

IN THE DISTRICT COURT OF THE VIRGIN ISLANDS
DIVISION OF ST. CROIX

JOSEPHAT HENRY, et al. : CIVIL ACTION
v. :
ST. CROIX ALUMINA, LLC, et al. : NO. 1999-0036

MEMORANDUM

Bartle, C.J.

April 13, 2009

The seventeen plaintiffs filed the instant lawsuit as a putative class action in February, 1999. The Third Amended Complaint alleges that as a result of Hurricane Georges plaintiffs, who were then residents of St. Croix, suffered personal injuries and property damage due to exposure to hazardous materials stored and contained by defendants St. Croix Alumina, L.L.C. ("SCA"), Alcoa, Inc. ("Alcoa"), and Glencore Ltd. ("Glencore"). Their claims include maintaining an abnormally dangerous condition, nuisance per se, public and private nuisance, negligent abatement, intentional and negligent infliction of emotional distress, negligence, and punitive damages. This court initially certified a class under Rule 23(b)(3) of the Federal Rules of Civil Procedure. Henry v. St. Croix Alumina, LLC, Civ. A. No. 1999-0036, 2000 WL 1679502 (D.V.I. Aug. 7, 2000). We later decertified that class and certified a new class seeking only injunctive relief under Rule 23(b)(2). Id., 2008 WL 2329223 (D.V.I. June 3, 2008).

Now before the court are the motions of defendants to exclude the testimony of plaintiffs' expert witnesses pursuant to Rule 702 of the Federal Rules of Evidence and the reasoning of the United States Supreme Court in Daubert v. Merrill Dow, 509 U.S. 560 (1993).

I.

Plaintiffs are current and former residents of St. Croix in the United States Virgin Islands who lived in the vicinity of the St. Croix Alumina Refinery Plant (the "refinery") when Hurricane Georges struck the Virgin Islands on September 21, 1998. Defendant Glencore, a Swiss company in the business of commodity trading, is the parent company of Clarendon Holdings, which is the parent company of VIALCO Holdings, Ltd. VIALCO Holdings, Ltd. was the parent company of VIALCO, which owned the refinery referenced in plaintiffs' Complaint. In 1995, VIALCO Holdings, Ltd. sold its interest in VIALCO to Century Chartering Company. The latter is not affiliated with Glencore or any of its subsidiaries. Later in 1995, VIALCO sold its interest in the refinery to defendant SCA, which is owned by defendant Alcoa.¹

The following facts are not in dispute. As part of its commodity trading business, Glencore supplied the refinery owners, including VIALCO and later SCA, with bauxite, a reddish ore having the consistency of dirt or dust. Using the "Bayer

1. The refinery ceased operations in January, 2001. The following year, SCA sold the refinery to St. Croix Renaissance Group, LLLP, which is not a party to this lawsuit.

process," refinery employees combined the bauxite with caustic soda, a strong, corrosive base also known as sodium hydroxide or lye. The process culminates in the extraction of commercially valuable alumina from the bauxite-soda solution. An undesirable but necessary byproduct of the Bayer process is a substance known as "bauxite residue," also called "red mud." It is indistinguishable in color from bauxite but otherwise has different physical and chemical properties.

During the relevant time frame in 1998, nearly ten thousand metric tons of bauxite awaited processing on the refinery premises in a single large, A-frame structure roofed by steel paneling. An even larger amount of red mud was "dry-stacked" in seven enormous, uncovered "cells" around the refinery.

As noted above, Hurricane Georges struck the island of St. Croix on September 21, 1998. Existing meteorologic data to some extent charts the direction, intensity, and duration of the storm's winds and rains. At some point during the hurricane, strong winds ripped portions of the steel roof from the bauxite shed. Witnesses on the refinery premises saw large amounts of bauxite being blown into the air.

In the days following the storm, the Virgin Islands Department of Planning and Natural Resources ("DPNR") and the United States Environmental Protection Agency ("EPA") received numerous reports from residents of neighborhoods adjacent to the refinery that the storm had deposited visible quantities of a

reddish material onto their properties and into their cisterns. The seventeen plaintiffs claim to be among those who experienced significant exposure to that material in the days, weeks, and months following the storm.

