		>100(900)	3-35° $\bar{x}$ 14°		N,D,V,F	DH	Restaurant (D)
	6-23	Yakima, Wash.	bologna		4(4)	4-72°	$\bar{x}$ 24	N,V,D	DH	Home (D)
	6-?	New Haven, Conn.			~350(>700)	~4°	>24°	C,D,N	DH	Hotel (D)

SECTION F - LINE LISTING

ETIOLOGY	ONSET	REPORTED FROM	VEHICLE	LAB DATA			CLINICAL DATA				REPORTER	COMMENT
				P.	V.	H.	# ill (at risk)	incub. period (hrs.)	Duration of dis. (hrs.)	Symptoms		
BACTERIAL												
BACILLUS CEREUS												
prob. B. cereus	7-10	Spokane, Wash.	?gravy		+		40(85)			N,V,D	DH	Camp (D)
prob. B. cereus	7-11	Wenatchee, Wash.	?gravy	+			6	11	12	C,D,N,F	DH	Restaurant (D)
prob. B. cereus	11-26	Pasco, Wash.	?dressing	+	+		3(33)	3	12	N,V	DH	Church(C)
CLOSTRIDIUM BOTULINUM												
C. botulinum type A	8-4	Gurnee, Ill. (Libertyville)	meatballs	+	+		4(4)	24	4-16 wks.	Diplopia, dysphagia, weakness, dysphonia	DH	Home (A)
C. botulinum type A	9-13	Liberal, Kan.	green beans	+	+		1(1)		3 dys.	Weakness, diplopia dyspnea, dysphonia	DH	Home (C)
prob. C. botulinum	10-15	Cambridge, Mass					1(1)		3 wks.	Diplopia, dysphagia, dysphonia, dyspnea		Home (D)
CLOSTRIDIUM PERFRINGENS												
C. perfringens	7-6	Kenosha, Wisc.	beef sandwich		+		7		48	N,V,C,D	DH	Restaurant (B)
C. perfringens	8-22	Atlanta, Ga	barbecue		+		00(~2000)	16	24	D,C,N,V,	DH	Picnic (B)
C. perfringens	9-27	Puget Sound, Wash.	beef roast	+			3.5(1155)	17	23	D,C,N	DH	Restaurant on ship (D)
C. perfringens	10-20	New York City, N.Y.	hamburger		+		350(5[illegible]0)	20	2	D,C,N	DH	School (B)
C. perfringens	11-11	Rumson, N.J.	turkey				254(1[illegible]20)	12	14	D,C,N	DH	Cafeteria (B)
prob. C. perfringens	2-17	New York City, N.Y.	beef roast				25(450)	15	12	D,C,N	DH	Cafeteria (B)
prob. C. perfringens	2-28	New York City, N.Y.	turkey		+		5(5)	9	13	D,C,N	DH	Restaurant (B)

ETIOLOGY	ONSET	REPORTED FROM	VEHICLE	LAB DATA			CLINICAL DATA				REPORTER	COMMENT
				P.	V.	P.	# ill (at risk)	incub. period (hrs.)	Duration of dis. (hrs.)	Symptoms		
prob. C. perfringens	4-20	New York City, N.Y.					12(17)	20	18	D,C	DH	Home (B)
prob. C. perfringens	5-16	Savannah, Ga.		+			40(170)				DH	Other (D)
prob. C. perfringens	6-19	Santa Maria, Calif.	?beans				80(120)	12	6		DH	Restaurant (B)
prob. C. perfringens	6-21	New York City, N.Y.	potato salad				4(6)	12	6	D,C,V	DH	Home (B)
prob. C. perfringens	7-17	Spokane, Wash.	chicken				2(2)	5	9	D,C	DH	Home (D)
prob. C. perfringens	8-1	Seattle, Wash.	duck	+			3(3)	10	36	D,C,N	DH	Restaurant (D)
prob. C. perfringens	8-10	Elma, Wash.	chiliburgers				2(2)	8	60	D,C,N	DH	Home (C)
prob. C. perfringens	8-20	Knoxville, Tenn.	beef roast				2(2)	24		D,C	FDA	Restaurant (B)
prob. C. perfringens	9-13	Bethlehem, Pa.	beef roast	+			74(160)	12	60		DH	Nursing home (B)
prob. C. perfringens	9-14	Arlington, Wash.	turkey				6(1545)	12	35	D,C	DH	Restaurant (B)
prob. C. perfringens	9-26	New Orleans, La.	beef roast				175(~1500)	12	18	D,C,N	DH	Picnic (D)
prob. C. perfringens	9-28	Seattle, Wash.	turkey				6(6)	12	48	D,C	DH	Restaurant (D)
prob. C. perfringens	10-22	Jal, N.M.	enchiladas				59(218)	10		N,C,D	DH	School (B)
prob. C. perfringens	10-31	St. Paul, Minn.	chop suey				91(325)	11	12	D,N,V	DH	School (B)
prob. C. perfringens	11-1	New York City, N.Y.	beef roast				9(9)	12	12	D,C	DH	Home (B)
prob. C. perfringens	11-12	Decatur, Ga.	turkey				348(580)	13	12	D,C,N,F,V	DH	School (B)
prob. C. perfringens	11-16	Stone Mountain, Ga.	beef roast				170(750)	13		D,C,N	DH	Restaurant (D)
prob. C. perfringens	11-19	Seattle, Wash.	Chinese food				4(4)	8	2	D,C,N	DH	Restaurant (D)
prob. C. perfringens	11-24	Scottdale, Ga.	turkey				48(59)	12	12	C,D,N	DH	School (B)

prob. C. perfringens	11-24	Chesapeake, Va.	turkey				210(400)	8	8	D,C,N	DH	Cafeteria (B)
prob. C. perfringens	11-26	Atlanta, Ga.	turkey				104(380)	11	11	D,N,C,V	MMWR	Airline (B)
prob. C. perfringens	12-10	New York City, N.Y.	Chinese food				4(4)	12	24	N,D,C	DH	Restaurant (B)
prob. enterococci (Strep. fecalis)	10-5	Locust Hill, Va.	?milk		+		23(5?)	8	12	D,N,C	DH	Nursing home (B)
SALMONELLA												
S. blockley	4-6	Lodi, Calif	turkey with dressing	+			19	24	72		DH	Restaurant (B)
S. thompson	5-16	Neenah, Wisc.	chicken	+			12	14	96	V,D,F	DH	Restaurant (B)
S. enteritidis	5-25	New York City, N.Y.	egg nog	+	+		3(4)	6	168	N,V,C,D,F	DH	Home (C)
salmonella	5-27	Greenwood, Fla.	ham	+	+		123(215)			N,C,D	DH	School (D)
S. st. paul	6-14	Wauwatosa, Wisc.	turkey	+		+	81(300)	21	5		DH	Restaurant (D)
S. thompson	7-6	Clarksville, Tenn.	pork	+	+		303(400)	40	72	D,C,F,N	MMWR	Restaurant (B)
S. enteritidis	7-12	Pensacola, Fla.		+		+	139(900)	12			AF	Navy Base (B)
S. typhi-murium	7-19	Johnson City, Tenn.	raw milk & ice cream	+	+	+	7(9)	16	48	N,V,C,D,F	DH	Home (C)
S. enteritidis	7-26	Library, Pa.	salad, ham	+	+	+	250(6000)	18	288	N,V,C,D,F	DH	Restaurant (D)
S. enteritidis	7-27	Baltimore, Md.		+			107(145)	12	96	D,F,N,C,V	DH	Nursing home (D)
S. typhi-murium	7-29	Statesville, N.C.	ham, barbecue	+	+		56(75)	6	72		DH	Restaurant (B)

ETIOLOGY	ONSET	REPORTED FROM	VEHICLE	LAB DATA			CLINICAL DATA				REPORTER	COMMENT
				P.	V.	H.	# ill (at risk)	incub. period (hrs.)	Duration of dis. (hrs.)	Symptoms		
S. enteritidis	8-2	Pittsburgh, Pa.		+			130(207)	18	158	D,F,N,C,V	DH	Restaurant (B)
S. enteritidis	8-8	Elmsford, N.Y. (Terrytown)	hen	+			240(406)	24		D,F,C	MMWR	Caterer (A)
S. thompson	8-9	Mendam, N.J.	turkey	+			112(221)	36	84	D,F,C,N,V	DH	Camp (B)
S. poona	8-12	Anchorage, Alaska	tacos	+			13(40)		12	D,C	DH	Restaurant (B)
S. enteritidis	8-16	Glennville, Ga.	eggs in ice cream	+	+		12(13)	8	240	N,V,C,D,F	DH	Home (C)
S. enteritidis	8-21	Seattle, Wash.	spaghetti with sauce	+		+	5(8)	24	72	N,D,C,F,V	DH	Restaurant (B)
S. blockley	8-25	Pittsburgh, Pa.	hamburger	+			2(5)	30	60	N,C,V,D,F	DH	Restaurant (D)
S. thompson	8-31	Grafton, N.D.	ice cream	+			198(1168)	24	168	D,F,N,V,C	DH	School(D)
S. typhi-murium	9-3	New York City, N.Y.		+			6(9)	20	84	N,V,C,D,F	DH	Home (D)
S. enteritidis	9-6	Sioux City, Neb.	roast beef	+		+	252	32	100	D,C,F,N,V	DH	Restuarant (D)
S. typhi-murium	9-14	Frohna, Mo.	eggs in ice cream	+	+		11(11)	24			DH	Home (C)
S. enteritidis	9-23	Carlisle, Pa.	chicken	+	+	+	54(150)	26	240	N,V,C,D,F	DH	Nursing home (B)
S. enteritidis	10-13	Jackson, Mich.	raw beef	+		+	353(876)	18	72	D,C,F,V,	DH	Cafeteria (B)
S. uganda	10-25	Atlanta, Ga.	ham	+	+		4(7)	30		D,F,C,N,V	DH	Home (C)
S. panama	11-27	Springfield, Ky.	turkey or ham	+			12(14)	21	24	D,F,N,V	DH	Home (C)
S. enteritidis	12-21	Waynesboro, Pa.	eggs	+			10(20)	58	96	D,C,F,N,V	DH	Home (C)
S. typhi-murium	12-22	Jackson, Tenn.	pork	+	+	+	300(2000)	24	96		DH	Restuarant
S. typhi-murium	12-24	Middleton, Tenn.	turkey	+			144(165)	20	96	D,F,C,N,V	DH	Caterer (B)

S. typhi-murium	12-27	Mexico, Mo.	turkey		+		6(6)					FDA	Home (D)
prob. salmonella	8-8	Florence, Ky.					19(38)	35	30	N,V,D,F		DH	(D)
SHIGELLA													
S. flexneri	6-19	Roxboro, N.C.	?water	+			27(47)	36	96	V,D,F		MMWR	Home (D)
S. sonnei	8-9	St. Louis, Mo.		+			28(69)	24	24	F,D,C,N,V		DH	(D)
S. sonnei	8-16	Maui, Hawaii	poi	+	+	+	≈1000(≈3000)	30	72	D,F,N,V		MMWR	Home (A)
S. sonnei	10-14	Le Center, Minn.	?pudding	+		+	334(750)	48	96			DH	School (D)
S. sonnei	12-18	Albuquerque, N.M.		+		+	200(800)					DH	School (D)
STAPHYLOCOCCUS													
S. aureus	1-16	Memphis, Tenn.	corn		+		51	10		D,C		AF	Navy Base (D)
S. aureus	2-25	New York City, N.Y.	cole slaw		+		3(3)	4	24	D		DH	Restaurant (B)
S. aureus	4-4	New York City, N.Y.	ham		+		3(3)	2	36	N,V,C,D		DH	Restaurant (B)
S. aureus	5-20	Long Beach, Calif.	ham		+		28(60)	4	5	N,D,C,V		DH	Home (B)
S. aureus	7-3	Kannapolis, N.C.	bakery		+	+	3(3)	3		N,V,C,D		DH	Home(B)
S. aureus	7-11	Sheboygan, Wisc.	coffee cake	+	+	+	63	4	6	N,V,C,D		DH	Home (B)
S. aureus	8-5	Chicago, Ill.	shrimp salad		+		22(83)	2	8	D,V,N,C			Airplane (A)
S. aureus	8-23	Anderson, Ind.	ham		+		17(19)	3	7	N,V,C,D,F		DH	Home (C)
S. aureus	8-24	San Diego, Calif.	coconut pie		+		3(5)		24			DH	(D)
S. aureus	8-29	Post Falls, Idaho	chicken and potato salad		+		12(30)			N,V,C,D		DH	Picnic (C)

ETIOLOGY	ONSET	REPORTED FROM	VEHICLE	LAB DATA			CLINICAL DATA				REPORTER	COMMENT
				P.	V.	H.	# ill (at risk)	incub. period (hrs.)	Duration of dis. (hrs.)	Symptoms		
S. aureus	9-3	Forrest City, Ark.	ham		+		200(1300)				DH	Restaurant (B)
S. aureus	9-15	Dyersburg, Tenn.	ham		+		2				Other	Restaurant (D)
S. aureus	9-17	Cherry Hill, N.J.	chicken salad		+	+	75(388)	31	3	N,V,C,D,F	DH	School (B)
S. aureus	9-21	Kannapolis, N.C.	bakery		+	+	3(3)	5		N,V,C,D	DH	Home (B)
S. aureus	9-24	Wake County, N.C.	turkey		+		29(623)	4		N,V,C,D	DH	Cafeteria (B)
S. aureus	9-27	Hapeville, Ga.	cake icing		+		3(3)	6	48	C,D,V	DH	Home (C)
S. aureus	10-2	Scottsdale, Ariz.	tacos		+		2(2)	4	7	N,V,C,D	DH	Home (B)
S. aureus	10-3	Marrero, La.	chicken		+		30	6		N,V,C,D	DH	Wedding (D)
S. aureus	10-17	Stockton, Calif.	chicken		+		2(2)	1	36	N,V,C,D	DH	Home (B)
S. aureus	10-22	Cleveland, Ohio	potato salad		+	+	31	3		N,V,D,C,F	DH	(B)
S. aureus	10-25	Cresapton, Md.	ham	+	+	+	49(150)	4	4	N,V,D,C,F	DH	Club (B)
S. aureus	11-1	New Orleans, La.	sardines		+		2(2)	4	5	N,V,C,D	DH	Home (A)
S. aureus	11-6	Salisbury, Md.	chicken salad		+		25(300)	4	10	N,V,D	DH	Home (B)
S. aureus	11-10	Uniontown, Pa.	turkey and potatoes		+	+	58(175)	4	96	N,V,C,D	DH	Restaurant (B)
S. aureus	11-12	Warwick, R.I.	ham		+		4(5)	3	2	N,V	DH	Home (B)
S. aureus	11-19	Wilmington, Del.	turkey	+			105(400)	4	24	N,V,D	DH	School (B)
S. aureus	11-25	Crimora, Va.	turkey		+	+	236(44))	4	6	V,N,C,D,F	DH	School (B)
prob. staph.	1-1	New York City, N.Y.	Chinese food				6(6)	2	2	N	DH	Restaurant (D)
prob. staph.	3-1	New York City, N.Y.	cake				10(75)	4	24	N,V,D	DH	Caterer (B)
prob. staph.	4-8	New York City, N.Y.	egg salad				3(3)	2	24	N,V,C,D	DH	Home (D)
prob. staph.	4-11	New York City, N.Y.	clams				3(6)	3	4	N,V,C,D	DH	Restaurant (B)

prob. staph.	4-12	Pine Mountain, Ga.	butter		14	3			DH	Restaurant (A)
prob. staph.	4-18	New York City, N.Y.			5(5)	2	4	V	DH	Delicatessen (B)
prob. staph.	4-20	New York City, N.Y.			15(32)	5	40	N,C,D,V	DH	Home (B)
prob. staph.	5-4	Penueles, Puerto Rico	ham		32	2	36	D,V,C,F,N	DH	Cafeteria (C)
prob. staph.	5-18	New York City, N.Y.			5(5)	4	18	D,C,N	DH	Restaurant (B)
prob. staph.	5-21	New York City, N.Y.			3(3)	4	10	D	DH	Restaurant (D)
prob. staph.	6-28	New York City, N.Y.			6(7)	4	7	N,V,C,D	DH	Home (C)
prob. staph.	7-1	San Francisco, Calif.	fried rice		8	2			DH	Restaurant (B)
prob. staph.	7-9	Woodland, Wash.	ice cream		2(2)	3	25	N,V,D	DH	Home (D)
prob. staph.	7-17	Vallejo, Calif.	?turkey		4(4)	2	8		DH	Restaurant (D)
prob. staph.	7-26	Mesilla, N.M.	chicken		42(100)	7	24	N,V,C,D	DH	Home (B)
prob. staph.	8-11	East Palo Alto, Calif.	ham	+	6(7)	3			DH	Home (D)
prob. staph.	8-12	Maplewood Village, Minn.	ham salad		5(20)				DH	Home (C)
prob. staph.	8-19	Seattle, Wash.	shellfish	+	14(15)	24	24		DH	Restaurant (B)
prob. staph.	8-20	Sacramento, Calif.	?TV dinner		3(5)				DH	Home (D)
prob. staph.	8-25	New York City, N.Y.	clams		2(4)	5	2	N,V	DH	Restaurant (D)

