Testingfor Recent Alcohol Use

rug testing is a powerful tool in the prevention, early intervention, treatment, and management of drug-related problems. Over the past 25 years, drug testing has dramatically increased in business and industry, the U.S. military, secondary schools, professional sports, addiction treatment programs, the criminal justice system and the child protection system. The Achilles' heel to the current system of drug testing has been that routine testing procedures until recently excluded the most widely used intoxicant in the United States, alcohol.

Monitoring individuals for recent alcohol use is hampered by the rapid metabolism of alcohol. Until recently, this has limited alcohol testing to a few hours after drinking stops. Several new developments are making it easier to test for alcohol use in the three to five days preceding the test, by identifying the presence of alcohol metabolites. This is especially important in monitoring alcohol use in settings in which no alcohol use is permitted, e.g., alcoholism and drug abuse treatment, professional assistance programs, abstinence as a condition of probation or child custody, and for people under the legal drinking age. This article describes these new testing procedures and suggests ways they can be successfully integrated into a comprehensive alcohol and drug testing program. Because these tests for alcohol use are new, the practice guidelines are evolving rapidly. We describe the current best practices in the new testing procedures and we recommend checking with the providers of the tests that are used to keep up with future developments.

Most drug testing today uses urine samples. The most common drug test panel is the so-called "NIDA-5" used to identify the five drugs mandated in federal workplace testing guidelines: opiates (morphine/codeine), marijuana, cocaine, PCP and amphetamine / methamphetamine. Unfortunately, this limited testing panel falls short of detecting many commonly used drugs and in detecting alcohol use. Of course, alcohol is a "legal" drug, but not for everyone. In the workplace where most workers are 21 or older, alcohol use outside of work is legal, so the only question in that setting about alcohol is whether the worker is impaired by alcohol consumption at or just prior to work. For this purpose breath and saliva tests for alcohol levels are appropriate. Similarly, if there

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are questions regarding whether a child is intoxicated at school or in another setting, or has been drinking during the preceding few hours, then testing for alcohol itself is appropriate using breath, urine or saliva.

Sometimes, however, the question is not whether the tested person is acutely intoxicated when tested, but whether the person has used alcohol at all. Tests are now available to detect alcohol metabolites that remain in the body at measurable levels for up to five days after drinking. Examples where such alcohol testing is appropriate include drug and alcohol addiction treatment where abstinence is the requirement and school-based testing for students who are under the legal drinking age. In these settings, testing for the presence of alcohol itself (the traditional test for alcohol) is a poor way to identify alcohol use because almost all drinking occurs hours before coming to the appointment at the treatment program or coming to school.

The new options make alcohol testing practical in settings in which any alcohol use is unacceptable. These new options include ethyl glucuronide (EtG) and ethyl sulfate (EtS), which are non-oxidative metabolites of alcohol that are only present in the body after alcohol consumption. They are slowly excreted, making them better markers for recent drinking. These tests combined with onsite breath or saliva testing (which detect very recent drinking) that can be done, for example, when a student returns home from being out with friends on the weekend, help cover the full spectrum of detection (both immediate and longer term) (Wurst, Skipper & Weinmann, 2003).

Additionally, new devices are being developed and studied that detect transdermal diffusion of alcohol. These devices are placed onto the ankle and are worn continuously. Data from the device is downloaded via telephone modem to a monitoring station. The most well-known commercially available device is known as the SCRAM device, Secure Continuous Remote Alcohol Monitor. The SCRAM measures alcohol passing from the blood through the skin and transmits data 24 times a day every day to the monitoring authority (http://www.alcoholmonitoring.com). The device has been studied by highway safety agencies in the management of impaired driving recidivists. Initial data from this device are encouraging. Drawbacks include the cost (approximately \$5 per day) and the discomfort of wearing the device continuously.

There are also remote electronic alcohol monitoring systems that combine random call schedules with a device that measures and transmits alcohol exposure through a voice-recognition, camera-rigged breathalyzer (e.g., products like the Sobrietor) (http://www.bi.com/content.php?section=products&page=products&detail=sobrietor).