None of the seventeen plaintiffs personally preserved samples of the reddish material that they observed on their property. The only direct evidence of the nature of that substance comes from post-hurricane testing conducted by the DPNR and EPA, which resulted in a finding that "the red dust [deposited in the neighborhoods surrounding the refinery] is in fact bauxite." Plaintiffs have proffered evidence that the agencies' test results also support a finding that some percentage of the deposited material may have been red mud.

To complicate matters further, conflicting evidence exists as to the health hazards posed by the red mud stored at the top of piles surrounding the refinery on the date of the hurricane. Plaintiffs' experts initially concluded in 2003, nearly five years after the hurricane, that plaintiffs' injuries were caused by exposure to crystalline silica and hexavalent chromium, also known as "chrome six," both of which are found in red mud. At the time, plaintiffs were pursuing a medical monitoring claim based in part on the status of chrome six as a known carcinogen.

In 2005, plaintiffs received a late-produced internal document from defendants indicating that the pH of the red mud stored at the refinery may have been higher than previously

believed. On this basis the court permitted plaintiffs' experts to revise their testimony, issue supplemental reports, and undergo additional depositions. Plaintiffs abandoned their medical monitoring claim in 2008. They now offer expert testimony that the most likely cause of their claimed injuries was exposure to a strong base, namely, red mud. One component of red mud is the aforementioned caustic soda, a highly alkaline substance that, undiluted, poses a serious health hazard due to its extremely high pH. Because the caustic soda is expensive, however, refinery employees operated filter presses to remove some amount of it from the red mud and make it available for reuse. The pH of any given batch of red mud therefore varies with the amount of caustic soda remaining in it. The storage method employed at the refinery, which involved combining the red mud with fly ash and seawater before dry-stacking, also affected the pH of the red mud sitting in piles.

Plaintiffs' post-hurricane symptoms purportedly consisted of a broad array of respiratory and dermatological maladies. As we noted in a previous memorandum, "the onset, duration, and severity of the alleged injuries varied enormously. Some [plaintiffs] developed rashes or experienced throat irritation only hours after the hurricane, while others reported different conditions that emerged weeks or months later." Henry, 2008 WL 2329223, at *6 (D.V.I. June 3, 2008). The claimed symptoms disappeared almost entirely in the months following the

hurricane.² Only a small number of plaintiffs ever sought professional medical treatment for their symptoms. As a result, the overwhelming majority of personal injuries alleged here are unsupported by any kind of medical documentation or testimony from treating physicians.

Evidence exists that plaintiffs' self-described symptoms were consistent with a number of causes other than exposure to a caustic substance. First, the Center for Disease Control ("CDC") confirmed that an epidemic of acute hemorrhagic conjunctivitis reached St. Croix approximately two weeks before the hurricane and peaked shortly after it. The CDC determined the cause to be the coxsackievirus A24, which can bring about various ocular and dermatological symptoms including those of the variety experienced by many of the plaintiffs. Defendants also provide evidence that in the aftermath of hurricanes, individuals regularly experience eye and skin problems due to strong winds and the circulation of various naturally occurring allergens.

Now before us are the motions of defendants to exclude the testimony, reports, and opinions of plaintiffs' experts Mr. Jim Tarr, Mr. Clayton Bock, Dr. Edward Kleppinger, and Dr. Nacham Brautbar.

2. The sole exception is scarring on one plaintiff's legs allegedly caused by a skin infection that arose several months after the hurricane.

II.

District courts are afforded broad discretion to admit or exclude expert testimony. United States v. Gibbs, 190 F.3d 188, 211 (3d Cir. 1999). Rule 702 of the Federal Rules of Evidence states:

If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise, if (1) the testimony is based upon sufficient facts or data, (2) the testimony is the product of reliable principles and methods, and (3) the witness has applied the principles and methods reliably to the facts of the case.

F.R.E. 702; see also Daubert v. Merrell Dow Pharms., Inc., 509 U.S. 579, 597 (1993). Our Court of Appeals has thoroughly explained and applied those three criteria in a toxic tort case much like the one presently before us. See In re Paoli R.R. Yard PCB Litig., 35 F.3d 717 (3d Cir. 1994) ("Paoli II").

A party wishing to introduce the testimony of an expert witness must first establish that the purported expert is qualified to offer an opinion in the relevant discipline. Id. at 741. The Third Circuit has "eschewed imposing overly rigorous requirements of expertise and [has] been satisfied with more generalized requirements" based on "a broad range of knowledge, skills, and training" Id.