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				P.	V.	H.	# ill (at risk)	incub. period (hrs.)	Duration of dis. (hrs.)	Symptoms		
prob. staph.	8-27	New York City, N.Y.					12(40)	4	8	C,V,D,N	DH	Restaurant (B)
prob. staph.	8-28	Visalia, Calif.	coconut pie				2(2)	5	40	D,V	DH	Home (C)
prob. staph.	8-30	Jamaica, N.Y.					20(139)	2	12	N,V,C,D		Airplane (D)
prob. staph.	9-17	New York City, N.Y.					4	2	18	N,C,D	DH	Restaurant (B)
prob. staph.	9-19	Tacoma, Wash.	macaroni salad				35(51)	4	40	V,D,N	DH	Nursing home (B)
prob. staph.	9-23	Olympia, Wash.	pizza				5(5)	5	48	N,D,C,V	DH	Restaurant (D)
prob. staph.	10-3	New York City, N.Y.					6(12)	4	3	N,V,C,D	DH	Home (C)
prob. staph.	10-5	Kingsville, Tex.					18				AF	Navy Base (D)
prob. staph.	10-6	Chattanooga, Tenn.	?chili				151(380)	6	12	C,V,D	DH	School (D)
prob. staph.	10-8	Spokane, Wash.	liver sausage				2(2)	3		N,V	DH	Home (D)
prob. staph.	10-11	New York City, N.Y.					9(14)	2	24	D,C,N	DH	Home (C)
prob. staph.	10-16	New York City, N.Y.	fish cakes				4	2	14	N,V,C	DH	Restaurant (D)
prob. staph.	10-27	McAlester, Okla.		+			5				DH	Restaurant (D)
prob. staph.	11-2	Camden, N.J.	pumpkin pie				2(2)	5	24	N,V,D	FDA	Home (D)
prob. staph.	11-6	Pasco, Wash.	pizza				2	6		V,C,D	DH	(D)
prob. staph.	11-15	Overland, Kan.	cheeseburgers				3	8	48	N,V,C,D	DH	Restaurant (D)
prob. staph.	11-19	Seattle, Wash.	crab	+			2(2)	2	60	N,V,C,D	DH	Restaurant (D)
prob. staph.	11-26	Boise, Idaho	oyster dressing				36(91)	4	6	V,D,N	DH	Home (D)
prob. staph.	12-10	Durham, N.C.	pigs feet				2(2)	8	5	N,V,C	FDA	Home (D)

prob. staph.	12-10	Nashville, Tenn.				7(19)	3	24	N,V,C,D	DH	Restaurant (D)
prob. staph.	12-23	Greenville, S.C.	turkey			194(1214)	3		V,C,D	DH	Caterer (D)
PARASITIC											
Trichinella spiralis	2-17	Cherington, Ohio	bacon	+		2(2)			myalgias, periorbital edema	DH	(D)
Trichinella spiralis	7-20	Norwood, Mass.		+		2(2)	360	720	myalgias, urticaria, periorbital edema	DH	(D)
Trichinella spiralis	9-18	Glasford, Ill.	pork sausage	+		3(3)			myalgia	DH	(D)
Trichinella spiralis	10-1	Shoshone, Idaho	bear meat	+	+	15(23)			myalgia, rash, facial edema	MMWR	(A)
VIRAL											
infectious hepatitis	7-6	Riley, Kan.	water	+		12			jaundice, N,V		Gas station (D)
infectious hepatitis	7-16	Bigelow, Mo.	?water	+		9(86)	45 dys.		jaundice, N,V	DH	Home (D)
infectious hepatitis	10-24	Washington	punch	+		9(26)	21 dys.		jaundice	DH	Church (D)
CHEMICAL											
monosodium glutamate	10-2	Orange, Calif.	Chinese food		+	11(13)	15 min.	2	paresthesias, flushing, headache	DH	Restaurant (B)
monosodium glutamate	11-5	Pompano Beach, Fla.	Chinese food			6(6)	30 min.	2	N,V,paresthesias, dizziness	DH	Restaurant (B)
monosodium glutamate	11-9	Washington	soup			2	2		headache,V,C	DH	Restaurant (B)
scombroid poisoning	9-20	San Pedro, Calif.	bonito fish			2(2)	1	12	flushing, headache, itching, N,D	DH	Automobile (B)
zinc	7-14	Bellevue, Wash.	punch in galvonized cooler	+		2(5)	45 min.	24	V,C,D,N	DH	Construction site (A)

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ETIOLOGY	ONSET	REPORTED FROM	VEHICLE	LAB DATA			CLINICAL DATA				REPORTER	COMMENT
				P.	V.	H.	# ill (at risk)	incub. period (hrs.)	Duration of dis. (hrs.)	Symptoms		
zinc	8-19	Fairmont, Utah	lemonade in galvonized cooler		+		20(50)	1	4	N,C,V, bitter taste	DH	Church (A)
prob. chemical toxin	2-4	New York City, N.Y.	wax beans				4(4)	1	2	N,V,C	DH	Home (D)
niacin	4-16	New York City, N.Y.	hamburger		+		3(3)	15 min.	30 min.	flushing, itching	DH	Home (D)
prob. chemical toxin	8-14	Olympia, Wash.	hamburger				2(4)	15 min.		N,C	DH	Restaurant (D)
prob. chemical toxin	9-21	Powhatan, Va.	orange juice				131(214)	1	3	V,D,F,N,fainting	DH	Cafeteria(B)
prob. chemical toxin	10-5	Helena, Mont.	cheese puffs				3(4)	15 min.	12	N,V,C	FDA	Home (A)
prob. chemical toxin	10-16	Bozeman, Mont.	margarine				3(5)	1	24	N,V	DH	Home (D)
prob. chemical toxin	10-23	Laredo, Tex.	carbonated beverage				84(140)	1	24	N,V,C,F,headache	DH	Cafeteria (D)
prob. chemical toxin	12-9	Olympia, Wash.	hamburger				2(4)	30 min.		N,C,D,headache	DH	Restaurant (D)
prob. chemical toxin	12-10	Olympia, Wash.	hamburger				2(2)	2		N,C,F,D	DH	Restaurant (D)
prob. chemical toxin	12-12	Vancouver, Wash.	pepperoni				5(5)	30 min.		N,V,D,C	DH	Home (D)
UNKNOWN												
	1-18	New York City, N.Y.	hamburger				3(4)	11	12	D,C,N,V	DH	Home (C)
	1-24	New York City, N.Y.	chicken				3(4)	16		D,N,C	DH	Home (D)
	1-26	Kingsville, Tex.					23				AF	Navy Base (D)
	3-13	New York City, N.Y.	ham				6(10)	4	24	N,C,D,V	DH	Home (C)
	3-17	New York City, N.Y.					20(48)	48	48	C,D,N,V	DH	Home (B)

4-2	Memphis, Tenn.		94	4			AF	Navy Base (D)
5-13	New York City, N.Y.		3(5)	12	12	N,V,D,C,F	DH	Home (D)
5-16	New York City, N.Y.	custard bakery	3(3)	15	12	D,C	DH	Restaurant (B)
5-24	New York City, N.Y.		15(75)	18	24	D,C,N	DH	Home (C)
5-30	Everett, Wash.		15(20)	31	25	D,N,V,C	DH	Restaurant (D)
6-8	Everett, Wash.		3(3)	10	12	D	DH	Restaurant (D)
6-16	Seffner, Fla.		38(53)	5	14	D,C	DH	School (D)
6-26	Santa Clara, Calif.		15(138)	2	4	C,D,N	DH	School (B)
7-2	Winslow, Ark.		4(5)	14	24	D,V,C	FDA	Restaurant (D)
7-4	Wenatchee, Wash.	macaroni salad	3(3)	9	5	N,V,C,D,F	DH	Home (C)
7-5	Bellingham, Wash.	oysters	3(5)		24	D	DH	Picnic (D)
7-9	San Rafael, Calif.	?hamburger	2(2)	2	24	V	DH	Home (D)
7-12	Los Angeles, Calif.	salad	85(192)	29	36	N,C,D,V,F	DH	Restaurant (D)
7-15	Norwood, N.J.	?crabmeat	7	2		D,V	FDA	Restaurant (D)
7-17	Metairc, La.		50(150)		12	N,V,C,D	FDA	Restaurant (D)
7-19	New York City, N.Y.	chicken salad	3(5)			N,C,D	DH	Restaurant (B)
7-26	New York City, N.Y.		5(6)	7	24	N,V,C,D,F	DH	Home (D)

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				P.	V.	H.	# ill (at risk)	incub. period (hrs.)	Duration of dis. (hrs.)	Symptoms		
	8-2	Addison, Ill.					50(70)	11	24	N,V,C,D	DH	Home (D)
	8-2	Athens, Ohio	?lemon pie				100(~1500)	9	36	D,C	Salm.	School (D)
	8-3	Everett, Wash.	peanuts				3(4)	30	12	N,V,C,D	DH	Home (A)
	8-4	New York City, N.Y.	hamburger				3(3)	5		C,D	DH	Cafeteria (D)
	8-13	Everett, Wash.	whipped topping				3(5)	12	60	D,C,N	DH	Restaurant (D)
	8-16	New York City, N.Y.					100(208)	12	18	C,D,N,V	DH	Caterer (B)
	8-18	Everett, Wash.	oysters				4(5)	4	12	N,D,V	DH	Home (D)
	8-24	Sayreville, N.J.	?hamburgers				3(3)	10	24	D,C	FDA	Restaurant (D)
	8-27	Ft. Benning, Ga.					125				AF	Army Base (D)
	8-29	Moses Lake, Wash.	steak				2(2)	9	25	N,V,C,D	DH	Restaurant (D)
	9-8	Hays, Kan.	cucumbers				7(9)	18	24	N,V,C,D,F	DH	Home (C)
	9-8	South Bend, Wash.	sausage				3(4)	3		N,V,D	DH	Home (D)
	9-12	Edina Village, Minn.					20(60)	4		N,V,C	DH	Home (D)
	9-20	Normal, Ill.	potato salad				10(40)	4		N,V,C,D	DH	Picnic (C)
	9-26	Baltimore, Md.	potato salad				140(162)	14	72	N,V,C,D,F	DH	Factory (D)
	9-30	Missoula, Mont.	tamales				3(3)	3		N,V	FDA	Home (D)
	10-3	Denver, Colo.	clams				4(4)	4	4	N,V,C,D	FDA	Home (D)
	10-6	Decatur, Ga.	omelet				3(4)	30	3	N,C,V,D	DH	Restaurant (D)
	10-7	Spartanburg, S.C.					425(850)	16	10		DH	Club (D)
	10-9	Leesburg, Fla.	cheese and macaroni				10(30)			N,V,D	DH	Cafeteria (D)

10-13	Underwood, Wash.	hotdog	6(6)			V,C	DH	Home (D)
10-19	Apache Junction, Ariz.		66(115)	30	24	N,V,D,F,C	DH	Restaurant (D)
10-20	Corvallis, Ore.		10(30)	36	72	N,C,D,F	DH	(D)
10-23	New York City, N.Y.		3(3)	9	4		DH	Restaurant (B)
10-27	Lincoln, Neb.		250(≈1000)	12	24	N,V,C,D,F	DH	Cafeteria (D)
10-28	Spokane, Wash.	ham	3(3)		36	N	DH	Home (D)
10-31	Norristown, Pa.	pizza	2(2)	4	96	N,V,C,D,F	DH	Restaurant (D)
11-3	Richfield, Minn.	ham	15(15)	18	24	N,V,C,D,F	USDA	Home (D)
11-4	Park City, Utah	?beef	31(60)	30		N,D,V,C,F	DH	Restaurant (D)
11-4	Salt Lake City, Utah		29(165)	20	48	N,V,D,F	DH	Nursing home (D)
11-5	Palos Verdes, Calif.		47(237)	4	13	N,V,D	DH	Restaurant (D)
11-7	Sunnyvale, Calif.	hamburgers	10(15)	6	12		DH	Home (D)
11-13	Golden, Colo.	?bean dip	2(2)	3	4	V,C	FDA	Home (D)
11-13	Oklahoma City, Okla.		18(150)	28	12	N,V,C,D	DH	Restaurant (D)
11-16	Pacific Beach, Wash.	soup	2(2)	4	3	N,D,V,C	DH	Restaurant (D)
11-19	Orangeburg, S.C.		129(350)	8	12	N,D	DH	School (B)
12-1	San Jose, Calif.	potatoes	3(4)	14	12		DH	Home (C)
12-6	Minneapolis, Minn.		100(140)	36	24	N,V,D	DH	Restaurant (D)

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				P.	V.	H.	# ill (at risk)	incub. period (hrs.)	Duration of dis. (hrs.)	Symptoms		
	12-3	Longview, Wash.	beef				4(6)	20	24	N,V,C	DH	Home (D)
	12-10	Durham, N.C.	pig's feet				3(40)	12	6	N,V,C	FDA	Home (D)
	12-13	Sedalalia, Mo.	tuna salad				13(17)	25		N,D,C,F	FDA	Home (D)
	12-14	New York City, N.Y.	ravioli				4(4)	4	24	C,D	DH	Home (C)
	12-14	Longview, Wash.	cake				7(7)	7	12	N,C	DH	Home (D)
	12-20	Decatur, Ga.					7(7)			N,V,C,D,F	DH	Gas station
	12-25	Kelso, Wash.	cake icing				2(9)	995		N,V	DH	Home (D)
	12-26	Minneapolis, Minn.	?beef				21(42)	36	24	N,V	DH	Restaurant (E)

ETIOLOGY	ONSET First 6 mo. 1969	REPORTED FROM	VEHICLE	LAB DATA P.	V.	H.	CLINICAL DATA # ill (at risk)	incub. period (hrs.)	Duration of dis. (hrs.)	Symptoms	REPORTER	COMMENT
BACTERIAL												
Bacillus cereus	5-12	Queens Co., N.Y.	ravioli & meat balls		+		5(6)	x̄ 16	11	C,D,N,	DH	Restaurant
CLOSTRIDIUM BOTULINUM												
C. botulinum type A	2-16	Pendleton, Ore.	pumpkin		+		1(1)	9-12		D, diplopia, dysphagia, cardiac arrest, death.	DH	Home-canned pumpkin pie. Home.
C. botulinum type A	3-3	Chicago, Ill.	mushrooms	+	+		1(1)	8-10		D, dysphagia, dysphonia, resp. arrest, ?cardiac arrest, death.	DH	Home preserved mushrooms. Home.
C. botulinum type B	3-7	Louisville, Ky.	home-canned tomato juice	+			1(1)	<24		C, diplopia, dysphagia, ocular paralysis	DH	Home
C. botulinum type A	3-28	Denver, Colo.	potato salad	+			6(~25)	~12-24		Symmetric cranio-bulbar paralysis	DH	Restaurant
C. botulinum type A	3-31	Dallas, Tex.		+			1	"		Dysphagia, diplopia, resp. distress.	DH	Unknown Death.
CLOSTRIDIUM PERFRINGENS												
C. perfringens PS43 PS66 PS72 PS75 PS76 PS88	1-22	Seattle, Wash.	cream gravy	+			34(60)	med. 14½	med. 7	D,C	DH	Restaurant
C. perfringens Hobbs 3, 4, PS73	1-29	Raleigh, N.C.	beef		+		>25(500)	10-11		N,D,C, F	ECA	Hotel
C. perfringens PS 91	2-7	Walla Walla, Wash.	turkey	+	+		8	x̄ 5	12-48	C,D,	DH	Home
C. perfringens	2-8	Ann Arbor, Mich.	meatloaf		+		15(23)	2-18 x̄ 10	12	D,C	DH	Fraternity house. College
C. perfringens	2-17	Tustin, Calif.	steak "picado"	+	+		25(33)	7-19	x̄ 12-18	H.N.C.D	DH	Restaurant
C. perfringens	2-19	W. Palm Beach, Fla.	turkey		+		680	10-18 x̄ 12	x̄ 36	V,D,C	DH	School

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				P.	V.	H.	# ill (at risk)	incub. period (hrs.)	Duration of dis. (hrs.)	Symptoms		
C. perfringens	2-26	Seattle, Wash.	beef stew with noodles	+		+	12(20)	med. 13½	x̄ 12	N,V,D,C, chills, H	DH	School
C. perfringens	3-15	Washington, D.C.	roast beef and/or gravy	+			139(202)	x̄ 18	x̄ 18	N,C,V,D,F	DH	Restaurant
C. perfringens	4-18	Watertown, Conn.	beef & gravy		+		4	x̄ 12	x̄ 12	D,C	DH	Restaurant
C. perfringens PS 69, PS 88	4-21	Raleigh, N.C.	ground beef in chili	+			150(807)	x̄ 9¾	x̄ 17	C,D	DH	School
C. perfringens	4-26	Seattle, Wash.	sirloin steak au jus	+			5(6)	x̄ 11½	12	C,D	DH	Restaurant
C. perfringens	4-27	Detroit, Mich.	roast beef		+		17(58)	5-20½ x̄ 12	½-54	N,C,D	DH	Restaurant
C. perfringens	5-2	Avon, Conn.	roast beef		+		48(200)	x̄ 16	x̄ 12	C,D	DH	School
C. perfringens PS 54	5-4	Seattle, Wash.	ribs of beef	+			~440(1100)	10-12 med. 12	med.24	C,D,N,V	DH	Canadian Liner, Seattle-Victoria, B.C.
C. perfringens	5-8	Vernon, Conn.	Italian sausage	+	+		3(4)	x̄ 10	x̄ 16	N,V,D,C,F	DH	Home
C. perfringens	5-13	Bozeman, Mont.	roast beef		+		80(~400)	x̄ 8-12	12-24	N,C,D,H	DH	School
C. perfringens	5-16	Renton, Wash.	roast beef	+	+		13(78)	x̄ 7	x̄ <12	C,D	DH	Restaurant
C. perfringens	5-22	Detroit, Mich.	roast beef and gravy	+			71(250)	4-17	2-20	C,D	DH	School
C. perfringens PS 67 PS 77	5-22	Stillwater Township, N.J.	sirloin roast	+			58(90)	x̄ 13	4-8	D,C	DH	Banquet
C. perfringens	6-2	Seattle, Wash.	Boston-type clam chowder	+	+		2(100)	x̄ 6½	x̄ 5	D,C,flatulence	DH	Restaurant
prob. C. perf.	1-17	Billings, Mont.	beef				63(110)	3-18	12-24	C,D,N,V	DH	Caterer. Cafeteria
prob. C. perf.	2-3	Baltimore, Md.	?roast beef and gravy				>36(90)	7-19 x̄ 12	x̄ 24	C,D	DH	Banquet
prob. C. perf. ?Hobbs type 3	2-4	Newark, N.J.	beef sandwiches	+			6(8)	10-12		C,D	Personal communication	Caterers
prob. C. perf.	2-10	Cocoa Beach, Fla.	Cheese taco				10(13)	12-15 x̄ 13	4-12	C,D	DH	Restaurant
prob. C. perf. PS 35	2-20	Seattle, Wash.	cheese sauce	+			2	13-16	18-36	C,D,N,chills	DH	Restaurant

