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Disclosures: Planners/Faculty

- Lonnetta Albright
- Elizabeth Duthie
- David Frazer
- Bernestine Jeffers
- Kyle Mounts
- Paul Neary
- Carrie Stehman
- Georgiana Wilton

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Testing Newborns for Exposure to Substances of Abuse

Paul J. Neary, M.D.
Clinical Professor of Pediatrics
University of Wisconsin – Madison
School of Medicine and Public Health
Division of Neonatology and Newborn Nursery
UW Child Protection Program

UWHealthKids | School of Medicine and Public Health
UNIVERSITY OF WISCONSIN–MADISON

Learning objectives:

- Understand the purposes for drug testing of newborns.
- Know the types of testing that are optimal for use in newborns.
- Know the specimen types that are unfeasible in newborns.

Reasons for testing:

- To determine the substances to which a symptomatic infant has been exposed in order to determine the optimal plan for treating the infant's condition.

- Part of an overall assessment of the competence of a parent to care for the infant after discharge from the hospital.

- Part of determining a plan for the safety of the newborn after discharge from the hospital.

Samples of body fluids or tissues that may be tested:

- Umbilical cord blood
- Segment of umbilical cord
- Infant's meconium (first fecal matter that is expelled)
- Infant's blood
- Infant's urine
- Infant's hair
- Infant's fingernails and toenails

Processing samples of body fluids and tissues:

- All specimens must comply with chain-of-custody collection procedures.

Umbilical cord blood:

- Requires familiarity and practice with the technique in order to obtain the specimen.
- The current perinatal practice of delayed clamping of the umbilical cord (or “stripping” or “milking” the umbilical cord) at the time of birth may reduce the amount of blood that is available from the umbilical blood vessels.
- Limited window of detection for most substances (hours to a few days).

Umbilical cord blood:

- Useful for detecting acute exposures to substances for which blood testing is readily available (e.g., alcohol, salicylates, acetaminophen, many anti-epileptic medications).
- The mother's clinical condition, medications to which the mother was exposed (either illicit or iatrogenic), time since exposure, and other factors can all confound the results.
- Parents cannot typically access specimens of umbilical cord blood. This reduces the risk of adulteration of the specimen.

Segment of umbilical cord:

- There is typically a sufficient length of umbilical cord to meet the requirements of the laboratory that tests the specimen.
- Many birthing centers routinely save a segment of the umbilical cord (in an appropriate refrigerator) for every birth. The specimen is sent for testing if warranted by history and clinical observations that are noted after the birth of the infant.
- Parents cannot typically access the placenta and umbilical cord. This reduces the risk of adulteration of the specimen.
- Window of detection ranges from hours to months.
- Two to three weeks turnaround time.

Meconium:

- Contains mostly debris products accumulated mostly during the third trimester.
- Not a homogenous product. Specimens vary in content of substances to which the infant was exposed.
- The first specimen expelled by the newborn is the optimal specimen.
- If the infant expels the meconium while still *in utero*, the meconium is then mixed with amniotic fluid. The specimen is no longer suitable for testing.
- Parents can access the first specimen of meconium. Parents who seek to evade drug testing of the newborn can adulterate, remove, or destroy the specimen.
- Two to three weeks turnaround time.

Infant's blood:

- Quantity available for testing is very limited, especially for premature infants.
- Limited window of detection for most substances (hours to a few days).
- Useful for detecting acute exposures to substances for which blood testing is readily available (e.g., alcohol, salicylates, acetaminophen, many anti-epileptic medications).
- Parents cannot typically access specimens of the infant's blood. This reduces the risk of adulteration of specimens.

Infant's urine:

- Quantity available for testing is very limited, especially for premature infants.
- Collection may necessitate the use of invasive techniques (e.g., catheterization of the urethra and bladder).
- Cleansing wipes might introduce cross-reacting contaminants into the specimen.
- Limited window of detection for most substances (hours to a few days).
- Optimal techniques use gas chromatography/mass spectrometry.

Infant's hair, fingernails, and toenails:

- Typically not feasible because the quantity of available tissue is low.

Testing techniques:

- Immunoassay
- Gas chromatography/mass spectrometry
- Cut-off levels

Immunoassay:

- Uses an artificially prepared antibody to detect the presence of a drug.
- Produces a qualitative result (positive or negative) rather than a quantitative result (amount of a substance that has been detected).
- Provides a rapid result within 1 to 2 hours.
- Result must be interpreted subjectively from a point-of-care device (e.g., a test strip).