The second requirement imposed by Rule 702 is that expert testimony be "reliable," that is, "based on the 'methods

and procedures of science' rather than on 'subjective belief or unsupported speculation.' " Id. at 742 (quoting Daubert, 509 U.S. at 590). "[T]he expert must have 'good grounds' for his or her belief." Id. (quoting Daubert, 509 U.S. at 590). We are instructed to consider the following eight factors along with "any others that are relevant" in conducting this analysis:

(1) whether a method consists of a testable hypothesis; (2) whether the method has been subject to peer review; (3) the known or potential rate of error; (4) the existence and maintenance of standards controlling the technique's operation; (5) whether the method is generally accepted; (6) the relationship of the technique to methods which have been established to be reliable; (7) the qualifications of the expert witness testifying based on the methodology; and (8) the non-judicial uses to which the method has been put.

Id. at 742 n.8.³ As Judge Easterbrook, writing for the Court of Appeals for the Seventh Circuit, has explained, "An expert must offer good reason to think that his approach produces an accurate estimate using professional methods, and this estimate must be testable. Someone else using the same data and methods must be able to replicate the results." Zenith Elecs. Corp. v. WH-TV Broad. Corp., 395 F.3d 416, 419 (7th Cir. 2005).

The final requirement is that an expert's proffered testimony "fits" the facts of the case. In other words, the

3. We are aware that the inquiry is "a flexible one," Daubert, 509 U.S. at 594, and that an expert's proffered grounds "do not have to be perfect." Paoli II, 35 F.3d at 744. Nonetheless, our Court of Appeals has repeatedly affirmed exclusions of expert testimony found to be unreliable by the district court. See, e.g., id.

proponent of the testimony must establish that a connection exists "between the scientific research or test result to be presented and particular disputed factual issues in the case" Paoli II, 35 F.3d at 743. Although "[t]his standard is not intended to be a high one," a court may "conclude that there is simply too great a gap between the data and the opinion proffered." Oddi v. Ford Motor Co., 234 F.3d 136, 146 (3d Cir. 2000) (quoting Gen. Elec. Co. v. Joiner, 522 U.S. 136, 146 (1997)); see, e.g., In re TMI Litig., 193 F.3d 613, 670 (3d Cir. 1999).

III.

The experts at issue offer conclusions ostensibly relevant to several elements of plaintiffs' claims for damages relating to personal injuries allegedly caused by exposure to toxic chemicals. To establish a prima facie case of negligence or strict liability, plaintiffs must prove that: (1) defendants released the allegedly toxic chemicals into the environment; (2) plaintiffs were exposed to the chemicals; (3) plaintiffs later suffered particular injuries; and (4) the aforementioned exposure in fact caused those injuries. See In re TMI, 67 F.3d 1103, 1118-19 (3d Cir. 1995).

We begin with Mr. Tarr. He is a chemical engineer with a specialization in air emissions from industrial properties. Plaintiffs first offer his testimony to establish the quantity and composition of particulate emissions released into the environment from the refinery premises during Hurricane Georges.

Through application of an air dispersion model, Mr. Tarr estimated the quantity of particulate emissions blown from the refinery premises during the hurricane to be roughly 160,000 pounds. Yet, when questioned at his deposition he expressed minimal confidence in this assessment. The air dispersion model at issue had been created by the Environmental Protection Agency to predict the behavior of coal dust, which, in Mr. Tarr's words, was "obviously ... not directly applicable to red mud." As a result, he described his figure of 160,000 pounds as a "rough estimate" and "first approximation" intended to be "just for illustrative purposes." He further stated that his conclusion "isn't an estimate or an emission rate that you would want to take to the bank" and "is not the kind of number that [he] would typically include in a report like this."

Mr. Tarr characterized the composition of the particulate emissions as "a complex mixture of red mud, bauxite, coal fly ash and bottom ash, as well as other unidentified industrial waste materials." He rendered this opinion despite being unable to test or analyze any samples of that mixture. Instead, he relied largely on "qualitative evidence" such as "the nature of red mud [and] the nature of the way that red mud was handled on the site." He further explained his conclusion as follows: "Looking at the site, thinking about a hurricane, for example, [it] seems perfectly obvious that red mud blew off the site." A review of the EPA's lab analyses of water samples drawn

from allegedly affected cisterns also suggested to him "that red mud may have been blown off the site."