prob. C. perf.	3-10	Brooklyn, N.Y.	roast beef			3(3)	~10	24	C,D	DH	Restaurant
prob. C. perf.	3-12	Atlanta, Ga.	?meatballs			10(16)	12-16		C,D	Ind.	Restaurant
prob. C. perf.	3-17	Baltimore, Md.				216(311)	9		C,D	DH	School
prob. C. perf.	4-7	Forestville, Conn.	turkey stuffing			8	12-16	x̄ 24	D,C	DH	Restaurant
prob. C. perf.	5-5	New York City, N.Y.	meat loaf			6(17)	x̄ 7		N,C,D,H	DH	Restaurant
prob. C. perf.	5-21	Brownsville, Fla.	?turkey and/or gravy			43(1350)	18-20		C,D	DH	School
prob. C. perf.	6-19	Seattle, Wash.	baron of beef			8(200)	10	x̄ 24	D,C	DH	Restaurant
ESCHERICHI COLI											
coliforms	4-30	Boca Raton, Fla.	hamburger		+	26(200)	x̄ 10	x̄ 12	N,V,D,F	DH	School
prob. coliforms	1-29	Glennwood Springs, Colo.	water			>36(>49)	20-72 x̄ 24	x̄ 1 dy.	N,V,D,F,C	DH	Contaminated well at ski lodge
SALMONELLA											
S. infantis	1-2	Shelby Co., Tenn.	smoked turkey	+	+	11(17)	23-43 x̄ 29	x̄ >3 dy.	D,F,C,V	MMWR	Home
S. typhi-murium	1-26	Hampton, N.Y.	meatballs	+		13(130)	8-76 x̄ 34		V,D,F,C,N	DH	Banquet
S. anatum	2-3	Everett, Wash.	headcheese luncheon meat		+	3		2-7 dy.	D,F,C	DH	Home
S. give	2-28	Wake County, N.C.	potato salad & chicken salad	+		7			F,C,D,N	DH	Hospital
S. eimsbuettel	3-29	Washington	turkey or beef	+		5			N,V,D,F	DH	Mexico
S. heidelberg	4-4	Rhode Island	barbeque chicken	+	+	3(3)	10-15		V,D,F,C	DH	Home
S. typhi	4-16	Portland, Ore.	water	+		6(7)			F,N,V,C,D,rash	DH	Acquired in Philippines
S. enteritidis	4-19	Royalton, Minn.		+	+	134(500)		x̄ 4.2 dy.	D,F,N,C,H	DH	School
S. amager	4-20	Seattle, Wash.	turkey	+		8(16)	med. 24	2 dy.	N,D,C,H,F	DH	Home

ETIOLOGY	ONSET First 6 mo. 1969	REPORTED FROM	VEHICLE	LAB DATA			CLINICAL DATA				REPORTER	COMMENT
				P.	V.	H.	# ill (at risk)	incub. period (hrs.)	Duration of dis. (hrs.)	Symptoms		
S. enteritidis	4-29	Erie Co., Penn.	chocolate pudding	+		+	31(84)	48		C,F,V,D	DH	Infant home. 1 death. Retarded children
S. thompson	4-29	Orono, Maine	turkey	+		+	~400	6-46		N,V,C,D,F	DH	School.
S. sieburg	5-4	Aitkin Co, Minn.	creampuffs	+			5(10)	24-36		Chills,F,C,D	DH	Home
S. infantis	5-?	New Orleans, La.		+		+	54			F,D	DH	Hospital
S. welikada	6-14	Montgomery Co., Md.	roast beef	+	+		33(100)	5-58 $\bar{x}$ 18		N,V,D,F,C	DH	Banquet
prob. salm.	2-24	New York City, N.Y.	pork				5(5)	9-21 $\bar{x}$ 13	$\bar{x}$ 3 dy.	N,V,C,D,F	DH	Home
prob. salm.	3-16	Aloha, Ore.					48(129)	10-64	$\bar{x}$ 34	N,V,D,C,F	DH	Church dinner
SHIGELLA												
S. sonnei	5-10	Jersey City, N.J.	salads	+			61(117)	1-8 dy. $\bar{x}$ 2 dy.	$\bar{x}$ 5.5 dy.	F,D,C,N	DH	Banquet
S. sonnei	5-16	Chula Vista, Calif.	?baked beans	+			18(37)	2 dy.		D,V	DH	Home
S. sonnei	5-20	Point of Rocks, Md.	prob. water	+			54(114)			V,C,F,D	DH	Home
STAPHYLOCOCCUS												
S. aureus	1-26	Detroit, Mich.	ham		+		5(3)	2	$\bar{x}$ 12	D,V,N,F	DH	Home
S. aureus	3-8	Santa Cruz, Calif.	ham		+		6(7)	1½-4⅙	2½	N,V,D,prostration	DH	Home
S. aureus	3-9	Las Cruces, N.M.	ham		+		14(20)	1-4		D,V,dizziness	DH	Home
S. aureus, B. cereus, and C. perfringens	3-23	New York City, N.Y.	ham		+		30(48)	$\bar{x}$ 3	$\bar{x}$ 12	N,V,C,D	DH	Home
S. aureus	3-25	Deerfield, Fla.	roast beef, corned beef, ham		+		17	$\bar{x}$ 4½	$\bar{x}$ 5	N,V,D	DH	Restaurant
S. aureus	4-3	Coffee Cantata, Calif.	shrimp salad		+		3(10)	2½-3		N,V,D,C, weakness	DH	
S. aureus	4-3	Fairbridge, Md.	pork chops		+		[illegible]					
S. aureus	4-4	Brooklyn Center, Minn.	ham		+							
S. aureus	4-11	Los Gatos, Calif.	tuna salad									

S. aureus	4-14	Detroit, Mich.	deviled eggs	+		7(12)	1-2½		N,V,D	DH	Home
S. aureus	4-15	Spokane, Wash.	hamburger	+		2(2)	x̄ 2	x̄ 7	N,V,C,D	DH	Home
S. aureus type 6/47/53/54/75/83A+	4-26	Pocatello, Idaho	roast beef	+	+	183(400)	1-6		N,V,D,C	DH	Tribal dinner, Indians.
S. aureus type 6/47/53/54/75/83A+	4-27	Pocatello, Idaho	roast turkey	+	+	19(64)			N,V,D	DH	Mission dinner. Indians.
S. aureus	5-16	Harvey, La.	beef stew	+		10(12)	x̄ 5		N,V,C,D	DH	Restaurant
S. aureus type 6/47/53/54/75/83A Enterotoxin A	5-22	Ruston, La.	chicken salad	+	+	138(240)	x̄ 3	13-24	N,V,C,D,F, weakness	DH	Banquet. School
S. aureus group 3, phage 47/54	5-24	Mechanicsville, Va.	potato salad	+		12(25)	1-6		N,V,C,D	DH	Home
S. aureus Enterotoxin A type 53/83/85	5-25	Nashville, Tenn.	barbequed pork		+	500(800)	3-5		N,V,C,D,H	DH	Picnic
S. aureus phage type 47/53	5-30	Norfolk, Va.	chicken and/or ham	+	+	145(180)			N,V,D,chills	DH	Lodge. Restaurant
S. aureus type 42E/47/53/55/75/77	6-1	Baton Rouge, La.	butter		+	2(5)	2		N,V,D	DH	Home
S. aureus phage type 54/47/77/84	6-5	Petersburg, Va.	chicken salad	+	+	200(540)	1-8 x̄ 3	x̄ 12	N,V,	DH	School
S. aureus	6-26	Nashville, Mich.	ham		+	4	x̄ 3	2 dy.	N,V,C,D,F	DH	Restaurant
prob. staph.	1-2	New York City, N.Y.	sausage			6(6)	2½	x̄ 2	N,V,C,D	DH	Home
prob. staph.	2-2	Spokane, Wash.	ham			5(5)	x̄ 2	x̄ 24	N,V,C,D,F	DH	Home
prob. staph.	2-9	Stockton, Calif.	canned, chopped luncheon meat			2(2)	7½	< 24	N,V,D	DH	Home
prob. staph.	2-22	Baker, Mont.	turkey & dressing			11(11)	~6	x̄ 12	V,C,D	DH	Home
prob. staph.	3-19	Snohomish Co., Wash.	banana cream pie			6(7)	x̄ 7	x̄ 13	N,V,C	DH	Restaurant

ETIOLOGY	ONSET First 6 mo. 1969	REPORTED FROM	VEHICLE	LAB DATA P.	V.	H.	CLINICAL DATA # ill (at risk)	incub. period (hrs.)	Duration of dis. (hrs.)	Symptoms	REPORTER	COMMENT
prob. staph.	3-20	Charleston, W. Va.					9(22)	1½-4	x̄ 3	N.V	DH	Restaurant
prob. staph.	3-22	Queens, N.Y.	prob. turkey with gravy				7(7)	2-3	6-12	D,C,N,V	DH	Home
prob. staph.	3-25	Portland, Ore.	boiled shrimp				4(4)	4-8 x̄ 6	x̄ 16	N,V,D	DH	Home
prob. staph.	4-14	Washington					2	x̄ 2	x̄ 13	V,C,D,F	DH	
prob. staph.	4-?	Spokane, Wash.	hamburger				8	x̄ 2½	x̄ 48	N,V,D,C	DH	Restaurant
prob. staph.	5-3	Manteno, Ill.					20(87)	med. 5		N,C,prostration, V,D,F	DH	Restaurant
prob. staph.	5-7	Saginaw, Mich.	custard filled creampuffs				2(2)	2½	2 dy.	N,V,D,chills	DH	Store.
prob. staph.	5-8	McClaery, Wash.	canned ham				4(4)	x̄ 2½	x̄ 24	N,V,C,D	DH	Home
prob. staph.	5-13	Renton, Wash.	potato salad				2(2)	2-3½		N,V,D	DH	Home
prob. staph.	6-29	Baltimore, Md.	doughnuts				5(7)	3-10		N,V,C	FDA	Home. 1 death.
STREPTOCOCCUS												
enterococci	6-29	Huntington, W. Va.	ham		+		3(5)	x̄ 4	x̄ 12	D,C,F,N	DH	Home
prob. enterococci	5-6	Queens, N.Y.	roast beef		+		3(3)	x̄ 7½	4	N,V,C,D	DH	Restaurant
CHEMICAL												
Chinese restaurant syndrome MSG	3-30	Bronx, N.Y.	Chinese food				4(7)	30 min.	30 min.	Burning in back of neck, numbness, flushing of face, dizziness, headache.	DH	Home. Food bought at Chinese restaurant
chemical toxin	4-19	Banks, Ore.	tomato juice				>43(260)	½-3 x̄ ½	x̄ 7	Bloating, C,D,N,V	DH	Dairy festival
water hemlock	4-22	Blackfoot, Idaho	water hemlock		+		1(1)	5 min.	2 hr. until death	N,V, seizures, apnea, cardiac arrest--death	DH	Home
psilocybe mushroom poisoning	5-11	Seattle, Wash.	psilocybe mushrooms		+		2(2)	1-2		V, dry throat, hallucination, somnolence, light headedness	DH	Home
chemical toxin	5-12	Redmond, Wash.	canned tomato juice				3(4)	10-15 min.	1-5	N,V,C, metallic taste	DH	Home

chemical toxin	5-13	Wapato, Wash.	tomato juice		22(36)	1-2		Bloating, D,N,H,V	DH	Restaurant
chemical toxin	5-?	Snohomish Co., Wash.	hamburger		3(4)	15-30 min.	$\bar{x}$ 1	V,C,D	DH	Home
chemical toxin	6-19	Seattle, Wash.	tomato juice		2(2)	$\bar{x}$ 1	4	N,C,D	DH	Home
prob. organic phosphorous pesticide	2-27	Washington, D.C.	pork neck bones & blackeyed peas' stew		13(13)	5-15 min.	$\bar{x}$ ½	Blurred vision, dizziness, headaches.	DH	Industrial plant
prob. mushroom poisoning	3-11	Stockton, Calif.	mushrooms		2(2)	1½-2	24	N,V,D	DH	Home gathered mushrooms
PARASITIC										
Trichinella spiralis	3-11	St. Louis Park, Minn.	?hot dogs	+	2	~3 weeks		F,C, periorbital edema, eosinophilia	Para.	?acquired in Mexico. Restaurant
Trichinella spiralis	3-28	Jersey City, N.J.	uncooked pork	+	2			Eosinophilia, periorbital edema	Para.	Home
Trichinella spiralis	4-28	Cuyahoga Co., Ohio	smoked sausage	+	6			Periorbital edema, malaise, myalgia, fever, eosinophilia	DH, MMWR	Home
Trichinella spiralis	6-?	Rhode Island	uncooked raw sausage	+	7	2-10 dy.		Periorbital edema, F, myalgia, eosinophilia	MMWR	Home
VIRAL										
infectious hepatitis	1-11	Bergen Co., N.J.	sandwishes: roast beef, corned beef, turkey		12(26)			Malaise, F, anorexia, N, jaundice	DH	Home. Sandwiches from delicatessen
infectious hepatitis	2-5	Burlington Co., N.J.	?well water		4(9)			Abnormal liver function tests, bilirubinuria, icterus, D	DH	Home
infectious hepatitis	3-?	Wrangle, Alaska	prob. water	+	5	26 dy.		Icterus, bilirubinuria, abnormal liver function tests	DH	Home
UNKNOWN	1-1	Palo Alto, Calif.	abalone		2(2)	9		H,N,V,C,D	DH	Home

ETIOLOGY	ONSET First 6 mo. 1969	REPORTED FROM	VEHICLE	LAB DATA P.	V.	H.	CLINICAL DATA # ill (at risk)	incub. period (hrs.)	Duration of dis. (hrs.)	Symptoms	REPORTER	COMMENT
Unknown (continued)	1-13	Campbell, Calif.	hot dogs				6(6)	8-9	$\bar{x}$ 12-15	C,D,V	DH	Home
	1-13	Fairton, N.J.					3(4)		1-3 dy.	N,V,D,F blood in stool	DH	Home
	1-16	Spokane, Wash.	?chocolate cake				2	$\bar{x}$ 9	36	C,D	DH	Home
	1-22	Kalamazoo, Mich.	chicken				4(7)	$\bar{x}$ 11	$\bar{x}$ 24	N,V,D	DH	Restaurant
	1-28	Denver, Colo.					3(3)	12		N,V,D	DH	Restaurant
	1-28	Ellenberg, Wash.					7	$\bar{x}$ 8	48	N,V,C,D,F	DH	School
	2-7	Dallas, Tex.					>10(25)	14-36		C,D,N,V	ECA	Restaurant
	2-21	Champaign, Ill.	beef				33(58)			C,D, N, chills	DH	Restaurant
	2-23	Kentucky	turkey				18(18)	5-13 mode 11		F,D, chills	DH	School
	2-27	Pasco, Wash.					3(3)	$\bar{x}$ 7	$\bar{x}$ 30	N,V,D, headache	DH	Home
	3-3	Spokane, Wash.	ham & beans				4(8)	6-48	3-24	N,V,C,D,H	DH	Home
	3-27	Staten Island, N.Y.	chocolate cream pie				7(10)	12-14	1-4 dy.	D,C	DH	Home
	3-29	Washington Co., Ore.	cheese taco				40(68)	4-66 $\bar{x}$ 26	$\bar{x}$ 24	N,V,D,C,F,H	DH	Banquet
	3-30	San Jose, Calif.					5(5)	3-6	24	N,V,D	DH	Restaurant
	4-2	Oklahoma City, Okla.	chicken, noodles, & cheese				19(40)	$\bar{x}$ 14	$\bar{x}$ 5-6	C,D,N	DH	Church dinner
	4-6	Wilkes Barre, Pa.	ham				3(11)	1-2		C,V,N	FDA	Home
	4-14	Sandy, Utah	kippered herring				2(2)	3-4		C,N	FDA	Home
	4-15	Seattle, Wash.	Chinese food				10(18)	$\bar{x}$ 36	1½ dy.	N,V,D,C,F,H	DH	Restaurant
	5-6	Greenfield, Calif.	ham				2(2)	4-5	$\bar{x}$ 3-4	N,V,D,C	DH	Home
	5-11	Springfield, Ill.					29(89)	$\bar{x}$ 12	$\bar{x}$ 23	D,N,C	DH	Restaurant
	5-15	Williamson Co., Tenn.	?water				325			N,D	News.	School
	5-18	Brooklyn, N.Y.	chow mein				9(9)	$\bar{x}$ 7	$\bar{x}$ 36	N,V,C,D	DH	Home

5-22	Denver, Colo.	turkey & mayonnaise	4(4)	4½-11		N,V,C,D	DH	Home. Sanwiches prepared by takeout delicatessen
5-24	Los Angeles, Calif.		103(152)	11-13	x̄ 9-12	N,V	DH	Banquet. Buffet
5-26	San Jose, Calif.	canned meatball stew	6(7)	3½-9½	24	N,V,C,weakness	DH	Home
5-30	Anaheim, Calif.	seafood newburg and/or swiss steak	62(162)	19-80	37	C,N,D,V,H	DH	Restaurant
5-?	Spokane, Wash.		3(5)	12	5	N,V,C	DH	Home
6-1	Westlake, Wash.	corn dog	4(30)	x̄ 30	x̄ 36	N,V,C,D,F	DH	Restaurant
6-10	Cocoa, Fla.	tomato juice	2(2)	1½	3-4	N,V,D,weakness, blurred vision	DH	Home

Section G.—Line Listing of Food Poisoning Episodes Reported as Single Cases, January–June 1969

ETIOLOGY	ONSET First 6 mo. 1969	REPORTED FROM	VEHICLE	LAB DATA			CLINICAL DATA				REPORTER	COMMENT
				P.	V.	H.	# ill (at risk)	incub. period (hrs.)	Duration of dis. (hrs.)	Symptoms		
BACTERIAL												
Brucella	3-69	Kenalwick, Wash.	prob. goat & cow milk	+			1			F,chills	Bruc.	Home. Unpasteurized milk
CLOSTRIDIUM PERFRINGENS												
prob. C. perf. PS22	1-2	Seattle, Wash.	roast beef		+		1	few hrs.	<12	D,C	DH	Restaurant
STAPHYLOCOCCUS												
prob. staph.	1-13	Somerville, S.C.	veal cutlets		+		1				USDA	Restaurant
prob. staph.	3-5	Oakland, Calif.	abalone				1	5		C,V,D	DH	Restaurant
prob. staph.	6-5	Seattle, Wash.	potato salad	+			1(2)	$\bar{x}$-1	3-4	N,V,C,D,F	DH	Home
PARASITIC												
Trichinella spiralis	1-?	Limestone, Maine	pork	+			1			Periorbital edema, eosinophilia	Para.	Home. Pig fed garbage.
Trichinella spiralis	2-10	Cedar Grove, N.J.	sausage	+			1	4 dy.		Eosinophilia, mycarditis, periorbital edema	Para.	Poorly cooked. Home
Trichinella spiralis	3-22	Somerville, Mass.	pork	+			1(2)	2 weeks		Periorbital edema, eosinophilia	Para.	Home. Undercooked pork.
Trichinella spiralis	3-22	York Co., S.C.	sausage	+			1(1)			D,chills, myalgia, periorbital edema, F, eosinophilia	Para.	Home. Poorly cooked & raw sausage.