Tests available for alcohol, drugs of abuse and tobacco

When people use drugs, including alcohol and tobacco, the drugs are distributed throughout the body. The drugs and their metabolites (breakdown products) are excreted in the urine and are present in sweat, saliva and growing hair. There are a few exceptions. For example, alcohol itself is not detectable in hair, but the metabolites, EtG and EtS, can be detected in hair (Politti et al., 2006). However, no hair test for

EtG and EtS is currently available in the United States.

Oral fluids are tested by taking a sample of saliva from a person's mouth (by swab, dipstick or pipette). The window of detection of most drugs in oral fluids is from about

12 hours up to two to three days. Some drugs cannot yet be tested in saliva, including EtG and EtS; at this time, however, saliva alcohol testing is available and

has approximately the same window of duration of detection as blood alcohol, usually a few hours after drinking stops.

Tests for direct detection of alcohol

Room No. Name

Blood Tests for Alcohol. Blood tests for alcohol can be obtained at laboratories, urgent care clinics and emergency rooms. A blood alcohol test is relatively cheap (about \$15), but often requires a physician evaluation and a physician or clinic fee. Policies governing blood tests vary by community and by laboratory. To obtain a blood test, it is necessary to transport the individual to the site and to draw blood. For these reasons, other alcohol tests are usually preferred.

Breathalyzer Testing. Breath tests for alcohol are easy to use, less invasive, less troublesome and — except for the initial cost of the breathalyzer equipment — much less expensive than blood tests. For breath testing the individual blows steadily and deeply into the breathalyzer. The reading is evident shortly after the device is triggered automatically at the end of expiration. Some individuals attempt to cheat by feigning

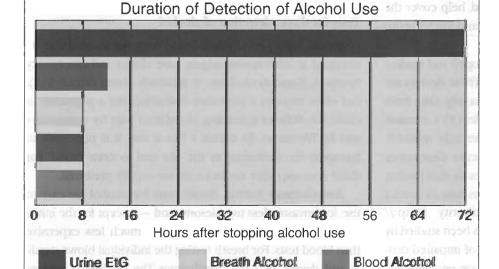
inability to blow deeply (so called, "shy lung"). Only someone with severe heart or lung disease would actually have trouble blowing adequately into a breathalyzer. It is easy to check that the breathalyzer is functioning by having someone else blow into the device to assure that it triggers a reading.

Testing breath for alcohol within a few hours of drinking will identify alcohol. However, after a few hours or more, the test will be negative because the alcohol will have dissipated. Onsite breath tests for alcohol can be administered by parents when young people come home in the evening or at other times when alcohol use is suspected. They can also be administered by school officials, at school parties and events. Breath samples can be taken from a person arriving for a treatment or probation visit, or in the workplace. A breathalyzer adequate for occasional use can be purchased over the Internet for as little as \$50 (e.g. Alcohawk micro, or other similar devices), and more sophisticated, elaborate (sometimes with printout capability) are available for \$1,000 or more.

Breathalyzers should be calibrated occasionally to maintain their accuracy. Manufacturers provide a method for calibration.

Saliva Testing for Alcohol. Saliva testing strips or kits for alcohol testing are readily available from drug treatment clinics, at some drug stores, and over the Internet. Saliva alcohol levels correlate with blood and breath alcohol levels, however, they are less precise, being measured only as .02, .04, .06, etc.). Oral fluid alcohol tests cost about \$3 per test and are available for purchase over the Internet (e.g. Alcoscreen, Q.E.D. tests, and others).

Instructions are included with the tests and are easy to follow. Usually a test strip is placed under the tongue until wet and then is read after one minute. If there is a line on the strip, it is positive. Some strips have colors that are compared to a chart. Another saliva kit requires drawing some saliva from under the tongue using a small suction pipette supplied with the kit. A drop of saliva is then placed in a well on the test device and it absorbs onto the test area and the result is read.



