Drug Users Sweat It Ou

By National Institute of Justice Staff

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With a number of high-profile cases of alleged substance abuse in professional sports, the topic of drug testing has received a great deal of mainstream media attention in recent months. Behind the newspaper stories are ongoing research efforts to find better methods to detect drug use.

Drug testing is used at all points in the criminal justice system. Results are used to help make decisions about pretrial release, probation and parole. To improve the practice of drug testing in the criminal justice system, the National Institute of Justice — the research, development and evaluation agency of the U.S. Department of Justice — funds research exploring new methods and evaluates the potential of alternative techniques. NIJ's latest project assessed the feasibility of adapting a device called the Macroduct[1] to collect sweat and test for drug use in criminal justice settings.

The project, a collaborative effort between the Institute for Social Analysis, the University of Utah's Center for Human Toxicology, and the National Institute of Standards and Technology's Office of Law Enforcement Standards, compared the accuracy of test results collected using different devices and methods — sweat patches, the Macroduct and urinalysis. The project also collected data about participants' perceptions of the different collection methods. The research was conducted in collaboration with the Pretrial Services Agency in Washington, D.C.

Current Collection Methods

Urinalysis is the most common method of drug testing used in criminal justice settings, even though it can be intrusive and uncomfortable for both the subject and the collector, requires burdensome chain-of-custody procedures and may require special facilities.

Hair analysis is regarded as perhaps the most advanced technique, but it may carry potential problems such as contamination and hair color bias (i.e., the darker a person's hair, the more it accumulates traces of ingested drugs). Saliva detection also shows promise as an alternative collection method, but results can be skewed if the subject smokes or takes drugs orally just before being tested.

Detecting Drugs In Sweat

Correctional agencies are already experimenting with sweat patches as a way to test for drug use. A sweat patch sticks to a person's skin and absorbs perspiration over days or weeks, which results in a sample of dried sweat. The adhesive used with the sweat patch bonds tightly with the skin to prevent tampering. Studies show that patches can detect drug use not detected by urinalysis. Sweat patches can detect several drugs, including amphetamine and methamphetamine, heroin, morphine, methadone, marijuana and phencyclidine. However, the concentrations of the drugs in the collected specimen are lower than those collected through urinalysis. Also, a single test uses an entire patch, which precludes repeat testing and testing for multiple drugs.

The Macroduct differs from the sweat patch in that it stimulates production of sweat, takes minutes rather than days and collects liquid versus dried sweat. The Macroduct — originally designed to test infants for cystic fibrosis — stimulates perspiration through a lightweight power source that delivers an organic compound (pilocarpine) through discs placed on a person's skin. Perspiration is then forced from the sweat glands into the Macroduct's collector, a plastic device with spiraled tubing. The tubing is then removed and the sample is transferred via a blunt-needle syringe into a storage vial and analyzed.

The Evaluation

After a pilot study had showed that sweat samples could be collected in a criminal justice setting using the Macroduct, a field study was completed using arrested individuals at the Pretrial Services Agency.

From the pilot study, researchers learned that it would take about 30

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minutes to collect enough sweat (60 micro liters) using the Macroduct system. For the field test, researchers minimized collection time and maximized the amount of sweat collected by increasing the concentration of pilocarpine (the substance that stimulates perspiration), increasing the voltage that induces the pilocarpine, using more than one collection device and using a collection device modified for this purpose by the manufacturer (under a subcontract).

The Results

How well did sweat collected using the Macroduct method detect drugs compared with urinalysis? Impressively well. Testing using sweat samples identified two to three times the number of cocaine users and nearly two times the number of opiate users compared to urinalysis.

As to the volunteers' rating of the level of unpleasantness, embarrassment and perception of the length of time required to collect the specimen, analysis of the self-reports revealed that volunteers found urinalysis to be the most embarrassing collection procedure, but that in other respects, collecting sweat and urine did not differ demonstrably.

What It All Means

The Bad. The barriers to using the Macroduct method include a higher cost and a lower volume of sweat collected compared to the sweat patch. The Macroduct costs $7 per collection with an initial investment of more than $1,500 for the power source. In comparison, the sweat patch costs $5 per collection and requires no power source.

The volume of liquid sweat collected by an unmodified Macroduct system is a limitation. The amount collected is only enough to perform a limited screen for drugs of abuse and a confirmation of no more than one or two drugs. However, the Macroduct system modified for this study harvested larger samples at a faster rate.

In detecting drugs, sweat detection was outperformed by hair and saliva analysis for the detection of cannabinoids.

Finally, whatever the collection method, testing may be limited by what little is known about how drugs are deposited into sweat; hence it can sometimes be difficult to interpret test results.

The Good. The researchers concluded that sweat could indeed be harvested using the Macroduct method in criminal justice settings. The collection method was considered noninvasive, easily observed and well-tolerated by subjects. For many drugs, sweat may be a preferable specimen to urine for the detection of drug use. It appeared to be a good to excellent sample for the detection of opiates and cocaine, it was consistent with urine, and outperformed the sweat patch for the detection of PCP.

The Bottom Line. Based on all of the findings, the researchers recommend further study of the collection and analysis of sweat to fully understand its advantages and limitations. However, the potential is there for sweat to be used as an alternative sample to urine in drug testing. In addition, the immediate, observable collection of liquid sweat versus the longer term collection of dried sweat in a patch, could work well in correctional facilities.

The full NIJ report, *An Evaluation of Innovative Sweat-Based Drug Testing Techniques for Use in Criminal Justice Drug Testing*, NIJ Report 606-03, can be found online at http://nij.ncjrs. org/publications/pubs_db.asp. The report was prepared for the National Institute of Justice, U.S. Department of Justice, by the Office of Law Enforcement Standards of the National Institute of Standards and Technology under Interagency Agreement 94-IJ-R-094.

ENDNOTES

[1] The Macroduct® Sweat Collection System is manufactured by Wescor Inc.

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