Trichinella spiralis	4-3	Vancouver, Wash.	raw hamburger	+	1			Myalgia, pleuritic chest pain, D, eosinophilia, periorbital edema	Para.	Home
Trichinella spiralis	4-20	Baltimore, Md.	raw hamburger	+	1			Eosinophilia, periorbital edema	Para.	Home. Store uses same grinder for pork and beef.
UNKNOWN	3-3	Simi, Calif.	clam		1(1)	2	16-18	N,V	DH	Home
	3-31	Susanville, Calif.	beef		1(1)	10	12	C,D	DH	Home
	3-31	Harrisburg, Pa.	?Seven-up soda		1	24	36	N,V,D,C,F	Ind.	Home
	5-7	San Francisco, Calif.	roast beef		1	15 min.	4	N,H,weakness	DH	Aboard train
	6-17	Cocoa, Fla.	tomato juice		1	1½		N,V,D,blurred vision, weakness, paresthesias	DH	Home.

ETIOLOGY	ONSET	REPORTED FROM	VEHICLE	LAB DATA			CLINICAL DATA				REPORTER	COMMENT
				P.	V.	H.	# ill (at risk)	incub. period (hrs.)	Duration of dis. (hrs.)	Symptoms		
BACTERIAL												
Bacillus cereus	10-19	Spokane, Wash.	doughnuts		+		5(5)	2-9($\bar{x}$ 6)		N,V,D	DH	Restaurant (B)
Bacillus cereus	12-22	Evansville, Ind.	oysters		+		4(9)	$\bar{x}$ 5½		N,C,D	DH	Home (D)
CLOSTRIDIUM BOTULINUM												
C. botulinum	7-2	Seattle, Wash.		+			1			Dizziness, blurred vision, resp. distress, symmetric cranial and skeletal nerve paralysis	DH, MMWR	Home (D)
C. botulinum	9-18	South Bend, Ind.		+			1(1)			N,V,ptosis, dysphagia, dysarthria, resp. distress, weakness	DH	Home (C)
C. botulinum	11-26	Los Angeles, Calif.	home-canned figs				2(2)	24		N,V, weakness, diplopia, dysphagia, dysarthria, resp. distress	DH	Home (C) (1 death)
C. botulinum type B	12-19	Denver, Colo.	home-canned chili peppers	+			1			Dysphagia, dysarthria, resp. distress, cranial nerve and skeletal muscle weakness		Home (C) (death)
prob. C. botulinum	12-4	Clayton, Idaho	home-preserved applebutter				2(3)			Diplopia, dysphagia, ptosis, resp. insufficiency, dysarthria, skeletal muscle weakness		Home (C)
CLOSTRIDIUM PERFRINGENS												
C. perfringens hobbs type 13	3-13	Oahu, Hawaii	pork	+			40(61)	5½-19	36	C,D	DH	School (D)
C. perfringens	4-7	Oahu, Hawaii	chicken gravy	+			5(7)	14-18	24-48	C,D	DH	Restaurant (D)

C. perfringens	5-23	NYC, N.Y.	chicken		+		20(25)	6-21 ($\bar{x}$ 12)	$\bar{x}$ 24	C,D,N,V	DH	Home (B)
C. perfringens PS 75 PS 76	5-31	Philadelphia, Penn.	beef stew	+			175(700)	12	24	N,V,D	DH	Hospital (B)
C. perfringens	8-7	Jacksonville, Fla.	turkey		+		250(1,400)	8-24 ($\bar{x}$ 12)	5-6	C,D	DH	Cafeteria-catered (D)
C. perfringens	8-10	Houston, Tex.	beef		+		6(7)	18		C,D	DH	Home (D)
C. perfringens	8-18	Newington, Conn.	turkey		+		27(35)	$\bar{x}$ 12	$\bar{x}$ 8	C,D	DH	Home-catered (D)
C. perfringens hobbs 8/PS 72/78/81A/38	8-27	Atlanta, Ga.	salad and/or potato	+			5(5)	$\bar{x}$ 8	$\bar{x}$ 8	C,D,N	Ind.	Restaurant (B)
C. perfringens	9-12	Spokane, Wash.	beef gravy				21(50)	3-48 ($\bar{x}$ 15)	$\bar{x}$ 24	C,D,N,F	DH	Restaurant (B)
C. perfringens hobbs type 3	9-27	Pullman, Wash.	burritos	+	+		90(100)	4-12 ($\bar{x}$ 9)	$\bar{x}$ 18	C,D,chills	DH	School (B)
C. perfringens	10-22	Memphis, Tenn.	braised beef on rice	+	+		13,500 (67,188)	3-18 ($\bar{x}$ 11)	4-48 ($\bar{x}$ 18)	C,D	DH	School (B)
C. perfringens PS 40	11-1	Memphis, Tenn.	roast beef	+			7(100)	12-24 ($\bar{x}$ 13)	$\bar{x}$ 6	C,D,H	DH	Restaurant (B)
C. perfringens	11-2	Los Angeles, Calif.	turkey and/or gravy	+			57(100)	$\bar{x}$ 11	$\bar{x}$ 12	C,D,N	DH	Hospital (B)
C. perfringens hobbs type 11	11-12	Cumming, Ga.	turkey	+		+	590(750)	9-10	4-6 dy.	N,C,D,F,V	DH	School (D)
C. perfringens	11-22	Clarksville, Tenn.	macaroni and cheese	+	+	+	200(700)	$\bar{x}$9-13	$\bar{x}$ 24	N,C,D	DH	Cafeteria (B)
C. perfringens	12-1	Memphis, Tenn.	rice	+			3(30)	4-13	4-24	C,D	DH	Restaurant (B)
prob. C. perfringens	3-18	Terre Haute, Ind.	pork gravy				153(1,167)	5-1[illegible]	$\bar{x}$ 13	D	DH	School (B)
prob. C. perfringens	5-17	Atco, N.J.	roast beef and gravy				23(70)	7-15 ($\bar{x}$ 11)	$\bar{x}$ 18	C,D,N,V	DH	Home (D)

ETIOLOGY	ONSET	REPORTED FROM	VEHICLE	LAB DATA			CLINICAL DATA				REPORTER	COMMENT
				P.	V.	H.	# ill (at risk)	incub. period (hrs.)	Duration of dis. (hrs.)	Symptoms		
prob. C. perfringens	5-18	Jersey City, N.J.	prob. turkey				22(36)	5-16 ($\bar{x}$ 12)	$\bar{x}$ 24	C,D	DH	Restaurant (D)
prob. C. perfringens	7-1	Woodstock, Conn.	turkey pie				69(250)	10-18 ($\bar{x}$ 14)	$\bar{x}$ 4	C,D,V	DH	Camp (D)
prob. C. perfringens	7-1	Columbus, Ohio	chicken a la king				~83(850)	10-16 ($\bar{x}$ 13½)	$\bar{x}$ 12	C,D	DH	School cafeteria(B)
prob. C. perfringens	7-26	Madison Township, N.J.	turkey				>18(160)	9-16 ($\bar{x}$ 11)	6-30	N,V,D,F,C	DH	Caterer- (D) Restaurant
prob. C. perfringens	8-2	Long Beach, Calif.	prime ribs				38(109)	10-24 ($\bar{x}$ 15)	$\bar{x}$ 17	C,D,N,V	DH	Private club (B)
prob. C. perfringens	8-12	Cocoa Beach, Fla.	roast beef and/or corned beef				2(2)	$\bar{x}$ 12½	$\bar{x}$ 24	C,D	DH	Home (B)
prob. C. perfringens	10-3	Missoula, Mont.	olives				3(5)	7-8		C,D	DH	Home (D)
prob. C. perfringens	10-8	San Jose, Calif.	roast beef				2(5)	16	24	D,C	DH	Restaurant (D)
prob. C. perfringens	10-8	Memphis, Tenn.	turkey and noodles				720(1,200)	4-14 ($\bar{x}$ 9)	$\bar{x}$ 18	C,D,N	DH	School (D)
prob. C. perfringens	10-31	Oahu, Hawaii	roast beef				38(43)	8-18	24-48	C,D	DH	Restaurant (D)
prob. C. perfringens	11-15	Seattle, Wash.	macaroni-cheese-beef casserole				17(17)	$\bar{x}$ 12	$\bar{x}$ 6	C,D	DH	Institution (B)
prob. C. perfringens	11-19	Toledo, Ohio	turkey gravy				58(182)	6-7	$\bar{x}$ 24-36	C,D	DH	Restaurant (B)
prob. C. perfringens	12-5	Renton, Wash.	roast beef	+			2	10	12-48	C,D,N	DH	Restaurant (B)
prob. C. perfringens	12-7	Redmond, Wash.	turkey	+			18(1,000)	4-19 ($\bar{x}$ 11½)	<24	C,D	DH	Restaurant (B)
prob. C. perfringens	12-19	Bloxom, Va.	turkey				>25(296)	8-24		V,C,D	DH	School (D)
ESCHERICHIA COLI												
E. coli	8-7	Jacksonville, Fla.	turkey		+		~250(~1,400)	5-24 ($\bar{x}$ 12)	$\bar{x}$ 5-6	C,D,N,V	DH	Factory cafeteria(D)
E. coli	8-23	Eureka Springs, Ark.	prob. water		+		84(>159)	15-48		N,V,D	DH	Restaurant (A)
prob. coliforms	12-16	Seattle, Wash.	raw oysters		+		2	$\bar{x}$ 5	$\bar{x}$ 5	N,V,C,D	DH	Restaurant (B)

SALMONELLA												
S. typhi-murium	5-31	Cleveland, Ohio	custard doughnuts	+	+		4(4)	24-48		D,V,F	DH	Bakery-Home (B)
S. infantis	5-26	Paramus, N.J.		+			9(1,100)			V,C,D,F	DH	Hospital (D)
S. typhi-murium var. copenhagen	6-13	New York State	custard cake	+			100	12-36		N,V,C,D,F	DH	Bakery-Home (D)
S. enteriditis	7-1	Fairlee, Vt.		+		+	38(240)			F,N,D,C,H	DH	Camp (B)
S. typhi-murium	7-2	Fresno County, Calif.		+			30 families			N,V,C,D,F,H	DH	Camp (B)
S. enteriditis	7-8	Kauai, Hawaii		+			32(185)	15-20		N,V,C,D,F	DH	Restaurant (D)
S. typhi phage F1	7-11	Hartford, Conn.	meatballs	+		+	4			F,H,D	Salm.	Delicatessen-Home (B)
S. muenchen	7-26	NYC, N.Y.	roast beef	+	+		19(29)	15-72 ($\bar{x}$ 17)	$\bar{x}$ 24	C,D,N,V,F	DH	Caterer-Home (B)
S. berta	July 1969	Tuscola County, Mich.	chicken	+	+		24	9-20		N,V,D,C,F	DH	Home (B)
S. enteriditis	8-8	Tanunak, Alaska	whale	+	+		95(99)	8-16		H,F,N,V,C,D	DH	Home (C)
S. thompson	8-11	Gettysburg, Ohio	ice cream	+			18(21)	$\bar{x}$ 16	48	N,V,C,D,F	DH	Home (C)
S. enteriditis	8-17	Pike County, Mo.	cream pie	+			10			D,V,F	FDA	Bakery-Home (B)
S. newport	9-5	Du Page County, Ill.	caesar salad	+		+	57(69)	15-72 ($\bar{x}$ 48)	$\bar{x}$ 72	N,D,F,C	DH	Banquet (B)
S. typhi-murium/ S. virchow	9-10	Floyd, Va.	coconut creme pie	+			21(38)	$\bar{x}$ 30	$\bar{x}$ 96	N,C,D,F	DH	School (B)
S. infantis	9-24	Houston, Tex.	chicken	+			3(3)	18		V,D,F	DH	Home (C)
S. panama	10-1	Des Moines, Iowa	turkey	+			122(1,900)	$\bar{x}$ 43	$\bar{x}$ 4.7 dy.	N,V,C,D,F	Salm.	Banquet (B)
Salmonella	10-6	Suisun, Calif.		+			3(3)			N,V,C,D	DH	Restaurant (B)
S. enteriditis	10-13	Cuyahoga Falls, Ohio		+			7(16)	56-64 ($\bar{x}$ 60)	$\bar{x}$ 36	D,F,prostration	DH	(D)
Salmonella	11-4	Cambridge, Mass.	roast beef	+			17			D	USDA	Restaurant (D)

ETIOLOGY	ONSET	REPORTED FROM	VEHICLE	LAB DATA			CLINICAL DATA				REPORTER	COMMENT
				P.	V.	H.	# ill (at risk)	incub. period (hrs.)	Duration of dis. (hrs.)	Symptoms		
S. blockley	11-12	Columbia, S.C.	chicken salad		+		35(146)	$\bar{x}$ 5	$\bar{x}$ 72	N,C,D,F	DH	Home (D)
S. typhi-murium	11-16	New Iberia, La.	chicken and/or eggs	+	+		90(115)			N,V,C,D,F	DH	Picnic (B)
S. infantis	11-20	New Orleans, La.	chicken and potato salad	+	+		201(>200)	R 7-12		D,V,F	DH	Church supper (B)
S. newport	11-28	Albuquerque, N.M.	turkey	+	+	+	12(35)	R 41		N,V,C,D	DH	Hospital (B)
S. san diego	12-14	Los Angeles, Calif.	turkey	+	+		128(400)	R 18		N,V,C,D,F	DH	Caterer-Home (B)
S. st. paul	12-25	Tacoma, Wash.	turkey	+	+		11(18)	16-57(R 35)		N,C,D,F,V	DH	Home (A)
Arizona hinshawii	11-27	Rocky Mountains, Va.	turkey dressing	+			7(12)	R 9½	R 12	N,V,C,D,F	DH	Home (D)
prob. salmonella	6-13	Oakland, Calif.	roast beef and chicken				29(200)	$\bar{x}$ 20	48	N,V,C,F	DH	Restaurant (D)
prob. salmonella	9-6	Fort Richardson, Alaska	pound cake				17(21)	20-48	$\bar{x}$ 36	N,V,C,D,F, dizziness	DH	Home (B)
prob. salmonella	11-27	Lynwood, Wash.	turkey				5(6)	62-96 (R 75)	$\bar{x}$ 24	N,V,C,D,H	DH	Home (D)
prob. salmonella	11-28	San Leandro, Calif.		+			5	12		N,V,C,D,F	DH	Restaurant (D)
prob. salmonella	11-28	Spokane, Wash.	turkey				6(6)	12-16 (R 15)	R 48	N,V,D	DH	Home (C)
prob. salmonella	12-11	Edmonds, Wash.	fruit cake				4(9)	7-12 ($\bar{x}$ 8)	$\bar{x}$ 48	N,V,C,D,H	DH	Home (D)
prob. salmonella	12-21	Spokane, Wash.	turkey				3(3)	4-21	R 24	C,D,N,F	DH	Home (C)
SHIGELLA												
S. sonnei	March 1969	Prineville, Ore.	water	+	+		31(36)	1-7 dy.	med. 3 dy.	D,F,N,C,H,V, myalgia	DH	Home (B)

