

Developments in Drug Testing:

Saliva as an Alternate To Urine and Blood

By Alim Fatah and Jeffrey P. Cohn

Can saliva and other fluids in the mouth be used to test prison and jail inmates, as well as others, for illegal drug use? Can saliva produce results that are as reliable as current techniques using blood, blood plasma or urine samples? And can those results be used to predict drug concentrations in blood and urine? The answer is a qualified “Yes,” although further research is needed before saliva testing can become a legally and scientifically accepted method.

A comprehensive, multiyear study by the University of Utah’s Center for Human Toxicology (CHT) in Salt Lake City found that illegal drugs can be detected in saliva. The study also found that the drug concentration found in saliva corresponds to the drug dosage. In addition, the saliva concentrations of particular drugs can be used to predict how much of those drugs are in the blood. The study was conducted by a team of researchers through a grant from the National Institute of Standards and Technology’s (NIST) Office of Law Enforcement Standards in Gaithersburg, Md. The funding was provided by the National Institute of Justice.

These findings directly affect the work of prison and jail officials, as well as police and prosecutors. Two-thirds of prison inmates admit that they use illegal drugs, one-third of those who commit crimes used drugs during their crimes and about two-thirds of drivers involved in fatal highway crashes have detectable levels of drugs and/or alcohol in their blood or urine.

Benefits

Unfortunately, conventional blood and urine testing of prison or jail inmates — still the gold standard of drug testing — is not always easy or

safe. Testing blood inherently involves a needle, an intrusive and difficult procedure with some infectious risks. Urine testing requires having someone watch inmates urinate into a cup, an uneasy, distasteful experience for inmates and observers alike. Once collected, laboratory technicians need to isolate the drugs from potential interferences naturally found in blood and urine before the sample can be tested. That process complicates laboratory testing, adds to its cost and duration and increases the chances for mistakes.

Detecting drugs using saliva interests the law enforcement, prison and testing communities because it is a clean and relatively easy liquid to test with conventional drug-screening and confirmation techniques. It can be collected simply — by spitting or collecting on a dental swab placed in the mouth — and in a less invasive and less embarrassing manner than blood or urine. Many illegal drugs, including heroin, cocaine and amphetamines, can be detected in saliva. And because saliva is derived from blood, drug concentrations found in oral fluids should reflect those present in the blood.

“There is a wealth of background literature (some dated) on the collection, analysis and interpretation of many drugs in oral fluid,” the NIST/University of Utah researchers wrote in their NIJ report *Evaluation of Saliva/Oral Fluid as an Alternate Drug Testing Specimen*, which will be published later this year. “Oral fluid appears to have promise as a specimen for testing in the criminal justice system.” Their study is one of the latest results of a 30-year collaborative effort between NIJ and NIST to develop standards and guidelines for technology used in the law enforcement and criminal justice systems.

The word saliva is commonly used to describe the complex combination

Note: The views and opinions in this article are those of the authors and do not reflect an official position of the U.S. government. References to any specific commercial products by trade name, trademark, manufacturer or otherwise do not constitute or imply its endorsement, recommendation or favoring by the U.S. government.

of oral fluids present in the mouth, including those produced by the three major and several minor saliva glands. Adults can produce more than 1,000 milliliters of saliva daily, including about 5 milliliters per minute while spitting, and .05 milliliters per minute while sleeping.

Restrictions To Further Examine

Before saliva can become an accepted specimen for illegal drug testing, several problems have to be resolved. For one, current testing methods usually measure the chemical breakdown products of illegal drugs rather than the parent drugs themselves. Usually, those parent drugs are found in saliva more often than the breakdown products. Eventually, however, this may be helpful because the parent drugs often can be extracted from a saliva sample more easily than the metabolites.

Also, if an inmate being tested has recently smoked, say, a marijuana joint, saliva concentrations of tetrahydrocannabinol will likely be elevated. Tetrahydrocannabinol, or THC, is the active ingredient in marijuana. That would make saliva, at least temporarily, a poor predictor of how much THC is in the blood or other specimens. Several hours would have to pass and repeat tests would be needed before saliva concentrations will actually correlate with those in the blood. The same is true for other drugs.

Further, the methods used to stimulate the flow of saliva and collect it can affect the results. Collection by an absorbent dental swab placed in the mouth, for example, requires an additional testing step of separating the saliva from the swab that spitting into a container does not.

The study also found that some commercially available products for collecting saliva are less reliable or more time consuming than others. Some devices take less than one minute to collect or absorb saliva while others take up to five minutes. Some result in such small sample sizes that accurate testing is difficult. Further testing and product development, as well as developing standards for assessing product reliability, will be necessary.

More research is also needed to develop a chemical marker in saliva that can be used to ensure that the sample to be tested has not been diluted or otherwise altered. The study's

researchers hoped that they could use certain chemicals, called immunoglobulins, that are always found in oral fluids. Unfortunately, the immunoglobulin concentrations in test saliva samples remained largely unaffected despite having subjects rinse their mouths to simulate how an inmate might seek to mask having recently smoked marijuana or taken another drug.

Despite these problems and limitations, and the need for more study, saliva testing can work to screen individuals for the use of many drugs. Scientists need to refine the techniques and improve collection devices. Still, there is now the potential for develop-

ing saliva as a means for testing people for illegal drug use that could complement and perhaps one day replace testing of blood, blood plasma and urine.

Alim A. Fatah, Ph.D., is a program manager for chemical systems and materials projects at the Department of Commerce National Institute of Standards and Technology. He works at the NIJ-funded Office of Law Enforcement Standards at NIST. Jeffrey P. Cohn is a freelance writer who specializes in science and technology. He is a contract writer with NIJ.

Detecting drugs using saliva interests the law enforcement, prison and testing communities because it is a clean and relatively easy liquid to test with conventional drug-screening and confirmation techniques.

Reprinted from the October 2003 issue of *Corrections Today*, Vol. 65, No. 6 with permission from:



The American Correctional Association, 4380 Forbes Blvd., Lanham, Maryland 20706