Salliva Alcohol

Figure 1. Duration of Alcohol Use Detection

Urine testing for alcohol

Since urine is collected in the bladder for a few hours until the next voiding, it may be positive for alcohol a few hours longer after drinking stops than the blood, breath or oral fluid alcohol tests. Urine alcohol testing is most often used if a urine sample is collected to be sent to a laboratory for other drug testing. An alcohol level can be requested and added to a drug test. Adding the alcohol test usually only adds a few dollars to the cost of the test. It has been found, however, that urine alcohol testing is largely inadequate to monitor abstinence in random testing programs because of the short duration of alcohol's presence in the urine following drinking. The concentration of alcohol in urine also does not correlate well with blood alcohol levels (because of the unpredictable amount of dilution in the urine from recent fluid consumption and because the urine in the bladder reflects blood alcohol levels over several hours). Therefore, a urine test for alcohol can only be used qualitatively (i.e., to document that alcohol is present) and not quantitatively (i.e., to document how much alcohol is in the body at the time of sample collection). Another caveat regarding alcohol found in urine is that alcohol can form in urine by fermentation during storage or shipment, particularly in diabetics (who can have glucose in their urine); therefore, the presence of alcohol in urine is not necessarily proof of drinking. This, however, does not always invalidate the test (see below).

Testing for alcohol metabolites that remain in the body for several days

Alcohol metabolism and the new tests for alcohol use. When people use alcohol, it quickly finds its way into the bloodstream through absorption from the stomach and intestines. The rapid circulation of blood carries the

Urine Alcohol

alcohol to all parts of the body, where it is absorbed into tissue, including the lungs. The presence of alcohol in the body can be detected by testing breath, blood, saliva, or urine for alcohol itself. Alcohol is rapidly metabolized by the liver and thus leaves the body quickly at a constant rate. There is nothing one can do to speed up or slow down this rate. This means that a person who tests positive for alcohol in breath, saliva or blood has consumed alcohol within the few hours immediately preceding the test. Because alcohol is metabolized fairly rapidly, alcohol itself is not usually detectable for more than six to eight hours following drinking.

EtG and EtS testing

The alcohol people drink, ethyl alcohol (also known as ethanol), is metabolized by the body through several pathways. One pathway metabolizes ethyl

alcohol to ethyl glucuronide, EtG, and another to ethyl sulfate, EtS. Both of these metabolites remain in the body longer than alcohol itself. Depending upon the amount of alcohol consumed, EtG and/or EtS can be present in urine for up to almost a week after drinking stops. Testing urine for EtG or EtS has become popular with testing in health professional monitoring programs (Skipper, Weinmann & Wurst, 2004) and in schools (USA Today, 2007).

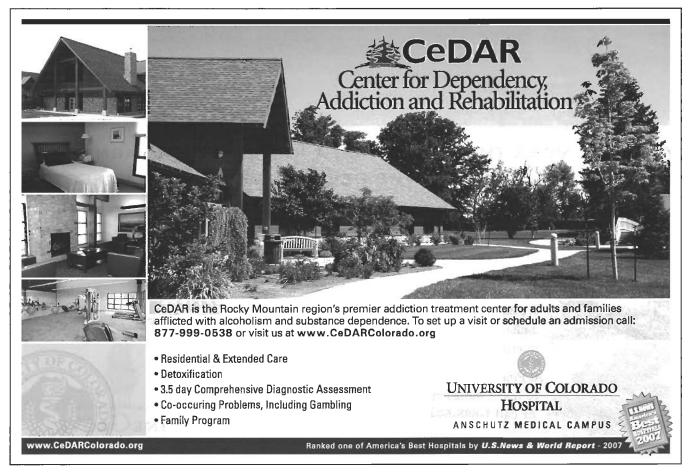
EtG, and to a lesser degree, EtS tests are now readily available through reference labs in the United States. EtG has been more widely used, although more recent experience has suggested EtS may have significant advantages. The specific problems with EtG are that it can deteriorate in the urine over time if bacteria are present (Helander & Dahl, 2005) and it has recently been reported that EtG also can be created in the

urine if bacteria are present (Helander et al., in press). Neither of these phenomena has been found to occur with EtS. In especially contentious settings both tests can be performed.

Cut-offs

All drug tests have cut-off levels, below which the test result is reported as negative. Cut-off levels are chosen to protect against "false positives" which can occur at levels below the specificity of the method of testing and from incidental or innocent exposure to the tested substances. For alcohol testing "innocent" exposure can be the result of recent exposure to alcohol from products such as mouthwash, foods, over-the-counter medicines or even frequent exposure to ethanol vapor (from hand gels, bug spray or other).