S. sonnei	7-15	Lexington, Ky.					10(30)		3 dy.	D,F,H,N,C,V, myalgia	DH	Church (D)
S. sonnei	7-23	Medford, Ore.	water (swimming pool)	+			37			F,D,C,H	DH	Swimming pool for children (B)
S. sonnei	9-9	Towtowa, N.J.		+			58(101)		$\bar{x}$ 4 dy.	F,D	DH	Institution (D)
S. sonnei	10-4	Cleveland, Ohio		+		+	242(640)		1-2 dy.	N,C,D,F, myalgia, H,V	DH	School (B)
S. flexneri 2b	10-13	Emmonak, Alaska	prob. water	+			33(430)			D,C,V,F,N, blood in stool	DH	Home (C)
S. sonnei	11-21	Columbia, Mo.		+		+	900(1,200)	24-72 ($\bar{x}$ 48)	$\bar{x}$ 36	N,V,C,D,F	DH	School (B)
STAPHYLOCOCCUS												
S. aureus	4-6	Jefferson, S.C.	ham		+		5(5)	$\bar{x}$ 5	$\bar{x}$ 24	N,V,C,D,F	DH	Home (A)
S. aureus	6-27	Michigan, Ind.	potato salad		+		19	$\bar{x}$ 3		N,V,C,D,F	DH	Cafeteria (B)
S. aureus	7-10	Hampton, S.C.	barbeque pork		+		40			N,D,V	DH	Restaurant(B)
S. aureus	7-12	Asan, Guam	ham	+	+		70(120)	$\bar{x}$ 4	$\bar{x}$ 6	N,V,D,C	DH	Restaurant(B)
S. aureus	8-3	Selma, Ala.	barbeque pork		+		~10(~50)	4-5	$\bar{x}$ 4½	N,V,C,D	DH	Home (B)
S. aureus	8-3	Edison, N.J.	potato, macaroni, and shrimp salad		+		6(10)	2½-9½ ($\bar{x}$ 3½)	$\bar{x}$ 8	N,V,D	DH	Picnic (C)
S. aureus	8-5	Bushkill, Penn.	turkey & stuffing		+		50(200)	$\bar{x}$ 7	48	C,D,H,V,weakness	DH	Restaurant(D)
S. aureus	8-14	Bloomington, Ill.	sausage		+		2	3	12-18	N,V,C,D	DH	Restaurant(B)
S. aureus (enterotoxin positive)	8-16	San Francisco, Calif.	cake		+		6(7)	$\bar{x}$ 6½	$\bar{x}$ 12	N,V,C,D,F	DH	Home (D)
S. aureus	8-19	Loon Lake, Calif.	ham		+		5(70)	$\bar{x}$ 4	$\bar{x}$ 8	N,V,D	DH	Camp (B)
S. aureus	8-27	Ridgecrest, Calif.	pizza		+		6(8)	2-4	48	D,C	DH	Restaurant-Home (D)
S. aureus	8-29	Calumet, Mich.	baked ham		+		9(50)	$\bar{x}$ 3.5		N,V,C,D	DH	Restaurant(B)
S. aureus phage type 53/77	9-11	Seattle, Wash.	shrimp	+	+	+	2	$\bar{x}$ 3		N,V,C,D	DH	Restaurant (B)

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				P.	V.	H.	# ill (at risk)	incub. period (hrs.)	Duration of dis. (hrs.)	Symptoms		
S. blockley	11-12	Columbia, S.C.	chicken salad		+		35(146)	$\bar{x}$ 5	$\bar{x}$ 72	N,C,D,F	DH	Home (D)
S. typhi-murium	11-16	New Iberia, La.	chicken and/or eggs	+	+		90(115)			N,V,C,D,F	DH	Picnic (B)
S. infantis	11-20	New Orleans, La.	chicken and potato salad	+	+		201(>200)	R 7-12		D,V,F	DH	Church supper (B)
S. newport	11-28	Albuquerque, N.M.	turkey	+	+	+	12(35)	R 41		N,V,C,D	DH	Hospital (B)
S. san diego	12-14	Los Angeles, Calif.	turkey	+	+		128(400)	$\bar{x}$ 18		N,V,C,D,F	DH	Caterer-Home (B)
S. st. paul	12-25	Tacoma, Wash.	turkey	+	+		11(18)	16-57(R 35)		N,C,D,F,V	DH	Home (A)
Arizona hinshawii	11-27	Rocky Mountains, Va.	turkey dressing	+			7(12)	R 9½	R 12	N,V,C,D,F	DH	Home (D)
prob. salmonella	6-13	Oakland, Calif.	roast beef and chicken				29(200)	$\bar{x}$ 20	48	N,V,C,F	DH	Restaurant (D)
prob. salmonella	9-6	Fort Richardson, Alaska	pound cake				17(21)	20-48	$\bar{x}$ 36	N,V,C,D,F, dizziness	DH	Home (B)
prob. salmonella	11-27	Lynwood, Wash.	turkey				5(6)	62-96 (R 75)	$\bar{x}$ 24	N,V,C,D,H	DH	Home (D)
prob. salmonella	11-28	San Leandro, Calif.		+			5	12		N,V,C,D,F	DH	Restaurant (D)
prob. salmonella	11-28	Spokane, Wash.	turkey				6(6)	12-16 (R 15)	R 48	N,V,D	DH	Home (C)
prob. salmonella	12-11	Edmonds, Wash.	fruit cake				4(9)	7-12 ($\bar{x}$ 8)	$\bar{x}$ 48	N,V,C,D,H	DH	Home (D)
prob. salmonella	12-21	Spokane, Wash.	turkey				3(3)	4-21	R 24	C,D,N,F	DH	Home (C)
SHIGELLA												
S. sonnei	March 1969	Prineville, Ore.	water	+	+		31(36)	1-7 dy.	med. 3 dy.	D,F,N,C,H,V, myalgia	DH	Home (B)

S. aureus	9-17	Palo Alto, Calif.	corned beef/ turkey		+		2	7	8-12	N,V,D,F	DH	Restaurant(B)
S. aureus	9-27	Seabrook, Tex.	ham		+		24(34)	4		N,D,V	FDA	Home-Party(D)
S. aureus phage type 29/52/52A/80/42E/47/ 53/54/75/77/81 (enterotoxin A)	9-28	Seattle, Wash.	custard cake	+	+	+	5(7)	$\bar{x}$ 7½	$\bar{x}$ 12	N,V,C,D,H	DH	Bakery-Home (B)
S. aureus	10-1	Harmon, Guam	meatloaf		+	+	76(620)	$\bar{x}$ 6	$\bar{x}$ 12	N,V,C,D	DH	Camp (B)
S. aureus	10-4	Memphis, Tenn.	barbeque pork		+		>93(1,300)	$\bar{x}$ 4		N,V,C,D,chills	DH	Restaurant(B)
S. aureus	10-11	W. Columbia, S.C.	coconut cake		+		5(5)	4-8($\bar{x}$ 6)	$\bar{x}$ 24	N,V,C,D,F	DH	Bakery-Home (D)
S. aureus	10-25	Belvidere, N.J.	chicken gravy and stuffing		+		40(65)	$\bar{x}$ 4	$\bar{x}$ 5	N,V,C,D	DH	Banquet Hall Catered (B)
S. aureus	11-8	Yakima, Wash.	beef jerky		+		175(500)	1-6 ($\bar{x}$ 4)	$\bar{x}$ 7	N,V,C,D	DH	Home-Picnic (C)
S. aureus	11-9	Franklin County, Ohio	turkey	+	+	+	17	4-5	$\bar{x}$ 48	N,V,D	DH	Restaurant (B)
S. aureus	11-12	Marrero, La.	ham		+		8(8)	1-1½	$\bar{x}$ 24	N,V,C,D	DH	Home (D)
S. aureus	11-13	Freehold Boro, N.J.	turkey salad		+	+	84(350)	3-9 ($\bar{x}$ 5)		N,V,C,D	DH	Church (C)
S. aureus phage type 85 (enterotoxin A&D)	11-17	NYC, N.Y.	corned beef		+		9(28)	$\bar{x}$ 2-3	4-5	N,V,D,C	DH	Home (C)
S. aureus	11-20	Temple Terrace, Fla.	turkey and dressing		+	+	207(662)	$\bar{x}$ 4	$\bar{x}$ 12	V	DH	School (B)
S. aureus	11-20	Cresaptown, Md.	turkey and pineapple crunch	+	+	+	207(527)	1-6 ($\bar{x}$ 3)	2-3	N,V,C	DH	School (B)
S. aureus	11-20	Coldwater, Mich.	ham and egg salad and dressing		+		3(3)	2-3($\bar{x}$ 3)	$\bar{x}$ 24	N,V,C,D	DH	Restaurant (B)
S. aureus	11-28	NYC, N.Y.	roast turkey and stuffing		+		11(11)	4-9($\bar{x}$ 5)	$\bar{x}$ 48	N,V,C,D	DH	Home (D)
S. aureus	12-3	NYC, N.Y.	chicken and rice		+		5(5)	$\bar{x}$ 4	$\bar{x}$ 18	N,V,C,D	DH	Home (C)
S. aureus	12-11	Van Buren, Ohio	chicken salad	+			2(2)	3/4		N,V,D,F	DH	Restaurant-Auto. (B)
S. aureus	12-25	Evansville, Ind.	ham		+		10(10)	$\bar{x}$ 23	$\bar{x}$ 30	N,V	DH	Home (D)

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				P.	V.	H.	# ill (at risk)	incub. period (hrs.)	Duration of dis. (hrs.)	Symptoms		
S. aureus phage type 52/52A/80/53 (enterotoxin A&C)	12-30	St. Louis, Mo.	turkey dressing		+	+	27(48)	1-6	x̄ 2½	N,V,C,D,F	DH	Home-Factory (C)
S. aureus epidermidis coag. negative (enterotoxin +)	10-8	Denver, Colo.	beef		+	+	145(223)	1½-8	x̄ 3½	D,N,V,C	FDA/ DH	Restaurant (B)
prob. staph.	2-28	Ridgeway, S.C.	beef pie or gravy				40	x̄ 4½	x̄ 24	N,V,C,D	DH	Nursing home (B)
prob. staph.	3-4	Greenville, S.C.	chili on hotdog				1(1)*	4	72	N,V,D	DH	Restaurant (D)
prob. staph.	3-24	Oahu, Hawaii	ham				3	2-4		N,V,C,chills	DH	Restaurant(D)
prob. staph.	4-28	Paso Robles, Calif.	hamburger				4	x̄ 6	x̄ 4	N,V,D	DH	Home (B)
prob. staph.	6-13	NYC, N.Y.	shrimp chow mein				6(6)	2-3	x̄ 2	N,V,C	DH	Restaurant (D)
prob. staph.	6-26	NYC, N.Y.					20(40)	2-4½		N,V,D	DH	Restaurant(B)
prob. staph.	7-22	Middletown, Ohio	macaroni salad				3(6)	3-12 (x̄ 6.3)	x̄ 12	N,V,C,D	DH	Home (D)
prob. staph.	7-23	Parris Island, S.C.	pork salad	+			101	5½		D,C,N,V,H	AF	Military Base (B)
prob. staph.	8-7	Carrollton, Ga.	barbeque pork				116(450)	x̄ 2½	x̄ 24	N,V,C,D,F	DH	Caterer-Factory (B)
prob. staph.	8-11	Pasco, Wash.	roast beef				2(2)	x̄ 5	x̄ 8½	N,V,D,H	DH	Restaurant(B)
prob. staph.	8-13	San Diego County, Calif.	balogna				100(480)		x̄ 5	N,V,D	DH	Camp (B)
prob. staph.	8-16	Mt. Ranier Park, Wash.	hamburger or potatoes				4(5)	2-8 (x̄ 5)	x̄ 24	N,V,C,D,H	DH	Restaurant(D)
prob. staph.	8-17	Elwood, N.J.	custard cake				10	2-4		C,V,D	DH	Bakery-Home (D)

*Excluded from tabulations

prob. staph.	8-24	Clinton, Wash.	chicken		4(5)	4-6 (x 6)	40	V,C,D,F,H	DH	Home (D)
prob. staph.	9-1	Seattle, Wash.	Chinese food	+	2	3-3½		N,V,D	DH	Restaurant(B)
prob. staph.	9-7	Butner, N.C.	ham		52	2½-3	12	V,D	DH	Institution(B)
prob. staph.	9-7	Raleigh, N.C.	ground ham		51	x̄ 2-3	10-14	N,V,D	DH	School-Mental Institution(B)
prob. staph.	9-17	Topeka, Kan.	cherry cream pie		4	3-9		N,V,D	DH	Restaurant(B)
prob. staph.	9-?	Yakima County, Wash.	TV dinner		2(2)	3-4	12-24	N,V,D	DH	Home (D)
prob. staph.	10-22	Springer, N.M.	balogna		2(3)	1-2 (x̄ 1½)	x̄ 12	N,V,C	DH	School (B)
prob. staph.	10-28	NYC, N.Y.	turkey, gravy, noodles		7(8)	x̄ 1½	x̄ 7	V,N,D,C	DH	Home (C)
prob. staph.	11-10	Orangeburg, S.C.			38(450)	x̄ 2½	x̄ 1-4 dy.	N,V,D	DH	Caterer-Banquet (B)
prob. staph.	11-16	Spokane, Wash.	tartar sauce or fish and chips		4(5)	1-5 (x̄ 5)	x̄ 24	N,V,C,D	DH	Restaurant (B)
prob. staph.	11-19	Willowbrook, Colo.	lasagna		2(2)	5-7½	x̄ 12	N,V,H,D	FDA	Home (D)
prob. staph.	12-?	Ephrata, Wash.	fruit cake		2(6)	1½-4 (x̄ 2)	x̄ 10	N,V,C,D	DH	Home (D)
STREPTOCOCCUS										
enterococcus	12-4	Chesterfield County, Va.	creamed shrimp	+	29(237)	6½-16½ (x̄ 13)	x̄ 6	D,C,N,V	DH	Restaurant (D)
prob. streptococcus	12-3	Murphysboro, Ill.	hamburger	+	2(2)	5½		N,V,C,D	DH	Home (D)
VIBRIO PARAHEMOLYTICUS										
prob. Vibrio parahemolyticus	7-25	Seabeck, Wash.	shellfish	+	48(251)	34-53 (x̄ 43)	x̄ 38	D,C,N,V,H,F	DH	Camp (C)
prob. Vibrio parahemolyticus	8-5	Seabeck, Wash.	shellfish	+	23(250)	14-66 (x̄ 39)	x̄ 18	N,V,C,D,F,H	DH	Camp (C)

ETIOLOGY	ONSET	REPORTED FROM	VEHICLE	LAB DATA P.	V.	H.	CLINICAL DATA # ill (at risk)	incub. period (hrs.)	Duration of dis. (hrs.)	Symptoms	REPORTER	COMMENT
prob. staph.	8-24	Clinton, Wash.	chicken				4(5)	4-6 (x̄ 6)	40	V,C,D,F,H	DH	Home (D)
prob. staph.	9-1	Seattle, Wash.	Chinese food			+	2	3-3½		N,V,D	DH	Restaurant(B)
prob. staph.	9-7	Butner, N.C.	ham				52	2½-3	12	V,D	DH	Institution(B)
prob. staph.	9-7	Raleigh, N.C.	ground ham				51	x̄ 2-3	10-14	N,V,D	DH	School-Mental Institution(B)
prob. staph.	9-17	Topeka, Kan.	cherry cream pie				4	3-9		N,V,D	DH	Restaurant(B)
prob. staph.	9-?	Yakima County, Wash.	TV dinner				2(2)	3-4	12-24	N,V,D	DH	Home (D)
prob. staph.	10-22	Springer, N.M.	balogna				2(3)	1-2 (x̄ 1½)	x̄ 12	N,V,C	DH	School (B)
prob. staph.	10-28	NYC, N.Y.	turkey, gravy, noodles				7(8)	x̄ 1½	x̄ 7	V,N,D,C	DH	Home (C)
prob. staph.	11-10	Orangeburg, S.C.					38(450)	x̄ 2½	x̄ 1-4 dy.	N,V,D	DH	Caterer-Banquet (B)
prob. staph.	11-16	Spokane, Wash.	tartar sauce or fish and chips				4(5)	1-5 (x̄ 5)	x̄ 24	N,V,C,D	DH	Restaurant (B)
prob. staph.	11-19	Willowbrook, Colo.	lasagna				2(2)	5-7½	x̄ 12	N,V,H,D	FDA	Home (D)
prob. staph.	12-?	Ephrata, Wash.	fruit cake				2(6)	1½-4 (x̄ 2)	x̄ 10	N,V,C,D	DH	Home (D)
STREPTOCOCCUS												
enterococcus	12-4	Chesterfield County, Va.	creamed shrimp		+		29(237)	6½-16½ (x̄ 13)	x̄ 6	D,C,N,V	DH	Restaurant (D)
prob. streptococcus	12-3	Murphysboro, Ill.	hamburger		+		2(2)	5½		N,V,C,D	DH	Home (D)
VIBRIO PARAHEMOLYTICUS												
prob. Vibrio parahemolyticus	7-25	Seabeck, Wash.	shellfish		+		48(251)	34-53 (x̄ 43)	x̄ 38	D,C,N,V,H,F	DH	Camp (C)
prob. Vibrio parahemolyticus	8-5	Seabeck, Wash.	shellfish		+		23(250)	14-66 (x̄ 39)	x̄ 18	N,V,C,D,F,H	DH	Camp (C)

CHEMICAL

chemical toxin	April 1969	Hardin, Mont.				3(3)			N,V,weakness, light headedness	DH	Home (D)
parathion poisoning	7-30	Trenton, N.J.	insecticide	+		4(4)	18-24		Resp. distress, myotic pupils, excessive salivation,	DH	Home (C)
organic phosphate poisoning	8-27	Aiea, Hawaii	oatmeal	+	+	3(3)	2-3	x̄ 6	N,V,D,weakness, sweating	DH	Home (C)
ciguatera toxin	9-11	Harmon, Guam	fish		+	2	x 4	x̄ 2 dy.	N,V,C,D,F, dry mouth, coma	DH	Home (C)
shellfish poisoning	9-21	Redway, Calif.	mussels			3(3)	½-3		Numbness, light-headedness, dysphagia	DH	Home (C)
organic phosphate poisoning	9-22	Aiea, Hawaii	oatmeal	+	+	5(6)	x̄ 30 min.	3-6	N,V,C,ataxia	DH	Home (C)
copper poisoning	9-23	Kaneake, Hawaii	root beer		+	3(4)	R 1 min.	x̄ 24	N,V	DH	Restaurant(B)
shellfish poisoning	10-7	Englewood, Colo.	oysters			3	20-30 min.	x̄ 24	N,V,D, backache, dry mouth, blurred vision, paresthesias	DH	Restaurant(B)
mushroom poisoning	10-17	Queens, N.Y.	mushrooms (Clytocybe illudens)		+	4(4)	1½-2½	x̄ 4	V,C	DH	Home (C)
Chinese restaurant syndrome-MSG	11-3	Hillcrest, N.Y.	Chinese food		+	2(2)	½		Paresthesias, light headedness, chest discomfort, swelling lips and breasts	DH	Restaurant (B)
scombroid poisoning	11-21	Oahu, Hawaii	mackeral			3(3)	3/4	24	H, erythema, urticaria, dizziness	DH	Restaurant (D)
copper poisoning	12-2	Lansing, Mich.	punch beverage		+	17(51)	30-45 min.		V,D,C	FDA	Party (B)
mercury poisoning	12-4	Alamogordo, N.M.	pork			3(9)	3½ months		Ataxia, blindness, agitation, proteinuria	DH	Home (C)
copper poisoning	12-5	Alderwood Manor, Wash.	bottled grape soda		+	8(10)	5-10 min. (x̄ 5 min.)	R 1½	N,C,V	DH	Home (A)
prob. chemical toxin	8-4	Philadelphia,Pa.	pizza			10(12)	R 30		N,C,V,D	DH	Home (D)
prob. psilocybe mushroom poisoning	11-12	Burton, Wash.	mushrooms			1(2)	1	13	hallucination, hyperactivity, somnolence, twitching drooling	DH	Home (C)

