USDTL News

July 2010 Volume 1 Issue 3

Alcohol monitoring using biomarkers beats self-report

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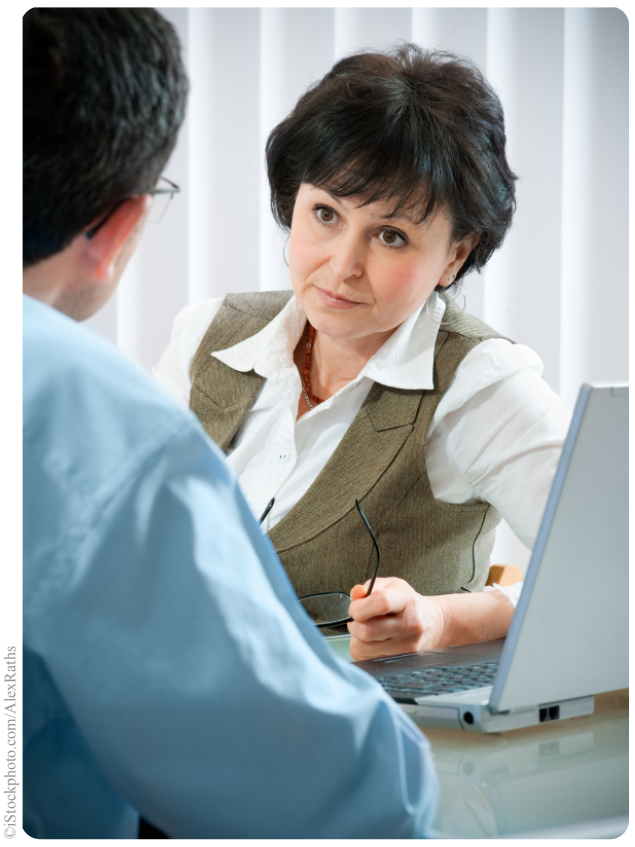

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Self-reports can be subject to both intentional and unintentional bias.

Alcohol dependence results in over 100,000 deaths annually. Those individuals that misuse alcohol are much more likely to be involved with domestic violence, injuries, assaults and homicides.

Treatment for alcohol dependence has demonstrated moderate success over the past few decades. Accurate and reliable measures for the detection and monitoring of alcohol abuse are important for not only successful therapy, but also public health and safety concerns. Several direct biomarkers have emerged in recent years that show promise as sensitive and specific tools for monitoring and detection.

Historically, self-report has been the "instrument" of choice because of a lack of specific and sensitive laboratory measures. Many self-report "instruments" have been utilized over the years such as AUDIT, CAGE, BMAST and Tolerance. These techniques involve specifically crafted questions in specific orders to engage accurate responses from the target subjects. While useful in some settings, several reports demonstrate that they are subject to bias, both intentional and unintentional. Objective biomarkers are needed to improve alcohol consumption monitoring.

Alcohol biomarkers are separated into two main categories, indirect and direct. Indirect alcohol biomarkers measure phenomena that result from repeated ethanol exposure. The usefulness of indirect biomarkers is limited because they are affected by gender and other disease states. Direct alcohol biomarkers measure ethanol itself or substances that are formed in the presence of ethanol.

The most widely used direct biomarker is ethanol itself. Ethanol can be detected in breath, sweat, oral fluid, blood and urine. Blood, breath and oral fluid ethanol measures are used generally for under the influence determinations in settings such as traffic safety, post-accident and reasonable cause testing. Urine ethanol measurements are ideal for zero-tolerance work related testing because of a slight lag of retention time. Ethanol is quickly eliminated from the system at a rate of approximately one drink per hour.

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USDTL adds pain prescription tapentadol to standard urine drug test

by Heather Sliwinski
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Tapentadol, a prescription pain drug, can be abused and is subject to criminal diversion. United States Drug Testing Laboratories (USDTL) recently released a tapentadol add-on urine assay for commercial use. Tapentadol is a synthetic opioid marketed under the commercial name Nucynta®.

The drug is FDA-cleared for the treatment of moderate to severe acute pain. Tapentadol has an abuse potential similar to hydromorphone, and may be abused by crushing, chewing, snorting or injecting the product. These practices pose a significant risk to the abuser that could result in overdose and death.

The tapentadol assay can be added on to any standard UrineStat[SM] 5-, 7-, 9-, 12-, 14-, 15- and 16-drug panel. USDTL tests for over 50 drugs and alcohol biomarkers in urine, and the New Applications Department is continually developing new assays and methods for illicit drug and alcohol testing.

Urine is the most widely tested specimen. It provides the middle ground in drug testing, showing a history of drug exposure shorter than hair, but longer than oral fluid. A urine sample of 10 milliliters provides information on the last two to three days worth of drug history for most drugs and an even longer period for marijuana.

To order the tapentadol test, contact Client Services at (800) 235-2367 or at customer.service@usdtl.com.