In Heller v. Shaw Industries, Inc., our Court of Appeals affirmed the exclusion of an expert's testimony founded upon an air dispersion model that was "based on speculation and estimation [and] ... subject to gross error." 167 F.3d 146, 162 (3d Cir. 1999). Mr. Tarr's conclusions in this case are self-evidently unreliable for similar reasons. By his own admission, the air dispersion model with which he calculated the amount of particulate emissions did not result in a reliable figure. Likewise, his estimates of the composition of those particulate emissions are not based on any reliable scientific methodology. Mr. Tarr's conclusion that an indeterminate amount of a substance containing an unknown percentage of red mud was introduced into plaintiffs' neighborhoods does not meet the standard of Rule 702 of the Federal Rules of Evidence and the reasoning of Daubert. Accordingly, we will grant defendants' motion to exclude the report, opinions, and testimony of Mr. Jim Tarr.

Plaintiffs next offer the testimony of Clayton Bock, an industrial hygienist. Like Mr. Tarr, Mr. Bock did not perform any testing upon samples of the substance to which plaintiffs were exposed. Nonetheless, he opined that in the aftermath of Hurricane Georges plaintiffs were exposed to a "fairly homogenous mix" of "red mud waste, fly ash, and bauxite." He based his assessment in part on observations made during a visit to the

refinery in June, 2002, almost four years after the hurricane.

The following exchange occurred at his deposition:

Q: Have you made any numerical calculation of the respective role of bauxite and red mud ... as constituents of the material blown from the St. Croix Alumina facility during Hurricane Georges?

A: No. Qualitatively I believe the red mud was a larger contributor, but I made no such calculation.

Q: And when did you arrive at your qualitative view that red mud was a larger contributor?

A: Well, I think initially my own personal view was established when I walked on the red mud pile [outside the refinery in 2002]. ... [I]t's very, very large. ... You could leave footprints in it. ... [Y]ou would expect a tremendous amount of material to come off of there.

Mr. Bock asserted that he later drew support for this opinion from meteorological data and second-hand measurements of the average particle sizes of bauxite and red mud. Nonetheless, his final conclusions remained purely qualitative. He was not able to quantify the mix of bauxite and red mud to which he contends plaintiffs were exposed, and instead characterized plaintiffs' exposure to red mud simply as "substantial" and "significant."

There is no evidence that the methodology described above has been peer reviewed, has a known or potential rate of error, or is generally accepted as a valid means of arriving at the proffered conclusions to a reasonable degree of scientific certainty. There is no indication that Mr. Bock's technique

compares favorably with reliable methodologies typically employed in similar cases, such as sample analysis. Simply put, Mr. Bock's conclusions as to the nature of the material deposited on plaintiffs' neighborhoods bear no hallmarks of a "testable," "accurate estimate." See Paoli II, 35 F.3d at 742 n.8; Zenith Elecs. Corp., 395 F.3d at 419. Because those opinions lack reliability, they will be excluded under Rule 702 and Daubert.

Mr. Bock also reached certain conclusions regarding the pH and toxicity of the red mud stored on the refinery property at the time of the hurricane. He based these estimates on information contained in a "material safety data sheet" for red mud prepared in 1999 by Alcoa and on a site assessment from 1995 that listed the pH of groundwater samples taken from monitoring wells adjacent to the red mud piles. These conclusions, although perhaps reliable, do not fit the facts of this case. The parties agree that plaintiffs were not exposed to the same undiluted red mud located at the top of the stacks near the refinery. Mr. Bock's reports simply do not address whether the mixture that reached plaintiffs possessed a similar pH to the red mud stored at the refinery or whether it was similarly hazardous. Consequently, Mr. Bock's testimony as to the toxicity of the red mud stored at the refinery is not a proper fit with the case as required under Rule 702 and Daubert.⁴

4. If plaintiffs had established that Mr. Bock's testimony as to the pH of the red mud stored at the refinery provided a necessary foundation for the testimony of another expert who could reliably
(continued...)