ETIOLOGY	ONSET	REPORTED FROM	VEHICLE	LAB. DATA			CLINICAL DATA				REPORTER	COMMENT
				P.	V.	H.	# ill (at risk)	incub. period (hrs.)	Duration of dis. (hrs.)	Symptoms		
prob. chemical toxin	12-15	Montpelier, Ind.	ham				3(3)	$\bar{x}$ ½	$\bar{x}$ 3	N,rash, flushing face and arms, pruritis, dilated pupils	DH	Caterer-Factory (D)
PARASITIC												
Giardia lamblia	Aug. 1969	Lookout Mountain, Colo.	water	+			19(33)		3 dy-months	D,C,N	DH	Home (A)
TRICHINELLA SPIRALIS												
Trichinella spiralis	1-8	Chicago, Ill.	home-made sausage	+			3(3)	~10 dy.		Myalgia, F periorbital edema	DH	Home (A)
Trichinella spiralis	1-9	Rochester, N.Y.	pork(raw)	+	+		2(2)	10 dy.		Periorbital edema	DH	Home (A)
Trichinella spiralis	6-7	Vermont State	pork		+		2(5)			F,H,myalgia, facial edema	DH	Home (A)
Trichinella spiralis	6-25	San Francisco, Calif.	pork	+			2(2)	3 wk.		F,H,myalgia, periorbital edema	DH	Restaurant (A)
Trichinella spiralis	July 1969	Cleveland, Ohio	smoked bacon	+			3(7)	2 wk.		Weakness, facial edema, F,D, myalgia,eosinophilia	MMWR	Home (A)
Trichinella spiralis	10-23	Johnston, R.I.	pork	+			2(2)	10 dy.		myalgia,F, malaise, periorbital edema, eosinophilia	DH	Home (A)
Trichinella spiralis	11-?	Harrisburg, Pa.	pork sausage	+			4			N,V,D,myalgia, periorbital edema, eosinophilia	DH	Home (A)
VIRAL												
infectious hepatitis	8-?	Oahu, Hawaii		+		+	5			Abnormal liver function test (LFT)	DH	Home (C)
infectious hepatitis	8-14	NYC, N.Y.	clams				6(60)	26-40 dy.		Jaundice,Abn. LFT	DH	Home (C)
infectious hepatitis	9-16	Sumter, S.C.	water	+			14(40)	1 month		F, anorexia, abn. LFT	MMWR	Camp (B)
infectious hepatitis	9-20	Worcester, Mass.	water	+			59(65)	25 dy.		F,N,C,icterus, abn. LFT	MMWR	School (B)

infectious hepatitis	9-29	Palo Alto, Calif.		+	4(45)	26-39		N,V,F. abn. LFT	DH	Home (D)
infectious hepatitis	10-4	Vernon, Tex.	well water	+	7(8)			F,N,V, abn. LFT	DH	Home (D)
UNKNOWN										
	3-2	Hendricks County, Ind.			9	9-17 ($\bar{x}$ 12)	10	C,D	DH	Restaurant (D)
	3-20	Indianapolis, Ind.			144(800)	$\bar{x}$ 11		D,N,V	DH	School (D)
	3-20	Charleston, W. Va.			9(22)	$\bar{x}$ 3		N,V,H	DH	Restaurant (D)
	4-11	Oak Brook, Ill.	chicken		90(115)	$\bar{x}$ 12	$\bar{x}$ 12	N,V,D,C	DH	Restaurant (D)
	4-16	Easley, S.C.	beef		2	10	72	N,V,D	DH	Restaurant (B)
	4-19	Oak Brook, Ill.	chicken		103(130)	$\bar{x}$ 12	$\bar{x}$ 24	N,C,D,V,F	DH	Restaurant (D)
	5-5	Columbia, S.C.	ham		2(3)	$\bar{x}$ 8	$\bar{x}$ 48	N,V,D	DH	Home (C)
	6-11	Greenwood, S.C.	bologna		2(3)	$\bar{x}$ 8	$\bar{x}$ 72	N,V	DH	Home (D)
	6-26	Concrete, Wash.	beef		3(3)	4-12 ($\bar{x}$ 7)	$\bar{x}$ 55	N,V,C,D,F	DH	Home (D)
	7-8	Madison, N.J.	turkey		200(490)	2-78 ($\bar{x}$ 12)	$\bar{x}$ 26	N,V,C,D,F	DH	School (D)
	7-8	W. Columbia,S.C.	pork		7	$\bar{x}$2½-4½	$\bar{x}$ 48	N,V,C,D,F	DH	Restaurant (B)
	7-9	Ridgeland, S.C.	chicken salad		6(30)	$\bar{x}$ 2-4	$\bar{x}$ 24	N,V,C,D	DH	Home-Plant (C)
	7-10	Washington, Ind.	?cream pie		10(11)	$\bar{x}$ 8	$\bar{x}$ 168	N,V,C,D,F	DH	Restaurant (B)
	7-16	Havana, Ill.			4(4)	2½	$\bar{x}$ 47	N,V,C,D	DH	Home (D)
	7-19	Camp McCall, S.C.	hamburger		10(17)	$\bar{x}$ 6	$\bar{x}$ 24	N,V	DH	Camp (D)
	7-22	Asheboro, N.C.			16(60)			C,N,V, D,H	DH	Camp (D)
	7-22	Fairlee, Vt.	water		93(240)			N,D,C,H,F,V	DH	Camp (?)
	7-27	Martinsburg, W. Va.	crab cakes		3(60)	9			FDA	Restaurant (D)
	7-25	Tacoma, Wash.	french-fried potatoes		3(4)	6-12 ($\bar{x}$ 8)	$\bar{x}$ 36	V,C,D	DH	Restaurant (D)

ETIOLOGY	ONSET	REPORTED FROM	VEHICLE	LAB DATA P.	V.	H.	CLINICAL DATA # ill (at risk)	incub. period (hrs.)	Duration of dis. (hrs.)	Symptoms	REPORTER	COMMENT
	8-11	Kansas City, Kan.	turkey salad				3(3)	3½-4		V,D,C,H	FDA	Home (D)
	8-22	Sunnyvale, Calif.					8(26)	5-22 ($\tilde{x}$ 5)		N,C,D	DH	Restaurant(B)
	9-7	Anchorage, Alaska					17(28)	20-48($\tilde{x}$ 24) $\tilde{x}$ 36		N,V,C,D,F	DH	Home (D)
	9-11	Clemson, S.C.					84(103)	$\tilde{x}$ 12		N,V,D,F,C	DH	School (D)
	9-15	Santa Clara, Calif.	steak and/or salad				121(400)	$\tilde{x}$ 10-12	$\tilde{x}$ 24-48	N,C,D,F,V	DH	Church picnic (D)
	9-30	Seattle, Wash.	chocolate candy				2	"immediate"		N,V,C,D	DH	Home (D)
	9-?	Indianapolis, Ind.					12(100)	6-12	$\tilde{x}$ 9	D	DH	School (D)
	10-8	Hartford, Conn.	shrimp egg roll				3(4)	5-7($\tilde{x}$ 6)		C,D,N,F	DH	Restaurant(D)
	10-12	Dallas, Tex.	Mexican food				6(6)	3		C,D,H,V,F	FDA	Home (D)
	10-15	Miami, Fla.	spinach				35(65)	$\tilde{x}$ 4	24-30	N,V,C,D	DH	Restaurant(D)
	10-22	Juana Diaz, P.R.	fish				4(8)	½-3½	$\tilde{x}$ 2	N,V,C,D	DH	Home (C)
	10-23	Lake Worth, Fla.					155(1,032)	$\tilde{x}$ 12		C,D,N,V	DH	School (D)
	10-30	Memphis, Tenn.					8(2,000)	13-54 ($\tilde{x}$ 30)	$\tilde{x}$ 24	N,V,C,D,F	DH	Caterers-(D) Institution
	11-1	Ft. Wayne, Ind.	corned beef				5	$\tilde{x}$ 34	$\tilde{x}$ 72	N,C,D,H	DH	Club (D)
	11-2	Mt. View, Calif.					7(10)	4½-12 ($\tilde{x}$ 5)	$\tilde{x}$ 24	V,D,H	DH	Restaurant (D)
	11-2	Lakewood, Colo.	vegetable-noodle soup				3(3)	2½		C,N,H	FDA	Home (D)
	11-5	Atlanta, Ga.	turkey				86(528)	4-20 ($\tilde{x}$ 13)	$\tilde{x}$ 12	N,V,C,D,F	DH	School (B)
	11-7	Salt Lake City, Utah	ham dinner				3(3)	½		N,V	FDA	Home (D)
	11-15	Atlanta, Ga.					29(60)	13-73 ($\tilde{x}$ 41)	$\tilde{x}$ 24	N,V,C,D,F	DH	Fraternity house-school (D)

11-22	New Haven, Conn.		148(183)	12-48($\bar{x}$ 32-15)		C,D	DH	Restaurant(D)
11-27	Sacramento, Calif.	turkey	10(10)	6-19 ($\bar{x}$ 10)	$\bar{x}$ 48	N,V,C,F,H	DH	Home (D)
11-?	Denver, Colo.	stew	3(3)	2½	12-13	N,C,H	FDA	Home (D)
12-2	Abilene, Tex.	lemon pie	2(4)	6½		N,V,C,D	FDA	AFB (D)
12-4	Sebastopol, Calif.	frankfurter	2(2)	3	$\bar{x}$ 9	N,V,D	DH	Home (D)
12-6	Rialto, Calif.	?roquefort dressing	20(56)	$\bar{x}$ 8		N,V,C,D	DH	Restaurant(D)
12-8	San Jose, Calif.		4(4)	8-10	48-72	N,V,C,D	DH	Delicatessen-Home (D)
12-10	Houston, Tex.		5(5)	1-16	4-12	N,C,D	FDA	Home (D)
12-21	Bremerton, Wash.	cookies	5(11)	8-31 ($\bar{x}$ 19)	$\bar{x}$ 36	N,V,F,D	DH	Home (D)
12-26	San Jose, Calif.	cheese fondue	9(18)	11-44($\bar{x}$ 34)		N,V,C,D	DH	Home (D)
12-26	Stone Mountain, Ga.		12(12)	$\bar{x}$ 30	48	N,V,C,D,F	DH	Home (D)
12-26	Aibonito, P.R.	roast pork	54(75)	12-41 ($\bar{x}$ 21)	$\bar{x}$ 48	N,D,F,V,C	DH	Fraternity House-School (C)

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Line listing of foodborne outbreaks reported to the National Communicable Disease Center during 1968*
(*This line listing excludes those reports previously listed in the Foodborne Outbreak Status Report - January-June 1968)

ETIOLOGY	ONSET	REPORTED FROM	VEHICLE	LAB DATA			CLINICAL DATA				REPORTER	COMMENT
				P.	V.	H.	# ill (at risk)	incub. period (hrs.)	Duration of dis. (hrs.)	Symptoms		
BACTERIAL												
BRUCELLA												
Brucella	1-?	California	unpast. milk	+	-	-	2				Bruc.	raw cow & goat milk in Italy (C)
Brucella	4-15	North Dakota	unpast. milk	+	-	-	3				Bruc.	raw milk (C)
Brucella	9-23	California	cheese	+	-	-	5			N,V,F,chills, weakness	Bruc.	cheese in Mexico (B)
CLOSTRIDIUM BOTULINUM												
C. botulinum type B	7-22	St. Joseph, Mich.	chicken & chicken soup	+			2(2)	~4 dy.		1 death	FDA	Home (C)
C. botulinum type A	10-17	Los Angeles, Calif.	chopped chicken liver		+		1	3-5 dy.		death	DH	home (A)
Prob. botulism	6-11	Muskegon, Mich.	rare hamburger				1(2)	24 hr.		recovery	DH	home (D)
Prob. botulism	8-29	Orange County, Calif.	home-preserved fruit				1	24 hr.		recovery	DH	restaurant (D)
Prob. botulism	10-27	Huntington, Tenn.					1			recovery	DH	home (D)
CLOSTRIDIUM PERFRINGENS												
C. perfringens	1-?	Richland, S.C.	hamburger		+		4(15)				DH	(D)
C. perfringens	2-8	Ann Arbor, Mich.	beef		+		194(500)	7-26 hr. med. 18 hr.		N,C,D, chills	DH	school (D)
C. perfringens	2-?	Sumter, S. C.	chicken stew		+		130(650)	13 hr.		N,C,D	DH	school (D)
C. perfringens	3-31	Hawaii		+			89(170)	x 13.8	1-2 dy.	H,N,C,D,F	DH	commercial luau (D)

C. perfringens	7-8	Towtowa, N.J.	lamb	+	+	148(260)	3-16 hr.		D	DH	school (B)
C. perfringens hobbs type 1	7-18	Chester, Conn.	meat loaf	+	+	2			D	DH	camp (D)
C. perfringens hobbs type 10	7-26	Hawaii	chicken gravy	+		6(7)	9-15 hr.	1-2 dy.	N,C,D	DH	restaurant (D)
C. perfringens	7-31	Tracy, Calif.	beef enchiladas		+	29 (1,400)	2-13 hr.	2-5 hr.	C,D,N,	DH	vocational institution (B)
C. perfringens	9-14	New York City	roast beef		+	>560 (1,800)	2-26 hr. $\bar{x}$ 15 hr.	12-24 hr.	C,D,N,V,F	DH	banquet (B)
C. perfringens PS 38, PS 80	9-25	Mendenhall, Miss.	turkey		+	191 (273)	18-22 hr. $\bar{x}$ 20 hr.	$\bar{x}$ 6 hr.	C,D	DH	school (D)
C. perfringens	9-20	New York City	roast beef, ham, corned beef, pastrami		+	7	7-24 hr.	4-27 hr.	C,D	DH	restaurant (B)
C. perfringens type PS 17	10-6	Greenville, Tenn.	tuna salad	+		160 (212)	9-48 hr.		N,V,D,F,C,H	DH	school (D)
C. perfringens	10-9	Lackland, Tex.	mushroom sauce	+	+	400 (900)	8 hr	24 hr.	C,D,N	AF	military base (B)
C. perfringens hobbs type 13 and PS 30	10-16	Whitley City, Ky.	turkey	+	+	141 (613)	$\bar{x}$ 11 hr.		C,D,V,F	DH	school (B)
C. perfringens	10-16	Seattle, Wash.	roast beef	+	+	8(60)	2-18½ hr. $\bar{x}$ 12 hr.	$\bar{x}$ 6 hr.	N,D,C,H	DH	restaurant (D)
C. perfringens	11-12	Fort Sill, Okla.	pork	+		124 (~ 500)	9-12 hr.	36 hr.	D,C	AF	cafeteria (D)
C. perfringens	11-17	Worden, Wash.	beef tongue	+	+	15 (25)	11-13 hr.	12 hr.	D,C,N,H	DH	home (D)
C. perfringens	11-26	New York City	pot roast		+	10 (500)	$\bar{x}$ 14 hr.	$\bar{x}$ 30 hr.	D,N,V,C	DH	restaurant (B)
C. perfringens	11-27	W. Palm Beach, Fla.	turkey		+	6	8 hr.	24 hr.	D, weakness, prostration	DH	restaurant (B)
C. perfringens	11-28	Hickory, N.C.	turkey and/or gravy		+	218 (448)	7-15 hr. $\bar{x}$ 9 hr.	$\bar{x}$ 18 hr.	N,V,D	DH	caterer (D)

ETIOLOGY	ONSET	REPORTED FROM	VEHICLE	LAB DATA			CLINICAL DATA				REPORTER	COMMENT
				P.	V.	H.	# ill (at risk)	incub. period (hrs.)	Duration of dis. (hrs.)	Symptoms		
C. perfringens	11-?	York, S.C.	hash		+		15	18 hr.		C,D	DH	church group (D)
C. perfringens	12-9	Davidson County, Tenn.	beef	+		+	108 (230)	6-14 hr.	6-12 hr.	C,D,N	DH	restaurant (D)
C. perfringens	12-18	Pauls Valley, Okla.	turkey & dressing				22 (25)	x̄ 13 hr.	x̄ 22 hr.	C,D,N,V	DH	restaurant (D)
Prob. C. perfringens	4-18	Seattle, Wash.	roast beef and/or gravy	+			2	12-14 hr.	<24 hr.	N,V,C,D	DH	restaurant (D)
Prob. C. perfringens	5-13	Flemington, N.J.	turkey gravy				~200	x̄ 14 hr.	x̄ 10 hr.	D,C,N	DH	restaurant (B)
Prob. C. perfringens	6-8	Long Beach, Calif.	mushroom-meat gravy				151 (371)	2.5-20.5 hr. x̄ 12.5	x̄ 5-10	D,C,N,H	DH	restaurant (D)
Prob. C. perfringens	6-17	Chesilhurst, N.J.	turkey gravy				16 (21)	med. 12 hr.	med. 18 hr.	C,D	DH	restaurant (D)
Prob. C. perfringens	6-23	Tacoma, Wash.	meat loaf and/or gravy	+			8 (9)	12-13½ hr. x̄ 12 hr.	12 hr.	N,C,D	DH	restaurant (D)
Prob. C. perfringens	6-24	Seattle, Wash.	chinese food	+			3	10½-11½ hr.		C,D	DH	restaurant (D)
Prob. C. perfringens	8-21	Edmond, Okla.	roast beef hash				25 (93)	7-23 hr. x̄ 10-12 hr.	15 hr.	D,C,N,V	DH	school (D)
? C. perfringens	9-9	Seattle, Wash.	clam chowder				2	x̄ 13 hr.	12-24 hr.	C,D,V	DH	restaurant (B)
? C. perfringens	10-2	Seattle, Wash.	fish balls				15 (20)	9½-19½ hr. x̄ 11½ hr	med. 12 hr.	C,D	DH	caterer (D)
? C. perfringens	10-9	Bloomington, Minn.	chicken base gravy	+			112 (257)	8-16 hr.		D,C	DH	school (B)
? C. perfringens	11-26	New York City	?roast beef				80 (125)	12-20 hr. x̄ 12 hr.		C,D,N	DH	caterer (D)

