

Alcohol Use Biomarkers Testing

Alcohol use biomarkers (eg, ethyl glucuronide, ethyl sulfate, carbohydrate deficient transferrin) can help determine acute or chronic alcohol use. Screening tests may be useful in ruling out recent alcohol use, for general screening in the assessment of ethanol exposure in the contexts of compliance and/or abuse, and as aid for monitoring alcohol abstinence.

Disease Overview

Clinical Issues

Acute ethanol intoxication beyond the first 6-8 hours is not reliably predicted by serum testing, so other biomarkers are often used to detect alcohol use.^{1,2}

Ethyl glucuronide (EIG) and ethyl sulfate (EIS)

- Direct metabolites of ethanol
 - Detected up to 80 hours in urine after ethanol ingestion
 - Good biomarkers of recent alcohol ingestion
 - Useful in short-term monitoring for abstinence

Carbohydrate deficient transferrin (CDT)

- Negative charged glycoprotein proteins with incomplete glycan chain(s)
 - Markedly increased by moderate to heavy alcohol use
 - Most useful for long-term abstinence monitoring (up to 2 weeks)

Phosphatidylethanol (PEth)

- Phospholipid formed only in the presence of ethanol
 - PEth may be a more sensitive marker of chronic use than CDT
 - Identifies chronic heavy ethanol use for up to 28 days

Test Interpretation

Analytical Sensitivity

Analytical Sensitivity	
Test	Results
Ethyl Glucuronide Screen with Reflex to Confirmation, Urine	Cutoff for positive screen is set at 500 ng/mL
Ethyl Glucuronide and Ethyl Sulfate Confirmation, Urine	<ul style="list-style-type: none"> • Reported as a concentration • Analytical range is 100-10,000 ng/mL • Lower limit of quantification is 100 ng/mL

Tests to Consider

Ethyl Glucuronide Screen with Reflex to Confirmation, Urine 2007912

Method: Qualitative Enzyme Immunoassay/Quantitative Liquid Chromatography-Tandem Mass Spectrometry

- Preferred method for ruling out ethanol exposure
- Identify recent ethanol exposure within 1-5 days after ingestion
- Results do not accurately correlate with amount or frequency of ethanol use

Ethyl Glucuronide and Ethyl Sulfate, Urine, Quantitative 2007909

Method: Quantitative Liquid Chromatography-Tandem Mass Spectrometry

- May be useful in the assessment of ethanol exposure in the contexts of compliance and/or abuse
- Identify recent ethanol exposure within 1-5 days after ingestion
- Results do not accurately correlate with amount or frequency of ethanol use

Carbohydrate Deficient Transferrin for Alcohol Use 0070412

Method: Quantitative Electrophoresis

- Identify alcohol abuse or abuse relapse
- Will detect chronic ethanol use (≥40 g/day for 2 weeks)

Tests for Acute Ethanol Use

Ethyl Glucuronide Screen Only, Urine 2012695

Method: Qualitative Enzyme Immunoassay

Ethanol, Serum or Plasma - Medical 0090120

Method: Quantitative Gas Chromatography

Drugs of Abuse Test, Alcohol, Urine - Screen with Reflex to Confirmation/Quantitation 0092280

Method: Semi-Quantitative Alcohol Dehydrogenase/ Qualitative Gas Chromatography-Flame Ionization Detection

Alcohols 0090131

Method: Quantitative Gas Chromatography



Test	Results
Carbohydrate Deficient Transferrin	<p>Reported as percent:</p> <ul style="list-style-type: none"> • ≥1.7%: supports alcohol use >40g/day • <1.4%: does not support alcohol use >40g/day over the prior 2 weeks • 1.4-1.6%: reported as inconclusive
Phosphatidylethanol (PEth)	<ul style="list-style-type: none"> • Concentration > 20 ng/mL is considered evidence of moderate to heavy ethanol use • Results should be interpreted within clinical, environmental, and behavioral contexts

Tests for Chronic Ethanol Use or Abuse Relapse

Alcohol, Urine, Quantitative 2010136

Method: Quantitative Gas Chromatography

Test for chronic ethanol use

Phosphatidylethanol (PEth), Whole Blood, Quantitative 3002598

Method: Quantitative Liquid Chromatography/Tandem Mass Spectrometry

Biomarker associated with ethanol consumption; may be helpful in monitoring alcohol abstinence

Limitations (by Test)

Ethyl Glucuronide and Ethyl Sulfate Confirmation, Urine

Incidental exposure from ethanol-containing products may be detected.

Ethyl Glucuronide Screen with Reflex to Confirmation, Urine

- False positive results may be caused by microbial formation or fermentation, ethanol-containing products (eg, hand sanitizer, mouthwash).
- False negative results may be caused by bacterial degradation, >4 days since ethanol ingestion.

Carbohydrate Deficient Transferrin

- Cannot be used in individuals suspected of having congenital glycosylation disorders.
- Advanced liver damage (including severe chronic viral hepatitis) and antiepileptic drug therapy can increase CDT levels.
- Interference in quantitation may be caused by:
 - Severe icterus
 - Genetic variants of transferrin
 - Excess monoclonal or polyclonal immunoglobulins

Phosphatidylethanol (PEth)

Elevated PEth may result from incidental or unintentional ethanol exposure

References

1. Allen JP, Sillanaukee P, Strid N, et al. [Biomarkers of heavy drinking](#). National Institute on Alcohol Abuse and Alcoholism. [Accessed: Jun 2020]
2. Nanau RM, Neuman MG. [Biomolecules and biomarkers used in diagnosis of alcohol drinking and in monitoring therapeutic interventions](#). Biomolecules. 2015;5(3):1339-1385. PubMed

Additional Resources

Niemelä O. [Biomarker-based approaches for assessing alcohol use disorders](#). Int J Environ Res Public Health. 2016;13(2):166. PubMed

Related Information

Alcohol Use Biomarkers

ARUP Laboratories is a nonprofit enterprise of the University of Utah and its Department of Pathology. 500 Chipeta Way, Salt Lake City, UT 84108
(800) 522-2787 | (801) 583-2787 | aruplab.com | arupconsult.com