Finally, Mr. Bock offers the results of an elaborate experiment in which a team of technicians propelled quantities of red mud into a specially constructed one-room building via a fan outside the window. They then attempted to measure the amount of red mud present in the room after various methods of cleaning had been used and certain intervals of time had elapsed. The goal of the experiment was to determine the nature and duration of plaintiffs' exposure to red mud. Defendants point out a myriad of ways in which the parameters of that experiment do not fit the facts of this case, including the fact that the material used consisted entirely of red mud and that the experiment admittedly did not simulate hurricane conditions. We agree that the results of that experiment and any conclusions based thereon do not fit the facts of this case and are inadmissible under Rule 702 and Daubert. In sum, we will grant defendants' motion with respect to the entirety of Mr. Bock's reports, opinions, and testimony.

Plaintiff's third expert is Dr. Edward Kleppinger, a chemist with a Ph.D in science education. Like Mr. Bock, he offers testimony that a substantial amount of red mud reached plaintiffs' neighborhoods and that a "preponderance" of the material to which plaintiffs were exposed "originated from the red mud dry stack waste piles." He too, however, did not examine any samples of the material that reached plaintiffs'

4. (...continued)

estimate the pH of the deposited material, we would have a different case under Rule 702. Plaintiffs have offered no such expert.

neighborhoods. He admitted that the methodology by which he arrived at his "preponderance" figure was a "simple, back-of-the-envelope kind[] of thing" based on his observations that "[t]he red mud area is closer to the impacted estates than the bauxite storage shed. It is higher and completely uncovered. The source area is larger." He further stated that a more accurate assessment, such as one that precisely estimated the constituent parts of the material to which plaintiffs were exposed, was "just not possible" given the complete absence of data on the amount of bauxite that had left the refinery premises.

There is no evidence that Dr. Kleppinger's methodology has been peer reviewed or that it is an adequate substitute for rigorous air dispersion modeling or sample analysis. Indeed, the proffered conclusions cannot be analyzed using a known or potential rate of error and do not appear capable of being tested. Because no evidence exists that he reached those conclusions through the application of scientific methodologies that would be acceptable under Rule 702 and Daubert, we will exclude them for lack of reliability.

Dr. Kleppinger also rendered an opinion as to the pH of the red mud stored at the refinery. We again conclude that an opinion as to the pH of the red mud stored at the refinery at the time of the hurricane is simply not helpful by itself to the case before us. To establish a prima facie case plaintiffs must present evidence as to the pH and chemical composition of the substance to which they were allegedly exposed. This substance

by all accounts was a mixture in which red mud, if present at all, would have been considerably diluted. Accordingly, we conclude that Dr. Kleppinger's testimony, opinions, and reports should be excluded under Rule 702 and Daubert.

The final expert offered by plaintiffs is Dr. Nacham Brautbar, an internist engaged by plaintiffs several years after Hurricane Georges. He never treated any of the seventeen plaintiffs, and while he examined them all, he did not do so until years after their symptoms had disappeared. Dr. Brautbar proffered a causation opinion ostensibly reached through "differential diagnosis," a practice that is well-established as "the basic method of internal medicine." Paoli II, 35 F.3d at 755. It consists of "the determination of which of two or more diseases with similar symptoms is the one from which the patient is suffering, by a systematic comparison and contrasting of the clinical findings." Kannankeril v. Terminix Int'l, Inc., 128 F.3d 802, 807 (3d Cir. 1997) (quoting Stedman's Medical Dictionary 428 (25th ed. 1990)). Analyzing whether a given differential diagnosis constitutes reliable expert testimony under Daubert is a fact-intensive inquiry. Our Court of Appeals has advised:

Although differential diagnosis generally is a technique that has widespread acceptance in the medical community, has been subject to peer review, and does not frequently lead to incorrect results, it is a method that involves assessing causation with respect to a particular individual. As a result, the steps a doctor has to take to make that (differential) diagnosis reliable are likely

to vary from case to case; the information a doctor needs in order to reliably assess the cause of a patient's lung cancer is often very difficult from the information needed to assess the cause of a patient's back or heart trouble However, to the extent that a doctor utilizes standard diagnostic techniques in gathering this information, the more likely we are to find that the doctor's methodology is reliable.

Paoli II, 35 F.3d at 758. These "standard diagnostic techniques" include "performance of physical examinations, taking of medical histories, and employment of reliable laboratory tests" Id.