C. perfringens	11-29	Winston-Salem, N.C.	turkey or dressing			4(4)	10-12 hr.	12 hr.	C,D		Ind.	restaurant (D)
ESCHERICHIA COLI												
? coliforms	5-31	New Jersey	water		+	477		x̄ 48 hr.	D,V,N,C,H,F		DH	floods contaminating water system (A)
? coliforms	7-28	Lincoln County, Ore.	water		+	>375 (1,391)	5-72 hr. x̄ 36-48 hr.	1-5 dy.	F,N,V,C,D, chills		DH	defective well, private camp (B)
SALMONELLA												
S. typhi-murium	1-21	Everett, Wash.	?salad	+	+	2			D,F,C		DH	hospital (B)
S. blockley	3-2	Seattle, Wash.	turkey	+		4(5)	20-28 hr.	48 hr.- 3 wk.	N,V,D,H		DH	home (D)
S. newport	5-25	Fort Walton, Fla.	turkey	+	+	30(60)	18-48 hr.				DH	caterer (D)
S. newport	5-27	Fort Walton Beach, Fla.	turkey	+	+	20(49)	~24 hr.				DH	caterer (D)
S. braenderup	6-8	Canton, Kan.	salad	+	+	7(13)	~24 hr.		D,C,N,F		FDA Salm.	restaurant (B)
S. braenderup	6-10	McPherson, Kan.	salad	+	+	19(25)	~24 hr.		D,N,F,C		FDA Salm.	restaurant (B)
S. oranienburg	6-16	Pennsylvania		+		13(42)			N,V,C,D		Salm.	restaurant (D)
S. infantis	6-23	Hawaii		+		2 (400)	13-14 hr.		N,V,C,D,F		DH	caterer (D)
S. typhi	6-28	Yakima, Wash.	?water in soda	+		3	19-21 hr.	10-14 hr.	F,D,N		DH	rodeo on Indian reservation (D)
S. braenderup	7-19	New York City	turkey	+	+	3(3)	7-14 hr.	3-5 dy.	C,D,N,V,F		DH	restaurant (B)
S. thompson	7-23	Los Angeles, Calif.	egg roll, won tons, soybean cakes	+	+	6(10)	<24 hr.		D,C,F		DH Salm.	restaurant (B)

ETIOLOGY	ONSET	REPORTED FROM	VEHICLE	LAB DATA			CLINICAL DATA				REPORTER	COMMENT
				P.	V.	H.	# ill (at risk)	incub. period (hrs.)	Duration of dis. (hrs.)	Symptoms		
S. enteritidis	8-8	Troy, Ohio	ice cream	+	+		12(12)	8-20 hr. $\bar{x}$ 10 hr.	$\bar{x}$ 6 dy.	N,V,D,F, weakness	DH	home (C)
S. typhi phage type C-1	8-25	Audrain County, Mo.	?water	+		+	26(189)	12 dy.		H,C,F, myalgia, malaise	DH	camp (B)
S. typhi-murium var. copenhagen	8-?	New Jersey	cake		+	+	2(3)	18 hr.		F,C,D, weakness, chills	DH	home (C)
S. enteriditis	9-3	Cambridge, Mass.	cake	+	+		3(3)	24 hr.		D,C,H,F	ECA	home (D)
S. orion	9-7	Gleenwood Springs, Col.	ham & beef sandwiches	+	+	+	23(37)	$\bar{x}$ 16-18 hr.		D,C,N,V,F	DH	picnic (B)
S. St. paul	10-6	Heidlersburg, Pa.	turkey	+		+	>112 (600)	7.5-103.8 hr. med. 29.3 hr.		C,N,V,F,D	DH	restaurant (B)
S. St. paul	10-16	Shelby County, Tenn.	turkey	+	+		98 (116)	med. 23 hr.		D,C,F,N,V	MMWR	church banquet (A)
S. give	10-26	Hawaii	packaged lau lau	+			2(5)	12-18 hr.	3-4 dy.	H,N,D,C,F	DH	store (D)
S. enteriditis	11-14	Grand Forks, N.D.		+			~16 (~80)			F,C,D	DH	college (D)
S. reading	11-23	Walla Walla, Wash.	turkey	+			33 (42)	13-52 hr.	$\bar{x}$ 5.1 dy.	D,C,F,N	DH	banquet (A)
S. typhi-murium	11-27	Appanoose County, Iowa	ice cream	+			21 (~30)	24 hr.	1-27 dy.	F,V,D, chills	Salm.	church group homemade ice cream (D)
S. enteriditis	11-28	Jersey City, N.J.	turkey and/or stuffing	+	+		17 (18)	3-18 hr. $\bar{x}$ 8.3 hr		N,V,D,F	DH	home stuffing-contained sausage-2 deaths (D)
S. bareilly	11-?	Wilmington, Del.		+		+	>49 (133)	7½ hr.-3 dy.		N,V,F,D,C	DH Salm.	hotel (D)
S. typhi-murium	12-7	Emmett, Idaho		+			38 (325)	3-48 hr.		F,C,D	DH	smorgasbord (D)

salmonella	6-23	Kansas City, Mo.	chopped liver			40	20-30 hr.		G,D,V	FDA	caterer (D)
salmonella group B	7-15	Phoenixville, Md.	shrimp and/or hollandaise sauce	+		2(4)	30 hr.		N,C,F,V, prostration	DH ECA	restaurant (D)
? salmonella	11-29	Seattle, Wash.	turkey			4(6)	21-36 hr.	1-3 dy.	N,V,C,D,H,F	DH	home (D)
SHIGELLA											
S. flexneri 2a	3-18	Hawaii		+		30	30-45 hr.		H,N,C,D,F	DH	college (D)
S. flexneri	4-2	White Swan, Wash.	potato salad	+		60 (105)	≥ 48 hr.		C,D,V,F	AF	church dinner (B)
S. sonnei	7-15	York County, Pa.	chicken and/or potato salad	+		3(8)	25 hr.		N,V,C,D,F, prostration	DH, ECA	picnic (D)
S. sonnei	8-28	New York City		+		21(234)		3-5 dy.	D	DH	hospital (D)
S. sonnei	9-24	Dayton, Ohio	chicken and potato salad	+	+	98 (130)	12-70 hr.		D,F,C,N,V	DH	caterer (B)
STAPHYLOCOCCUS											
S. aureus phage type 53	2-28	Miami, Fla.	turkey gravy		+	140 (669)	≥ 3-5 hr.	<24 hr.	N,V,D,weakness, prostration	DH	school (B)
S. aureus	4-14	Hawaii	chicken	+		5(7)	4-5 hr.		N,V,C,D	DH	store (D)
S. aureus	5-16	Bellvue, Wash.	chopped salami in salad		+	2	1½-2 hr.		D,N,V,C	DH	restaurant (D)
S. aureus phage type 80/81/42E	5-21	Miami, Fla.	cake		+ +	15	2 3/4 hr.		N,V,D	DH	bakery (B)
S. aureus	5-?	Richland, S.C.	pork		+	3(8)	3 hr.		N,V,D	DH	restaurant (D)
S. aureus	6-16	New York City	hamburger		+	3(6)	2½-7½ hr.	24-72 hr.	N,V,C,D	DH	restaurant (B)

ETIOLOGY	ONSET	REPORTED FROM	VEHICLE	LAB DATA			CLINICAL DATA				REPORTER	COMMENT
				P.	V.	H.	# ill (at risk)	incub. period (hrs.)	Duration of dis. (hrs.)	Symptoms		
S. aureus	7-1	Bozeman, Montana	shrimp		+		2(2)	1-6 hr.	2-12 hr.	C,V,D,N	DH	store (D)
S. aureus	7-20	Des Moines, Iowa	beef	+		+	30(270)	3½ hr.		N,V,C,D	DH	banquet (B)
S. aureus phage type type 6/47/53	8-1	Coldwater, Kan.	potato salad--ham	+	+		22(95)			V,D,C, weakness, diaphoresis	FDA	banquet (B)
S. aureus	8-8	Charleston, W. Va.	cheese		+		2(3)	3 hr.	3-12 hr.	N,V,D	DH	restaurant (D)
S. aureus phage type 6/7/42E/47/53/54/73/75/81/83/B	8-14	New York City	ham		+	+	3	3 hr.		N,V,D	DH	restaurant (B)
S. aureus type 85	8-21	Miami, Fla.	submarine sandwich	+	+		5(8)	2-6 hr. x̄ 3.5 hr.		C,V,D,N	DH	home (B)
S. aureus	8-22	Brandon, Fla.	ham	+	+	+	44(56)	2.8 hr.	<24 hr.	N,V,C,D	DH	picnic (B)
S. aureus	8-24	Elmira, N.Y.	roast beef	+	+		~200 (~4,500)	x̄ 4 hr.		V,D,C	FDA	catered picnic (B)
S. aureus	8-25	Nashville, Tenn.	ham and/or beans, potatoes		+		14(50)	1½-6 hr.		N,V	DH, FDA	church supper (D)
S. aureus	8-29	San Jose, Calif.	corned beef			+	6	2½-5½ hr.	x̄ 15 hr.	N,V,D	DH	restaurant (B)
S. aureus	9-3	Ponce, P.R.	ham	+	+		~140 (~446)	x̄ 4 hr.		V,D,C,H	DH	catered food in hospital (B)
S. aureus phage type 53	9-12	Pittsburg, Pa.	ham loaf		+	+	4	x̄ 3½ hr.	24 hr.	N,V,D,C	DH	store (B)
S. aureus phage type 86/42E/47/53/75/42D/81 Enterotoxins A & C	9-12	Morton, Miss.	eggs in tuna salad		+	+	406 (1,241)	1-9 hr. x̄ 3½ hr.	x̄ 6 hr.	V,D	DH	school (B)
S. aureus	9-17	Walsenburg, Col.	beef and pork hash		+		79 (297)	4-6 hr.		N,V,D	DH	school (D)
S. aureus	10-15	Plantation, Fla.	ham		+		>90 (160)	3-5 hr.		N,V,D	DH	banquet (B)

S. aureus phage type 6/47/53/85 Enterotoxins A & D	10-17	Seattle, Wash.	turkey	+	+	+	78(300)	1½-6 hr. med. 3½ hr.	14 hr.- 3 dy.	N,V,D,C,H, chills	DH	bazaar (B)
S. aureus	10-?	Newberry, S. C.	pork		+		15(300)	4 hr.		N,V,D	DH	school (D)
S. aureus phage type 47/54/75/77 Enterotoxin A	11-10	Waukesha Co., Wisconsin	ham	+	+	+	28	1½-3 hr.		V,D, prostration	DH	store, 1 death (B)
S. aureus	11-12	Washington, D.C.	corned beef		+		52	3-5 hr.	12-24 hr.	N,C,V,D	AF	cafeteria (B)
S. aureus	11-18	Stockton, Calif.	custard cake		+		4 (6)	4-5½ hr.	6-24 hr.	N,V, chills, malaise	DH	home (B)
S. aureus phage type 42E/77+	11-22	Prairie Village, Kansas	corned beef and roast beef		+	+	17	4-6 hr.		N,V,C,D,	DH	restaurant (B)
S. aureus	11-25	Memphis, Tenn.	pork		+	+	59(150)	$\bar{x}$ 5.1 hr.	$\bar{x}$ 12 hr.	N,V,C,D	DH	school (B)
S. aureus phage type 53	11-26	Hialeah, Fla.	turkey	+	+	+	207 (890)	2-8 hr. $\bar{x}$ 4-5 hr.	4.1 hr.	N,V,D,C,H, weakness	DH	school (B)
S. aureus	12-20	Ponce, P. R.	pork		+		2	½ hr.		V,C,H, dizziness	DH	hospital (D)
Prob. S. aureus	5-23	Seattle, Wash.	crab		+		2	1½ - 3 hr.	4 hr.	N,V,C,	DH	restaurant (D)
Prob. S. aureus	6-9	Lakewood, N.J.	eggs				8 (15)	$\bar{x}$ 3 hr.	< 24 hr.	N,V,D	DH	home (C)
Prob. S. aureus	7-5	New York City	Chinese fried rice			+	9 (10)	½ - 1½ hr.	$\bar{x}$ 36 hr.	N,V,D,C	DH	restaurant (B)
Prob. S. aureus	7-19	San Diego, Calif.	shrimp				3 (3)	2½-4½ hr.	$\bar{x}$ 3 hr.	N,V,C,D	DH	home (B)
Prob. S. aureus	8-16	Mt. View, Calif.	barbeque ham				2	3½ hr.	12 hr.	N,V,D	DH	restaurant (D)
? Staph	5-7	New York City	cream cake		+		3 (3)	2-6½ hr.	24-36 hr.	N,V,D,C	DH	home (D)
? Staph	6-26	Sacramento, Calif.	?eggs				3 (4)	2-11½		N,V,C	DH	restaurant (D)
? Staph	6-?	Oak Harbor, Wash.	?chocolate candy				9 (11)	5 hr.	7-10 hr.	C,N,D	DH	home (D)

ETIOLOGY	ONSET	REPORTED FROM	VEHICLE	LAB DATA			CLINICAL DATA				REPORTER	COMMENT
				P.	V.	H.	# ill (at risk)	incub. period (hrs.)	Duration of dis. (hrs.)	Symptoms		
? Staph	7-26	Illinois	ham				3 (4)	1-4 hr. $\bar{x}$ 2½ hr.		N,C,D	DH	restaurant (D)
? Staph	8-11	Blue Creek, W. Va.	ham				3 (3)	1 hr.	$\bar{x}$ 36 hr.	N,V,C,D	DH	food eaten in field (D)
? Staph	8-26	Morgantown, W. Va.	turkey		+		199 (315)	$\bar{x}$ 8 hr.	$\bar{x}$ 1½ hr.	N,V,C, weakness, myalgia	DH	school (B)
? Staph	8-?	Olympia, Wash.	green beans				7 (9)	$\bar{x}$ 3.9	several hours	N,V,D,C	DH	home (D)
? Staph	9-8	New York City					3 (3)	1½ - 4 hr.	48 hr.	D,C,N,V,H	DH	restaurant (B)
? Staph	9-26	Mayaguez, P. R.	codfish salad				23(25)	2-4½ hr.	3-10 hr.	C,V,D,H,F	DH	prison (D)
? Staph	9-31	Miami, Fla.	salad dressing				2	2 hr.		N,V,D,C	DH	restaurant (D)
? Staph	9-?	Port Huron, Mich.	custard buns				36	~4 hr.		C,D,N,V	DH	bakery (B)
? Staph	10-7	New York City	lamb chops and sauce				3 (4)	4 hr.		N,V,H	DH	home (D)
? Staph	10-17	Towtowa, N. J.					9 (45)	4-13 hr.	$\bar{x}$ 8 hr.	V,D,F	DH	school (D)
? Staph	10-22	Harrison, N. J.	chicken				2 (2)	1½ - 3 hr.	½ dy.	V,D	DH	home (D)
? Staph	10-22	Muskegon, Mich.	turkey and dressing				8 (11)	4-8 hr.	30-36 hr.	V,D	DH	home (D)
? Staph	10-24	Seattle, Wash.	rice and pork			+	3 (5)	3/4-1 1/4 hr. med. 1 hr.	$\bar{x}$ 4 hr.	N,V,C,D,H	DH	restaurant (D)
? Staph	10-?	Ephrata, Wash.					4 (5)	5-10 hr.		N,V,C,D	DH	home (D)
? Staph	11-?	Olympia, Wash.					7 (13)	1-7 hr.	5 hr.	H,N,C,D	DH	home (D)

STREPTOCOCCUS												
Group G	10-16	Vermont	egg salad	+		172 (502)	~3 dy.		H,F, pharyngitis chills	MMWR	school (D)
Group A beta hemolytic	11-15	Pratt, Kan.	egg salad	+	+	~400 (850)	≈ 20-30 hr.		H,F,V, pharyngitis chills	DH	school (B)
Enterococcus	4-29	New York City	roast beef		+	22 (45)	14 hr.		C,D	DH	caterer (B)
Enterococcus	6-22	New York City	shrimp		+	5 (5)	8-21 hr.		N,V,D,C	DH	home (B)
Enterococcus	7-15	New York City	macaroni salad and ham		+	3 (3)	2½-3 hr.		N,C,D	FDA, DH	store (B)
Enterococcus	7-18	New York City	roast beef and sausage		+	3(3)	2-5 hr.		N,V,C,D	DH	restaurant (B)
Enterococcus	7-23	New York City	ham		+	4 (6)	5½ hr.		N,V,C	FDA,DH	home (B)
Enterococcus	7-25	New York City	roast beef		+	3 (8)	12-21 hr.	2 dy.	D,C,N,V	DH	store (B)
? Enterococcus	3-24	New York City	manicotti		+	25(120)	3½-16½ hr. ≈12 hr.	12-72 hr. 18 hr.	C,D	DH	restaurant (B)
? Enterococcus	12-31	New York City				4 (4)	5½-7½ hr. ≈ 6½ hr.	24 hr.	N,V,C	DH	restaurant (B)
CHEMICAL												
Histamine	1-16	Hawaii	frozen taiwan mahimahi	+		6	15-30 m.	1-2 dy.	H,C,D,flushing chills	DH	home (D)
Zinc	6-20	Port Arthur, Tex.	ice	+	+	17	20-30 m.		C,V, prostration	DH	restaurant (D)
Scombroid fish poisoning histamine-like substance	7-19	New York City	tuna fish		+	8 (9)	30 m.	1-4 hr.	N,D,C,H, flushing, urticarial rash conjunctivitis	DH	home (B)
Carbophenothion (Trithion)	8-19	Brookshire, Tex.	tortillas		+	6	1-7 hr.		N,V,C,D,F, leg cramps, miosis, respiratory distress	MMWR	home (D)