Immunoassay:

- Procedure is sufficiently straightforward that testing is available in most emergency departments and birthing units.
- All positive results must be confirmed by a secondary method, typically gas chromatography/mass spectrometry (GC/MS).
- Some negative results should be confirmed by GC/MS if there is high clinical suspicion that the infant was exposed to a particular substance.

Gas chromatography/mass spectrometry:

- Identifies the presence of a substance from the unique molecular signatures of the substance.
- Requires costly equipment and specially trained personnel. Consequently, most hospitals send specimens to a reference laboratory.
- Provides accurate results.
- Two to three weeks turnaround time.
- Interpretation of the results requires knowing and understanding the cut-off level.

Cut-off level:

- Quantity of a substance in a specimen below which the result is considered negative and above which the result is considered positive.
- The cut-off level is determined by the manufacturer of the clinical test with regard to the properties of the substance and the population for which the test is intended to be used.
- Tests that are intended for use in newborns tend to have the lowest cut-off levels.

Cut-off level:

- Tests that are intended for use in adults (especially for pre-employment screening) tend to have higher cut-off values. This limits the problem of positive results after ingestion of food items that contain poppy seeds.
- A negative result does not confirm that there is absolutely none of the substance in the specimen.
- A positive result may be false because of cross-reactivity with another specimen. This is a significant problem with immunoassay testing.

Testing panels:

- Urine drug screen
- Urine comprehensive drug test panel
- Meconium drug testing
- Umbilical cord drug testing

Urine drug screen:

- Commonly used in emergency departments and for pre-employment screening.
- Intended for use for adults.
- High cut-off levels to avoid false positive results (e.g., after ingestion of foods containing poppy seeds).
- Provides little utility for drug testing of newborns.
- Specimens are frequently adulterated or contaminated.
- Tests are immunoassays. Positive results must be confirmed by GC/MS.

Urine drug screen:

- Frequent false-positives because of cross-reactivity.
- Drug categories included in the test panel typically include amphetamines, cocaine, marijuana, opiates, and phencyclidine. Some panels test for more than these substances.
- Testing for synthetic opiates, semi-synthetic opiates, synthetic cannabinoids, and other substances of abuse (some of which are designed to evade detection on immunoassays) requires different testing techniques (typically with GC/MS).

Urine comprehensive drug test panel:

- Sometimes described as “pain management panel” or similar terminology.
- Intended for use for adults to assure compliance with requirements for participation in medication-assisted treatment of a substance abuse disorder or long-term prescription of opiates for management of chronic pain.
- Lower cut-off levels make these panels suitable for the above purposes.
- Might require a volume of urine that can be difficult to collect from a newborn.
- Turnaround time varies from 1 to 3 weeks.

Meconium drug testing:

- Intended for use only for newborns as only newborns produce meconium.
- Cut-off levels are lower than for urine drug screens.
- Some labs use a two-stage approach starting with an immunoassay screen followed by confirmation by GC/MS.

Meconium drug testing:

- Specimen might be intercepted by parents (or others) and adulterated, removed, or destroyed.
- Clinical conditions of the newborn (e.g., delayed passage of meconium, exposure to chorioamnionitis) might render the specimen unsuitable for testing.
- Turnaround time varies from 1 to 3 weeks.

Umbilical cord testing:

- Tests the umbilical cord tissue (not cord blood).
- Low risk of interception by the parents (or others).
- Lowest cut-off levels of available testing methods for newborns.
- Testing is GC/MS.
- Turn around time 1 to 3 weeks.

Communications with parents:

- Best practice is to transparently inform parents that the newborn will be tested for drugs.
- Because of the complexity of this communication, it might have to be delayed because of mother's health status.
- Mother's partner might not know about the substance use. Take necessary precautions to protect mother's safety.
- Remain alert for signs that mother has been subjected to human trafficking.

Ask for help with interpreting the results:

- Toxicologist (either at the health care facility or at the reference lab that does the testing).
- Pathologist
- Laboratory director
- Contact your facility's child protection team.

Communications with county Child Protective Services:

- Report all positive results to CPS.
- Mandated reporters must report to CPS reasonable concerns about threats to the newborn's safety.
- CPS and Law Enforcement have the legal authority to investigate potential threats to the newborn's safety. Health care providers do not have this authority.
- To help to assure the newborn's safety, support a strong working relationship with CPS.

Recommendations:

- A specimen of the umbilical cord (not cord blood) is the optimal choice for testing.
- A specimen of the meconium is the next best choice for testing.
- A specimen of urine for comprehensive drug testing with GC/MS is the next best choice.
- Ask for help with interpreting the results of drug testing.
- Work closely with Child Protective Services and Law Enforcement.

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Thank you.

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