For alcohol, EtG and EtS cutoffs have become controversial because of the



large number of widely used products that contain alcohol. Commonly used EtG cutoffs range between 100ng/ml and 1,000ng/ml and EtS between 25ng/ml and 100ng/ml. High cut-offs reduce the problem of "innocent" exposure but they do this at the cost of failing to identify relatively lower levels of alcohol consumption and/or alcohol consumption at relatively more distant times. Low cut-offs identify alcohol use at lower levels and for longer periods of time, but they also identify more "innocent" exposure to alcoholcontaining products. Because EtG and EtS testing are relatively new, the cutoff levels are evolving with increasing experience and increasing research. We offer suggestions for handling these problems, but when questions arise about the interpretation of a particular result it is useful to review the results with medical review officers (MRO)

and to discuss the results with the laboratory that did the test (see below).

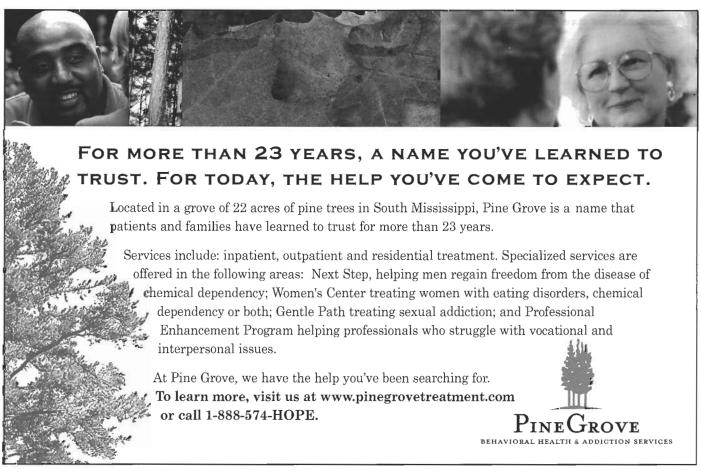
When monitoring someone for alcohol use with EtG or EtS testing it is important that the individual being tested agree to avoid use of products associated with incidental alcohol exposure. Low levels of EtG or EtS in urine are sometimes difficult to interpret if the person denies drinking. Therefore it is important to initially approach the individual in ways that promote candor and honesty. There is no cutoff level that reliably distinguishes between incidental exposure to alcohol and drinking beverage alcohol because ethyl alcohol is the same in both of these exposure. A low level EtG/EtS can be from drinking alcohol several days ago or from incidental exposure more recently.

There are no "quick tests" or on-site devices to identify EtG or EtS in urine

at this time. The urine sample must be collected and sent to a laboratory for analysis, a process that typically takes several days. EtG or EtS testing can cost from \$15 to \$75 depending on the lab.

Dealing with positive EtG/EtS or urine alcohol results

Testing for alcohol and drugs should be done after the tested person has been informed in advance that the testing will be performed; after the tested person has been warned not to use alcohol-containing products; and when there is a clear understanding of the consequences to be imposed as a result of a positive test. The primary purpose of alcohol and drug testing is not to catch the offender; it is to prevent the use of alcohol and other drugs. This deterrent effect is best achieved by calm, thoughtful discussion of the testing and a clear understanding of the



purposes of the testing. In family-based alcohol and drug testing the family needs to have a well-understood family policy about alcohol and drug use by the tested person and a strategy to deal with any problems that emerge in the testing. Disputes about the interpretation of a positive alcohol or drug test

can be resolved by an MRO. Local lab-

oratories doing alcohol and drug tests can refer families to local MROs.

In September of 2006 the Substance Abuse and Mental Health Services Administration issued an advisory regarding alcohol biomarkers (SAMH-SA, 2006). This advisory warned against over-reliance on positive EtG or EtS results as the sole indicator of alcohol use, especially if drastic actions (e.g., termination from a job, incarceration, etc) are being considered as a response to a positive test. The advisory points out that no cut-off level can be relied on to always distinguish between incidental exposure to ethanol and alcohol beverage consumption. Nevertheless EtG and EtS continue to reliably document abstinence and they are useful for the detection of drinking alcohol. Confronted with a positive EtG or EtS test result, many individuals admit to drinking. Additionally, a positive test, even if drinking is denied, indicates a higher likelihood of drinking. In response, surveillance increased. If problems emerge with the alcohol and drug testing, contact the laboratory doing the test for advice and reach out to local experts in alcohol and drug abuse prevention and treatment for guidance and support. Alcohol and drug testing is usually done without significant problems in interpretation but when problems do occur it is important to get help.