ETIOLOGY	ONSET	REPORTED FROM	VEHICLE	LAB DATA			CLINICAL DATA				REPORTER	COMMENT
				P.	V.	H.	# ill (at risk)	incub. period (hrs.)	Duration of dis. (hrs.)	Symptoms		
Monosodium Glutamate (Chinese food poisoning)	9-27	Seattle, Wash.	Chinese food				3 (5)	15-30 m. x̄ 15 m.	x̄ ½ hr.	Paresthesias of neck and extremities, blurred vision, tachypnea, palpitations	DH	restaurant (B)
Histamine-like substance (Scombroid fish poisoning)	10-4	New York City	tuna fish				5 (5)	20-30 m.	2-6 hr.	D,C, rash palpitations	DH	home (C)
Monosodium Glutamate (Chinese food poisoning)	10-17	Pompano Beach, Fla.	won ton soup				3 (3)	10-15 m.	x̄ 1 hr.	H, flushing paresthesias	DH	restaurant (B)
Prob. Chinese food poisoning	9-12	New York City	?egg drop soup				3 (3)	20 m.	3-18 hr.	H, paresthesias of face and neck, neck pain	DH	restaurant (B)
Prob. copper poisoning	9-13	New York City	soda				5 (25)	5 m.	3 hr.	N,V,C	DH	store (B)
? Chemical	9-8	Anchorage, Alaska	asparagus in rusty can				2 (2)	2½ hr.		H,N,V, malaise dizziness	DH	camping (A)
? Chemical	10-8	New York City	chicken noodle soup				3 (4)	30 m.	7 hr.	V,C	DH	home (D)
? Chemical	11-11	Chicago, Ill.	pancakes				6 (10)	1 hr.		C,N,V,H, dizziness	DH	home (D)
? Chemical	12-6	Trenton, N. J.	sausage				3 (4)	2 hr.	6 hr.	N,F,V, prostration	DH	home (D)
PARASITIC												
Trichinella spiralis	5-9	Syracuse, N. Y.	pork	+			4 (4)	2½ wk.		periorbital edema, eosinophilia	Para.	home (A)
Trichinella spiralis	5-?	New Berlin, Wisc.	raw hamburger	+			8	1 wk.		eosinophilia	MMWR	home (B)
Trichinella spiralis	8-1	Anchorage, Alaska	black bear	+	+		8 (30)	~20 dy.		F, myalgia, periorbital edema, eosinophilia	DH	home (C)

Trichinella spiralis	9-4	New York City	pork	+		2	24 hr.		peri. edema eosinophilia	Para.	home (A)
Trichinella spiralis	12-28	Washington, Mo.	raw pork sausage	+	+	47			H,F, peri. edema eosinophilia, myalgia, conjunctivitis	MMWR	home (A)
Trichinella spiralis	12-?	Washington, Miss.	pork	+	+	4 (10)	9 dy.		F,V,D, myalgia periorbital edema, eosinophilia	MMWR	home (C)
VIRAL											
Hepatitis	7-28	Cuyahoga Co., Ohio	?water			5 (16)	13-33 dy.		jaundice, bilirubinuria, abnormal LFT's	DH	picnic (C)
Hepatitis	8-10	San Pedro, Calif.	cream cakes			76	$\bar{x}$ 28.1 dy.		anorexia, N,C, icterus, SGOT	DH	bakery (B)
Hepatitis	9-9	Limestone Co., Ala.	?water			21 (~750)			jaundice, bilirubinuria, SGOT	MMWR	school (D)
OTHER											
Bacillus cereus	7-9	Brookfield, Vermont	meat casserole		+	66 (100)	11-21 hr. 1-48 hr. $\bar{x}$ 16½ hr. $\bar{x}$ 11.3 hr.		D,N,C	DH	camp (B)
Mycobacterium bovis	10-?	Wayne Co., Ohio	unpast. milk	+	+	5			Positive tuberculin skin test	DH	farm tuberculosis cows (C)
UNKNOWN											
	1-?	Chehalis, Wash.				5 (6)	36 hr.	2-3 dy.	C,N,V,D	DH	restaurant (D)
	1-?	Beaufort, S. C.	chicken			2 (2)			N,D	DH	restaurant (D)
	1-?	Richland, S. C.	pancake and eggs			2 (2)	24 hr.		N,C	DH	restaurant (D)
	1-?	Richland, S. C.	hamburger			2 (3)	5 hr.		N,C,D	DH	restaurant (D)
	1-?	Jasper, S. C.	hamburger			24(32)	25 hr.		N,V,F	DH	restaurant (D)
	1-?	Richland, S. C.	shrimp			15(113)	11 hr.		C,D	DH	restaurant (D)
	2-?	Clarendon, S. C.	turkey			575 (900)	14 hr.		N,C,D	DH	school (D)

ETIOLOGY	ONSET	REPORTED FROM	VEHICLE	LAB DATA			CLINICAL DATA				REPORTER	COMMENT
				P.	V.	H.	# ill (at risk)	incub. period (hrs.)	Duration of dis. (hrs.)	Symptoms		
	2-28	Coral Gables, Fla.					30(730)	ẋ10-18 hr.		N,V,D, leukocytosis	DH	school (D)
	3-18	Hawaii					10	24 -36 hr.	1-3 dy.	N,V,C,D, chills	DH	restaurant (D)
	3-26	New York City					26			N,V,C,D	DH	hospital (D)
	3-?	Spokane, Wash.					6 (6)	10 - 14 hr.		C,N,V,D	DH	home (D)
	3-?	Barnwell, S.C.	chicken				65(700)	13 hr.		D	DH	school (D)
	3-?	Greenwood, S.C.	hot dogs				3(3)	1½ hr.		N,D	DH	restaurant (D)
	3-?	Richland, S. C.	hot dogs				4(4)	7 hr.		N,V,C	DH	restaurant (D)
	5-13	Seattle, Wash.	chicken liver				2 (9)	x̄ 2½ hr.		D,C,V, chills	DH	restaurant (D)
	5-20	New York City					3 (3)	9-20 hr.	2-3 dy.	N,V,D,C	DH	home (D)
	6-3	New York City	?roast beef				3 (3)			C,D	DH	restaurant (D)
	6-9	New York City	?tongue and chopped liver				~20 (130)	3-17 hr.		D,C	DH	caterer (B)
	6-13	Aurora, Ill.	?beef				3	2-2½ hr.			DH	home (D)
	6-13	New York City	shrimp or				3 (3)	[illegible]				

7-10	San Jose, Calif.	beef	5 (6)	8-10 hr.	$\bar{x}$ 12 hr.	C,D	DH	restaurant (D)
7-19	Lynwood, Wash.	egg salad and ham	60(65)	$\bar{x}$ 31 hr.	$\bar{x}$ 24 hr.	N,V,D,H,F, myalgia	DH	home (D)
7-20	Sedalia, Mo.	hamburger	18(48)	4-10 hr.		V,C,D	FDA, DH	store (D)
7-?	Olympia, Wash.	?water	15	12-60 hr.	6-12 hr.	N,V,D	DH	picnic (D)
8-2	Kansas City, Mo.	roast beef	4 (10)	3½-5 hr.		V,D,N, prostration	ECA	restaurant (D)
8-27	Carmichael, Calif	ice cream	6 (6)	8-12 hr.	~12 hr.	N,V,D	FDA	home (D)
8-28	Oakland, Calif.	prosciutto ham	6 (6)	24-.8 hr.	$\bar{x}$ 1 dy.	N,V,D,C,F	DH	home (D)
8-29	Arkansas		60(480)			C,N,V	DH	picnic (D)
8-?	Lexington, S. C.	macaroni salad	2(2)			N	DH	restaurant (D)
8-?	Richland, S. C.	chicken	4(7)	4 hr.		N,V,C,D	DH	restaurant (D)
8-?	Spokane, Wash.		2	1 hr.	18 hr.	N,V, dizziness	DH	restaurant (D)
9-11	New York City		13(16)	21-44 hr. med. 33½ hr.	48 hr.	H,N,V,C,D	DH	restaurant (D)
9-24	New York City	?lamb	4(5)	6 hr.	2-6 dy.	N,V,C,D	DH	home (D)
9-28	Hawaii	kalua pork or chicken long rice	17(235)	10-16 hr.	1-2 dy.	C,D, chills	DH	commercial luau (D)
9-?	Bremerton, Wash.		5(5)	8-9½ hr.	12 hr.	H,N,V	DH	home (D)
9-?	Lancaster, S. C.	turkey	226 (548)	18 hr.		N,V,C,D	DH	school (D)
10-2	San Jose, Calif.	cake	5(9)	2½-4 hr.	$\bar{x}$ 12 hr.	N,D,C	DH	home (D)

ETIOLOGY	ONSET	REPORTED FROM	VEHICLE	LAB DATA P.	V.	H.	CLINICAL DATA # ill (at risk)	incub. period (hrs.)	Duration of dis. (hrs.)	Symptoms	REPORTER	COMMENT
	10-2	Saratoga, Calif.	?macaroni salad, ?eggs				4(4)	7-10 hr.		C,D,V,F,H	DH	restaurant (D)
	10-5	Mt. Vernon, N. Y.					2	3 hr.	5 hr.	N,V,C,D	DH	banquet (D)
	10-10	Greenfield, Mo.	turkey				150	12-21 hr.		D,N,V,C, chills	FDA	school (D)
	10-10	Ranson, W. Va.	turkey				109 (204)	6-24 hr. $\bar{x}$ 10	$\bar{x}$ 24 hr.	N,V,C,D,F	DH	school (D)
	10-13	Newport, Oregon					>24 (180)	~30-36 hr.		N,V,D,F,C	DH	banquet (D)
	10-16	Stanton, Calif.	imitation milk				7 (7)	12-24 hr.	$\bar{x}$ 12 hr.	N,V,F,D	DH	home (A)
	10-18	Sunnyvale, Calif.	chicken				5 (5)	½-12 hr.		C,D,V	DH	cafeteria (D)
	10-20	Campbell, Calif.	roast beef				2 (3)	3½ -4 hr.	1-2 dy.	C,V,D	DH	restaurant (D)
	10-22	San Jose, Calif.	fishburger				2 (2)	4 hr.	3½ hr.	C,N,D	DH	restaurant (D)
	10-23	St. Paul, Minn.	meat loaf and gravy				46 (409)	$\bar{x}$ 8.4 hr.		C,D	DH	school (D)
	10-?	Sumter, S. C.	cookies				3(3)	6 hr.		N,V	DH	store (D)
	10-?	Lexington, S. C.	turkey				70(233)	22 hr.		N,D	DH	school (D)
	10-?	Pickens, S. C.	ham				20(182)	4 hr.		N,V,C	DH	school (D)
	11-5	Hawaii	roast beef				34 (36)	8-15 hr.	1-2 dy.	C,D	DH	restaurant (D)
	11-10	San Antonio, Tex.					6				DH	hospital (D)
	11-14	Stringtown, Ill.	weiners and macaroni				35(65)	med. 8 hr.		D,V,C,N,F	DH	school (D)

	11-16	New Haven, Conn.	raw clams		17(23)	31-53 hr. x̄ 38.9 hr.		N,V,F,D	DH	restaurant (D)
	11-20	Renton, Wash.			69(100)	20-65 hr. med. 37 hr.	mode > 2½ dy.	N,V,D,F, chills	DH	church dinner (D)
	11-28	Belvedere, Calif.	turkey		19(28)	6-60 hr.	x̄ 24 hr.	D,V,C	DH	home (D)
	12-5	Selma, Ala.	pork					N,D	FDA	school (D)
	12-14	New York City			3 (6)	2-4 hr.	12-24 hr.	N,V,C,D	DH	restaurant (D)
	12-16	Denver, Colo.			3 (4)	12 hr.		N,V,D	DH	restaurant (D)
	12-17	Hawaii	mahimahi		3 (3)	1 hr.		H,N,D, flushing, tingling of lips	DH	restaurant (D)
	12-19	San Jose, Calif.	chili hot dog		2 (2)	2-5 hr.		C,V, shock	DH	restaurant (D)
	12-?	Tumwater, Wash.			100 (200)	30-36 hr.	24 hr.	F,N,V,D	DH	church dinner (D)

The following outbreaks were not received in time for inclusion in the preceding tabulations.

Infectious hepatitis	11-?	Buckley, Wash.	water		5 (9)			jaundice, abnormal liver function tests	DH	home (C)
Chemical - copper	11-10	New York City	soda	+	3 (3)	Few minutes		N,V	DH	vending machine in theater (A)
S. sonnei	11-11	Snohomish County, Wash.	water	+	20 (24)			D,V,F	DH	cabin (C)

SECTION F.—LINE LISTING OF EPISODES OF FOOD POISONING NOT INCLUDED IN THE TABULAR DATA

ETIOLOGY	ONSET	REPORTED FROM	VEHICLE	LAB DATA			CLINICAL DATA				REPORTER	COMMENT
				P.	V.	H.	# ill (at risk)	incub. period (hrs.)	Duration of dis. (hrs.)	Symptoms		
BACTERIAL												
B. melitensis	3-25	California	unpast. goat milk	+			1				Bruc.	raw goat milk in Mexico (C)
Brucella	3-27	California	unpast. milk	+			1				Bruc.	raw milk in Mexico (C)
Brucella	4-?	Illinois	unpast. milk	+			1				Bruc.	raw milk (C)
Brucella	6-?	Oklahoma	unpast. milk	+			1				Bruc.	raw milk (C)
Brucella	7-5	Mississippi	unpast. milk	+			1				Bruc.	raw milk (C)
Brucella	7-6	California	unpast. milk	+			1				Bruc.	raw milk (C)
Brucella	7-15	California	cheese	+			1				Bruc.	cheese in Mexico (C)
Brucella	7-16	Mississippi	unpast. milk	+			1				Bruc.	raw milk (C)
Brucella	8-3	Illinois	unpast. milk	+			1				Bruc.	raw milk in Mexico (C)
Brucella	8-5	Mississippi	unpast. milk	+			1				Bruc.	raw milk (C)
Brucella	8-7	North Dakota	unpast. milk	+			1				Bruc.	raw milk (C)
Brucella	10-?	Utah	unpast. milk	+			1				Bruc.	raw milk (C)
Brucella	12-4	North Dakota	unpast. milk	+			1				Bruc.	raw milk (C)
S. aureus	9-?	Clarksville, Tenn.	sausage			+	1			V,D	FDA	restaurant (A)

Prob. S. aureus	3-?	Richland, S. C.	meat		1 (2)	4 hr.	N,V,C	DH	restaurant (D)
PARASITIC									
Trichinella spiralis	2-22	Harker Heights, Tex.	pork	+	1		periorbital edema, eosinophilia	Para.	(D)
Trichinella spiralis	4-7	Cleveland, Ohio	pork	+	1	3 wk.	periorbital edema, eosinophilia	Para.	home (D)
Trichinella spiralis	5-1	Fairborn, Ohio	pork	+	1		periorbital edema, eosinophilia	Para.	home (A)
Trichinella spiralis	5-?	Chicopee, Mass.		+	1		periorbital edema, eosinophilia	Para.	home (D)
Trichinella spiralis	6-1	New York City	pork	+	1		eosinophilia	Para.	restaurant (A)
Trichinella spiralis	6-10	San Diego, Calif.	pork	+	1	2 wk.	C, eosinophilia, myalgia	Para.	home (A)
Trichinella spiralis	6-29	Summersville, W. Va.	sausage	+	1		eosinophilia	Para.	home (A)
Trichinella spiralis	7-2	Cleveland, Ohio	pork	+	1		eosinophilia	Para.	home (A)
Trichinella spiralis	7-8	Whately, Mass.	sausage	+	1	3 dy.	periorbital edema, eosinophilia	Para.	home (A)
Trichinella spiralis	7-9	Adkins, Iowa		+	1		periorbital edema, eosinophilia	Para.	(D)
Trichinella spiralis	7-13	Bald Knob, W. Va.	sausage	+	1	10 dy.	periorbital edema, eosinophilia	Para.	home (A)
Trichinella spiralis	7-16	Providence, R.I.	pork	+	1	2 dy.	periorbital edema, eosinophilia	Para.	home (A)

ETIOLOGY	ONSET	REPORTED FROM	VEHICLE	LAB DATA P.	V.	H.	# ill (at risk)	incub. period (hrs.)	Duration of dis. (hrs.)	Symptoms	REPORTER	COMMENT
Trichinella spiralis	9-22	Philadelphia, Pa.	pork	+			1			periorbital edema, eosinophilia	Para.	home (A)
Trichinella spiralis	10-14	Detroit, Mich.	pork	+			1			periorbital edema,	Para.	home (A)
Trichinella spiralis	12-6	Westerly, R. I.	pork sausage	+			1	1 wk.		eosinophilia	Para.	home (A)
Trichinella spiralis	12-17	Westerly, R. I.	sausage	+			1	2 dy.		periorbital edema, eosinophilia	Para.	home (D)
UNKNOWN												
	1-?	Sumter, S. C.	ice cream				1	6 hr.		N,V,C,D	DH	restaurant (D)
	2-?	Richland, S. C.	hamburger				1 (1)	6 hr.		N,V,D,F	DH	restaurant (D)
	3-?	Charleston, S.C.	meat				1 (1)	24 hr.		N,F,D,C	DH	restaurant (D)
	5-?	Sumter, S. C.	orange juice				1 (1)	4 hr.		V,C	DH	store (D)
	7-24	Casey, Ill.	?ham				1	3 hr.	48 hr.	N,V,C	DH	home (D)
	10-?	Aiken, S. C.	meat					8 hr.		N,C	DH	caterer (D)
	11-?	Anderson, S. C.	hot dog				1 (1)	8 hr.		V	DH	restaurant (D)