

Antibody Sensors

Historically, biologically identifying individual persons has involved such technologies as fingerprinting, retinal scans, and DNA analysis. Although DNA testing is now commonly used by law enforcement, medicine, and agriculture, it is expensive, and to develop genetic-code-based information takes a long time. INL is developing a novel technique called *antibody profiling* for identifying persons from forensic samples. The technology can uniquely identify a person by analyzing the antibodies in body fluids. A unique, individual set of antibodies, called *individual specific autoantibodies* (ISA) is found in blood, serum, saliva, urine, semen, perspiration, tears, and body tissues, and the antibodies are not affected by illness, medication, or food/drug intake. An unskilled technician using inexpensive equipment can complete a test in a couple of hours.

The identification process is simple. A sample is placed on a membrane strip, and two reagents are added to the strip. A final step produces a colored profile, or *bar code* (see the figure at right). The bar code is unique to the person. One can compare the bar code visually to those from previous tests or, using computer software, compare it to those stored in a database.

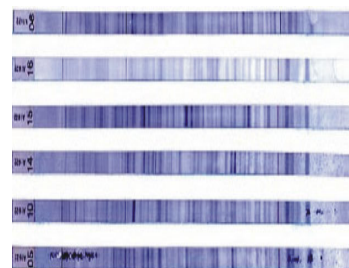
Progress

INL is also developing a novel screening test associated with testing for drugs of abuse in law enforcement and rehabilitation settings. Currently, urine and occasionally blood samples are used for drug testing. Invasion of privacy is a problem when collecting urine samples, since the person must be

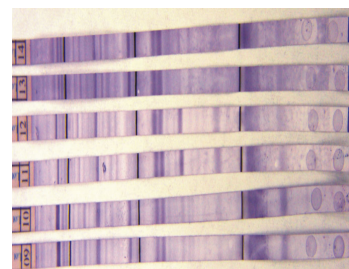
observed to maintain chain of custody and eliminate the possibility of the subject switching or adulterating samples. Also, while obtaining blood samples doesn't share the same privacy concerns as urine samples, collecting blood is an invasive procedure and requires special facilities and trained personnel.

INL's novel ISA test is based on a saliva sample. The approach allows integrating the drug test with verifying the person's identity. It simplifies the complex sample chain of custody procedure and eliminates the invasion of privacy issue since saliva samples can be collected while the person is in the presence of the officials. Individual identification and testing for illegal drugs are simultaneous.

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Antibody profiles from saliva.



Antibody profiles combined with results from drug testing.

Science



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INL is a U.S. Department of Energy
national laboratory operated by
Battelle Energy Alliance



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**Selected Publications/
Presentations**

V.S. Thompson and D.E. Key. "A Novel Test for Detection of Drugs in the Body That Also Provides the Identity of the Person Being Examined," *ONDCP International Technology Symposium, Counterdrug Research and Development: Technologies for the Next Decade, San Diego, June 25–28, 2001.*

V.S. Thompson, K.B. Barrett, D.E. Key, T. Davis, S. Nieto, and T. Unger. "Forensic Validation Study of Antibody Profiling Identification," *FRENZY - Forensic Science and Crime Scene Technology, Conference and Expo, Washington, D.C., May 14–17, 2001.*

V.S. Thompson and D.E. Key. "Novel Assay for Drug and Identity Determination in Body Fluids," *American Academy of Forensic Sciences Annual Meeting, Reno, February 22–26, 2000.*

V.S. Thompson, K.B. Barrett, T. Davis, S.R. Nieto, and T.F. Unger. "Antibody Profiling As an Identification Tool for Forensic Samples," *Proceedings of SPIE – The International Society for Optical Engineering, Conference on Investigation and Forensic Science Technologies, Vol. 3576, Boston, November 3–4, 1998, pp. 52–59.*

V.S. Thompson, K.B. Barrett, T. Davis, S. Nieto, and T. Unger. "Antibody Profiling Technique for Rapid Identification of Forensic Samples," *CAT/NWAFS/SWAFS/SAT Combined Professional Training Seminar, Las Vegas, November, 3–7 1997.*

V.S. Thompson, K.B. Barrett, T. Davis, S. Nieto, and T. Unger. "Antibody Profiling Technique for Rapid Identification of Forensic Samples," *California Association of Criminalists Fall Seminar, Irvine, California, October 8–11, 1997.*