

## Drug Detection Panel Testing, Meconium and Umbilical Cord Tissue

Testing biological specimens such as meconium and umbilical cord tissue to detect prenatal drug exposure is preferred to maternal self-reporting because drug use is generally underreported by pregnant individuals.<sup>1</sup> For example, in a recent study, 2.6% of expectant individuals reported marijuana use to their healthcare providers; however, marijuana metabolite (THC-COOH) was detected in 22.4% using an umbilical cord assay.<sup>2</sup>

Testing may be indicated for neonates born with unexplained neurological complications, growth restriction, or evidence of drug withdrawal symptoms (eg, neonatal abstinence syndrome [NAS]). Testing may also be indicated if the pregnant individual has a history of high-risk behaviors (eg, drug use/misuse/abuse), has had little or no prenatal care, or has experienced unexplained placental abruption or premature labor.<sup>1</sup>

Umbilical cord tissue testing may be preferable to meconium testing in certain contexts due to the ease and speed of collection and comparable window of detection.<sup>1</sup> Collecting both specimen types may increase detection of drug exposure. For a detailed discussion of newborn drug testing and the use of these specimens, refer to the [Newborn Drug Screening - Meconium and Umbilical Cord Tissue](#) topic.

### Disease Overview

Timely detection of in utero drug exposure supports the identification and clinical management of affected neonates.<sup>1,3</sup> The actual time window for detecting exposure is drug dependent, but results are thought to represent approximately the last trimester of a full-term pregnancy.<sup>1</sup>

Detection of drugs is subject to the following factors<sup>1</sup>:

- Extent of maternal drug use
- Specific drug(s) used
- Deposition of drug analytes in meconium or umbilical cord tissue, which varies based on the chemistry of the drug analyte and the unique characteristics of each specimen
- Performance characteristics of test method

### Test Interpretation

#### Sensitivity/Specificity

- Clinical sensitivity: Detection of most compounds and metabolites is consistent between meconium and umbilical cord tissue testing, but results may not correlate with those of maternal urine testing or maternal self-report. In general, concentrations of drug analytes are lower in umbilical cord tissue than in meconium.
- Specificity: high; mass spectrometric methodology and inclusion of multiple drug analytes/metabolites minimizes false positives and the need for confirmatory testing.
- Analytical sensitivity: dependent on method details and cutoff concentration for the analyte(s) of interest; cutoff concentrations have been selected to maximize agreement between meconium and umbilical cord tissue while assuring accuracy and precision requirements.

#### Tests to Consider

##### [Drug Detection Panel, Meconium, Qualitative 3004583](#)

**Method:** Qualitative Liquid Chromatography/Tandem Mass Spectrometry

##### [Drug Detection Panel, Umbilical Cord Tissue, Qualitative 2006621](#)

**Method:** Qualitative Liquid Chromatography/Tandem Mass Spectrometry

- Use to detect and document maternal drug use during the last trimester of a full-term pregnancy
- Qualitative detection of drugs and drug metabolites
- Confirmation testing usually not required due to analytical specificity (mass spectrometry)

See [Related Tests](#)

Drug Class/ Drug/Drug Metabolite	Cutoff Concentrations (ng/g)	
	Drug Detection Panel, Meconium, Qualitative <sup>a</sup>	Drug Detection Panel, Umbilical Cord Tissue, Qualitative <sup>b</sup>
<b>Barbiturates</b>		
Butalbital	50	25
Phenobarbital	200	75
<b>Benzodiazepines</b>		
Alprazolam	5	0.5
Alpha-hydroxyalprazolam <sup>c</sup>	5	0.5
Clonazepam	5	1
7-Aminoclonazepam <sup>c</sup>	5	1
Diazepam	5	1
Lorazepam	20	5
Midazolam	20	1
Alpha-hydroxymidazolam <sup>c</sup>	20	2
Nordiazepam	20	1
Oxazepam	20	2
Temazepam	20	1
Zolpidem	10	0.5
<b>Hallucinogens</b>		
Phencyclidine	10	1
<b>Opioids and Gabapentin</b>		
Buprenorphine	20	1
Norbuprenorphine <sup>c</sup>	20	0.5
Codeine	20	0.5
Dihydrocodeine	20	1

<sup>a</sup>Meconium testing for cannabis metabolite is available separately. Associated cutoff concentrations can be found on the Laboratory Test Directory. See [Related Tests](#).

<sup>b</sup>Umbilical cord tissue testing for cannabis and ethanol metabolites is available separately. Associated cutoff concentrations can be found on the Laboratory Test Directory. See [Related Tests](#).