Publication review: Hair analysis versus conventional methods of drug testing in substance abusers seeking organ transplantation

by Douglas Lewis
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American Journal of Transplantation 2010; 10:1305-1311

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ABSTRACT

As substance abusers need to demonstrate abstinence prior to transplant, valid/reliable drug tests are needed. Patients may deny use, fearing surgery will be delayed. Breath, blood and urine tests have brief detection windows that allow patients to evade detection. Routine laboratory tests do not include all substances of abuse. Hair analysis overcomes these barriers, increasing the likelihood that active users will be identified. This study compared results for alcohol, opioids and cocaine based on 445 self-report, breath, urine and hair samples from 42 patients who had been denied a transplant due to recent substance abuse. Compared to hair toxicology, sensitivity for conventional drug tests was moderate for cocaine and opioids, but poor for alcohol. Of positive hair tests, only half were corroborated through other tests. In contrast, specificity was high across tests and substances, with positive findings from conventional tests confirmed through hair toxicology. Based on a 90-day detection window for hair analysis, two negative tests suggest 6 months of continuous abstinence. Hair testing should be considered as an alternative approach for monitoring substance use in the transplant population, either as a routine procedure or when the veracity of findings from conventional tests is in doubt.

This study showed in a patient population of prospective transplant recipients with histories of substance abuse, traditional drug history instruments of self report, breath alcohol analysis and urine dip sticks rather dramatically under performed hair and nail analysis for alcohol, cocaine and opiate use. The longer look back and increased difficulty in confounding hair and nail tests suggests the higher utility in performing hair and nail analyses on a less frequent basis than the more traditional means.

Ask the President

Got a question for USDTL? Ask our president and scientific director, Douglas Lewis. E-mail heather.sliwinski@usdtl.com with your questions, and you may be featured in our newsletter!

©United States Drug Testing Laboratories

Q: How long are specimens and original data kept at United States Drug Testing Laboratories?

DL: Many people ask me how long USDTL keeps specimen and data, especially for re-testing purposes. Negative specimens are kept for at least 3 working days. Positive specimens are kept for at least 1 year. All original data is retained for at least 2 years.

Alcohol biomarkers (cont.)

The second most widely used direct alcohol marker is ethyl glucuronide (EtG). EtG has been known for decades but has gained popularity in the past 10 years as an alcohol abstinence test in urine and most recently hair and nails. Several issues stymied widespread acceptance of EtG as an independent measure of beverage alcohol consumption, namely the sensitivity to unintentional ingestion, bacterial formation and bacterial degradation. EtG is detected in the urine for two to five days. The detection window and washout rate of EtG in hair has not been reported.

Ethyl Sulfate (EtS) has been reported as an ethanol metabolite with properties preferential to EtG. There have not been any reports of bacterial formation or bacterial degradation. However, EtS measurements are very sensitive and can detect unintentional ingestion.

Fatty Acid Ethyl Esters (FAEE) are non-oxidative metabolites of ethanol that have been reported in blood, various tissue types, meconium (newborn's first fecal matter) and hair. FAEE detection window in blood is measured in hours, whereas meconium and hair FAEE is measurable for months. Currently, meconium FAEE measurements are the most common method for the detection of a newborn's exposure to ethanol. Unfortunately, the sensitivity of FAEE in hair and meconium is, at best, in the seventy-percentile range, therefore missing approximately one-third of the exposed individuals. Post-collection synthesis is always a pre-analytical variable that must be fully understood and accounted for. Previously collected meconium and hair specimens produce copious amounts of FAEE (in vitro) when exposed to ethanol vapors. Exposure of the scalp to ethanol containing products produces detectable amounts of FAEE in hair as well.

Phosphatidylethanol (PEth) has recently gained recognition as being a direct alcohol biomarker with the most predictable behavior versus actual ethanol intake. PEth is an abnormal phospholipid that is formed in the presence of ethanol. Once produced, it resides in cell membranes until it naturally decomposes, with a half-life of 4.5 days (total detection window-up to three weeks). PEth can be measured in a variety of tissue types, blood, and most recently reported using dried blood spots. One issue for whole blood PEth is that an intoxicated person's whole blood PEth may be artificially elevated due to post-collection synthesis. Whole blood collections are executed using evacuated blood collection systems such as Vacutainer® therefore exposure to the ethanol vapors is not an issue. Post-collection synthesis of PEth using dried blood spots is not observed because once dried, the enzyme is non-functional.

Detection windows of ethanol biomarkers

Alcohol Marker	Serum/Plasma/ Whole blood	Urine	Hair	Blood spot
INDIRECT				
Alanine Aminotransferase (ALT)	weeks			
Aspartate Aminotransferase (AST)	weeks			
Gamma Glutamyltransferase (GGT)	days			
Mean Red Cell Volume (MCV)	weeks			
Carbohydrate Deficient Transferrin (CDT)	week			
Apolipoprotein J (Apo J)	week			
DIRECT				
Ethanol (EtOH)	hours	hours		
5-Hydroxytryptophol (HTOL)		days		
Ethyl Glucuronide (EtG)	hours	days	months	
Ethyl Sulfate (EtS)		days		
Whole blood Acetaldehyde (WBAA)	week			
Fatty Acid Ethyl Esters (FAEE)	hours		months	
Phosphatidylethanol (PEth)	weeks			weeks

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