An expert need not perform every available diagnostic technique with respect to a given individual in order to reach a reliable medical conclusion as to the cause of that person's illness. For example, where an expert cannot administer a physical examination himself, he may rely upon medical records detailing the results of such an examination administered by a treating physician. Kannankeril, 128 F.3d at 807. Nonetheless, "a physician who evaluates a patient in preparation for litigation should seek more than a patient's self-report of symptoms or illness and hence should either examine the patient or review the patient's medical records simply in order to determine that a patient is ill and what illness the patient has contracted." Paoli II, 35 F.3d at 762.

Dr. Brautbar, as noted above, did not personally examine any plaintiffs at the time when they manifested the symptoms allegedly caused by exposure to red mud. Rather, he performed physical examinations in 2003, over four and a half

years after the hurricane. Consequently, he had no first-hand knowledge of the nature of the very injuries for which he attempted to explain causation. For twelve of the seventeen plaintiffs, the sole evidence of symptoms allegedly caused by exposure to red mud consists of self-reports procured only for purposes of litigation. On this basis alone, the differential diagnoses performed by Dr. Brautbar with respect to these twelve plaintiffs lack sufficient reliability for us to permit their admission under Rule 702.⁵ See id. at 762.

The remaining five plaintiffs did produce testimony or documentation from treating physicians describing at least some of their alleged injuries. For three of those individuals, however, the documentation does not corroborate all the self-reported injuries for which he or she seeks compensation. Hospital records establish that Josephat Henry sought treatment only for shortness of breath in the weeks following the hurricane. Dr. Brautbar based his conclusions on the broader assumption that Henry had suffered from not only aggravation of his preexisting asthma, but also "skin irritation and eye irritation." Likewise, documents show that Neftali Camacho visited the emergency room shortly after the hurricane and exhibited eye redness, fever, weakness, and headache. Dr. Brautbar bases his opinion, however, not only on "itchy eyes and

5. These twelve are Martha Acosta, Sylvia Browne, Angel Camacho, Kelshall Cheddie, Sonia Cirilo, Maud Drew, Wilhelmina Glasgow, Eyajie Malaykhan, Amado Rodriguez, George E. Rodriguez, Jr., Mercedes Rosa, and Kay Williams.

itchy skin" but also his self-reported claims of "an acutely swollen face and eyes," which are not mentioned in Camacho's medical records. George E. Rodriguez paid a documented visit to the hospital for "wheezing" roughly six weeks after the hurricane, but Dr. Brautbar opined as to possible causes of "aggravation of his asthma, skin irritation, including rashes and itching, [and] eye irritation."

Dr. Brautbar applied what plaintiffs characterize as the "whole body / whole exposure" approach to differential diagnosis. It entails rendering an opinion as to the most likely cause of an individual's condition as a whole, rather than as to the most likely cause of each individual symptom considered in isolation. See, e.g., Kannankeril, 128 F.3d at 808. In other words, the specific combination of symptoms exhibited by a given plaintiff was crucial to Dr. Brautbar's opinion. If even a single self-reported symptom had not in fact been present, Dr. Brautbar's opinion would be undermined. As detailed above, Dr. Brautbar had verification from medical records for only some of the symptoms allegedly exhibited by these three plaintiffs. He had no basis on which to conclude reliably that they did in fact suffer from all the complained-of injuries upon which his diagnoses were rendered. Because his differential diagnoses for Josephat Henry, Neftali Camacho, and George E. Rodriguez admittedly incorporated unverified symptoms, they are unreliable.

The remaining two plaintiffs, Raquel Tavaréz and Samantha Viera, provided contemporaneous medical records

documenting all claimed injuries. This evidence is sufficiently corroborative to support Dr. Brautbar's findings that they did display specific symptoms at specific times.

We must still examine whether the causation opinions proffered by Dr. Brautbar as to these two plaintiffs are reliable and "fit" their claims. In his initial expert report, authored in 2003, Dr. Brautbar concluded that plaintiffs' injuries were caused by exposure to crystalline silica and chrome six, which are toxic constituent parts of red mud. That report did not implicate the pH of red mud as a cause of plaintiffs' injuries. In 2008, almost ten years after the hurricane and five years after his introduction to the case, he substantially revised his conclusions. His current opinion is that the red mud's high pH "caused and/or significantly contributed to" plaintiffs' claimed injuries.⁶

We find adequate support for Dr. Brautbar's opinion that high-pH substances, as well as substances such as crystalline silica and chrome-six in sufficient doses, are capable of causing the reported injuries. The problem arises with the next step when he concludes without any evidence that the red mud to which plaintiffs were exposed possessed a