Readers may find two addition resources helpful: *Guide to Responsible Family Drug Testing* and *Alcohol Testing and Smarter*



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Student Drug Testing (DuPont & Bucher, 2005; DuPont & Graves, 2005). Both are available on the website of the Institute for Behavior and Health, Inc. (www.ibhinc.org) for guidelines for family-based drug tests. These papers also discuss the role of the MRO in the interpretation of test results.

Positive test results for recent alcohol use, even if questionable (for example, a low positive EtG or EtS test, or a positive urine alcohol test) should be treated initially as proof of drinking alcohol, since this is usually the case. The individual who tests positive should be approached in a calm, supportive manner with assurance that the test identified recent drinking. The person providing the positive sample should be aware that there will be consequences but that these will not be extreme, otherwise, excess denial is elicited. Most individuals who have been drinking (or using drugs) know that they run the risk of being detected if they are asked to submit a urine sample. In fact, they actually suspect, and dread the positive result. Therefore, if they are encouraged to "get honest" they usually will if they are approached confidently regarding the positive test.

If the tested person is approached in this manner, and alcohol use is strongly and insistently denied, particularly if the test report was a urine alcohol or low positive EtG or EtS test, then it is often acceptable to consider that the initial positive result could be "false positive" due to in-vitro (outside the body) fermentation or "innocent" alcohol exposure. Continued frequent urine testing for EtG and/or EtS, with additional admonitions that continued exposure to any alcohol-containing product will be interpreted as a positive test leading to whatever the consequences are for this test result, will usually make it clear in short order whether there has been drinking. The EtG/EtS tests will not usually remain borderline for long in the presence of continued drinking.

Communication of test results is best followed by informing the individual involved of the consequences of the positive alcohol or drug test — consequences that may include the necessity of professional screening, assessment and counseling services. It is useful to identify local drug and alco-

hol treatment programs that can provide such services in advance of beginning testing. It is also helpful to conclude the interview with a clear communication of next-step consequences resulting from any future positive tests and expressing confidence in the individual's ability to refrain from such use and expressing support in overcoming the problem of continued drinking if that occurs. Importantly, the alcohol and drug testing that serves as a deterrent to use and a catalyst for problem identification and intervention can also serve as a tool of recovery support in student assistance programs, professional assistance programs, drug court programs, and in professional treatment settings.

Summary

The availability of EtG and EtS testing in urine samples provides a valuable new opportunity to prevent alcohol use, and when appropriate, to intervene in settings in which any use of alcohol is prohibited. Because this testing is new, it is important for frontline service specialists to understand how it works and how to interpret test results. •

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Additional resources

Information regarding EtG Testing
http://www.ethylglucuronide.com
State List of Certified Labs
http://workplace.samhsa.gov/ResourceCenter/lablist.htm
American Society of Addiction Medicine (ASAM) List
of Medical Review Officers
http://www.asam.org/search/search4.html

American Association of Medical Review Officers Registry

http://www.aamro.com/registry_search.html Substance Abuse Treatment Facility Locator www.findtreatment.samhsa.gov

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Figure 2: Comparison of various alcohol markers

Test	Detection time*	Benefits	Drawbacks	Cost
Breathalyzer	2-8 hours depending on drinking behavior	Ease of use, low cost, readily available	Alcohol vapor (from handgel, etc) can cause false positive test	10 cents per test, device — \$50-1,000
Blood alcohol	2-8 hours depending on drinking behavior	"Gold standard," best evidence for court proceedings	Prescription or doctors order needed to obtain test	\$15-25
Saliva alcohol	2-8 hours depending on drinking behavior	Easier to obtain sample compared to urine, ease of use of new quick alcohol tests	Quick tests on saliva not as accurate as blood alcohol	\$0.50 - 3
Urine alcohol	3-12 hours	Urine often obtained to test for other drugs and alcohol tests can be added	Cannot be used for quantization	\$2-15
EtG/EtS	1-6 days	Longer detection time, can confirm fermentation as the cause for positive urine alcohol	Very sensitive (false positives from "incidental exposure" to environmental alcohol, cost	\$15-75
SCRAM device	Continuous monitor thus detection time unlimited	Continuous monitoring, "longest detection time"	Cost, discomfort of wearing device	\$5/day