<sup>c</sup>Drug metabolite

Drug Class/ Drug/Drug Metabolite	Cutoff Concentrations (ng/g)	
	Drug Detection Panel, Meconium, Qualitative <sup>a</sup>	Drug Detection Panel, Umbilical Cord Tissue, Qualitative <sup>b</sup>
Fentanyl	10	0.5
Gabapentin	20	10
Heroin	–	–
6-Acetylmorphine <sup>c</sup>	20	1
Hydrocodone	20	0.5
Norhydrocodone <sup>c</sup>	20	1
Meperidine	20	2
Methadone	10	2
EDDP <sup>c</sup>	10	1
Morphine	20	0.5
Hydromorphone <sup>c</sup>	20	0.5
Naloxone	20	1
Oxycodone	20	0.5
Noroxycodone <sup>c</sup>	20	1
Oxymorphone	20	0.5
Noroxymorphone <sup>c</sup>	–	0.5
Propoxyphene	–	1
Tapentadol	20	2
Tramadol	20	2
N-desmethyltramadol <sup>c</sup>	20	2
O-desmethyltramadol <sup>c</sup>	20	2
<b>Stimulants</b>		
Amphetamine	20	5

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<sup>b</sup>Umbilical cord tissue testing for cannabis and ethanol metabolites is available separately. Associated cutoff concentrations can be found on the Laboratory Test Directory. See [Related Tests](#).

<sup>c</sup>Drug metabolite

Drug Class/ Drug/Drug Metabolite	Cutoff Concentrations (ng/g)	
	Drug Detection Panel, Meconium, Qualitative <sup>a</sup>	Drug Detection Panel, Umbilical Cord Tissue, Qualitative <sup>b</sup>
Cocaine	20	0.5
Benzoyllecgonine <sup>c</sup>	20	0.5
Cocaethylene <sup>c</sup>	20	1
M-hydroxy benzoyllecgonine <sup>c</sup>	20	1
Methamphetamine	20	5
Methylenedioxymethamphetamine	20	5
Methylphenidate	20	—
Phentermine	20	8

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<sup>b</sup>Umbilical cord tissue testing for cannabis and ethanol metabolites is available separately. Associated cutoff concentrations can be found on the Laboratory Test Directory. See [Related Tests](#).

<sup>c</sup>Drug metabolite

## Results

Results	Clinical Significance	Notes
Present	One or more drug analytes were detected	<p>Consistent with exposure to relevant drug(s) prior to birth</p> <p>Does not insinuate impairment and may not affect outcomes for the infant</p> <p>May reflect drugs administered during labor and delivery</p> <p>For meconium, may reflect drugs administered directly to the newborn before specimen collection</p>
Not detected	No drug analytes were detected	<p>Only the targeted drugs can be detected</p> <p>Does not exclude the possibility that the mother used drugs during pregnancy</p>

## Limitations

- The pattern and frequency of drug use by the pregnant individual cannot be determined by these tests.
- Detection of drugs in meconium or umbilical cord tissue depends on the extent of maternal drug use, as well as drug stability in matrix, the unique characteristics of drug deposition in meconium and umbilical cord tissue, the quality and quantity of specimen submitted for testing, and the performance of the test method.
- Concordance of results between twins is higher in umbilical cord tissue than in meconium.<sup>4</sup>
- Minimum reporting limits and estimated concentrations are established for each compound, but quantitative results are not reported.

## References

1. Wabuye SL, Colby JM, McMillin GA. [Detection of drug-exposed newborns](#). *Ther Drug Monit*. 2018;40(2):166-185.
2. Metz TD, Silver RM, McMillin GA, et al. [Prenatal marijuana use by self-report and umbilical cord sampling in a state with marijuana legalization](#). *Obstet Gynecol*. 2019;133(1):98-104.

3. Wu F, Jensen TL, McMillin GA. [Detection of in utero cannabis exposure in umbilical cord tissue by a sensitive liquid chromatography-tandem mass spectrometry method.](#) *Methods Mol Biol.* 2019;1872:211-222.

4. Nelson HA, Wood KE, McMillin GA, et al. [Umbilical cord drug screening in multiple births: experience from a reference laboratory and academic medical center.](#) *J Anal Toxicol.* 2021:bkab077.

## Related Information

[Newborn Drug Screening - Meconium and Umbilical Cord Tissue](#)  
[Newborn Drug Testing Algorithm](#)  
[Ethyl Glucuronide, Umbilical Cord Tissue, Qualitative](#)

## Related Tests

[Drugs of Abuse Confirmation/Quantitation - Cannabinoids \(Marijuana\) - Meconium 0092316](#)

**Method:** Quantitative Liquid Chromatography-Tandem Mass Spectrometry

[Marijuana Metabolite, Umbilical Cord Tissue, Qualitative 3000256](#)

**Method:** Qualitative Liquid Chromatography-Tandem Mass Spectrometry

[Ethyl Glucuronide, Umbilical Cord Tissue, Qualitative 3000443](#)

**Method:** Qualitative Liquid Chromatography-Tandem Mass Spectrometry

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