6. Plaintiffs do not appear to have abandoned entirely their argument that crystalline silica and chrome six played a role in causing their alleged injuries. Nonetheless, they have scarcely mentioned those substances in the voluminous briefs submitted on the instant motions. Moreover, plaintiffs' experts have not rendered opinions as to the levels of those substances present in the mixture to which plaintiffs were exposed.

sufficiently high pH and toxicity to cause plaintiffs any damage. Evidence that such exposure could have caused plaintiffs' documented injuries in the abstract is manifestly different from evidence that it did cause those injuries. To reach the latter conclusion, an expert must have "a factual basis and [a] supporting scientific theory that is reliable" Heller, 167 F.3d at 157 (quoting Kannankeril, 128 F.3d at 809). "[I]t is improper for an expert to presume that the plaintiff must have somehow been exposed to a high enough dose to exceed the threshold necessary to cause the illness, thereby justifying his initial diagnosis. This is circular reasoning." Mancuso v. Consol. Edison Co. of N.Y., Inc., 967 F. Supp. 1437, 1450 (S.D.N.Y. 1997) (internal quotation marks omitted).

In this case, Dr. Brautbar's opinion must be supported by evidence that red mud was emitted from the refinery premises and that plaintiffs were exposed to a particular dosage or pH. Plaintiffs concede that he is unqualified to opine on those subjects. Instead, they offered as foundation the opinions of Mr. Tarr, Mr. Bock, and Dr. Kleppinger. We are excluding their testimony for the aforementioned reasons. Dr. Brautbar's conclusions consequently lack a reliable factual basis.

Plaintiffs direct us to language in Heller v. Shaw, in which the plaintiffs alleged that they had developed respiratory illnesses from exposure to toxic compounds emitted by a carpet recently installed in their home. 167 F.3d at 157. Then Chief Judge Becker, again writing for the Court, suggested that

plaintiffs would not be required to show "direct proof" of inhalation of the compounds at issue if they could otherwise prove through expert testimony that the carpet in the home emitted the compounds, that plaintiffs became ill, and that the compounds caused the illnesses. Id. at 153 n.6. He cited Kannankeril v. Terminix Int'l, Inc., 128 F.3d 802, 807 (3d Cir. 1997), for the proposition that a causation expert can sometimes render an opinion even in the absence of "hard evidence of the level of exposure to the chemical in question," particularly where: 1) a close temporal relationship exists between the timing of the alleged exposure and the onset of alleged injuries, and 2) the injuries are of the variety typically caused by exposure to the toxic agent in question. Id. at 157.⁷ The panel ultimately concluded that the plaintiffs had not satisfied their burden and affirmed the district court's exclusion of all expert testimony offered by the plaintiffs. Id. at 165.

We do not read Heller or Kannankeril as abandoning the element of exposure in toxic tort cases. Each involved a relatively simplistic exposure scenario in which a small number of plaintiffs fell ill allegedly due to the presence of toxic agents inside their own home. Here, by contrast, a large,

7. In Kannankeril, the plaintiffs attributed their illnesses to their exposure to pesticides left in their home by the defendant, Terminix. The district court excluded the testimony of plaintiffs' causation expert on reliability grounds. 128 F.3d at 808. The Court of Appeals reversed, concluding that the expert "had sufficient knowledge of exposure" based upon "application records showing when, how much, and where pesticide had been applied [to the home]." Id.

geographically disparate group of plaintiffs alleges that a hurricane swept metric tons of both toxic and non-toxic substances from over a mile away into their neighborhoods. Plaintiffs' experts concede that those substances combined with rainwater and were diluted to an unknown extent. They have not calculated the resulting pH and chemical composition of that complex mixture. In the absence of this information, we conclude that Dr. Brautbar's causation opinion lacks a reliable factual basis. See id. at 157; Kannankeril, 128 F.3d at 809. Accordingly, we will exclude all reports, opinions, and testimony of Dr. Nacham Brautbar under Rule 702 and Daubert.⁸

8. Our Court of Appeals has stated that an expert may sometimes testify as to his observations of plaintiffs' injuries even where his opinion as to the causation of those injuries has been excluded. Heller, 167 F.3d at 159 n.8. Because Dr. Brautbar did not observe plaintiffs' injuries, this is not such a case.