Toxicology Resource Guide

Developed to Support Child Welfare Professionals in Colorado

COLORADO
Office of Children, Youth & Families
Division of Child Welfare

Developed by:

illuminate
Building Brighter Childhoods

Contents

PURPOSE

The Toxicology Resource Guide was developed to support Colorado Child Welfare Professionals in understanding substances, possible effects, and the utility and application of toxicology testing to enhance practice.

Introduction

Reading toxicology results, as well as trying to decipher symptoms related to substance use, can be complicated and overwhelming. With this quick reference guide, you will be able to explore what toxicology results do and do not tell us, types of substances, and what kinds of symptoms may be connected to specific substances. Throughout the guide, look for the red light bulbs indicating critical thinking tips that may help to guide decision making in child welfare or have practice implications.

A drug test is just one piece of the puzzle; it is not the entire puzzle.

The results from a drug test must be viewed within the context of the rest of the puzzle. The intention of this guide is to walk professionals through the complex factors of substance use and toxicology to provide guidance.

Ultimately, if there are questions or concerns, contact a specialist. A glossary of key terms, list of frequently asked questions, and additional resources are available at the end of the guide.

Key Considerations

Important Considerations When Using the Toxicology Resource Guide

Caregiver substance use may have a significant impact on caregiver engagement and child safety in a variety of ways - which could include: inattentiveness; impaired decision making; inability to supervise or participate in daily living; risks around driving while impaired; increased risk for violence and abuse; passive substance exposures or unintentional ingestions; and other impacts on functioning and environmental safety.

Drug testing can be an important piece of evaluating the safety of the home, caregivers and the child. Drug testing itself is RARELY diagnostic when interpreted alone, and best done in conjunction with clinical examination and/or observation of behavior, environment, and evaluation of the entire situation.

Each drug, each patient, and each case is different.
There are no universal rules with drug testing.

A drug test MAY or MAY NOT tell you whether or not:

- An adult was exposed to a substance
- A child or adolescent was exposed to a substance
- A newborn was prenatally exposed to a substance
- Level of intoxication/impairment
- How much was used
- Route of exposure (inhalation, ingestion, injection, etc)
- Specific timing of exposure
- Safety of the environment

A NEGATIVE "toxicology test" does not ALWAYS mean NO exposure.
This may be dependent on the drug itself, the timeline of exposure, and the detection limits of the test.

Toxicology Tests

General Guidelines to Consider for Toxicological Testing

Both targeted drug assays and comprehensive panels (7 to over 200 drugs) exist with various reference labs, and may include screening and confirmatory techniques and can test many common biologic matrices (urine, hair, blood, etc).

Urine Drug or Toxicology Screens

Urine Drug Screens are usually urine immunoassay/ELISA based tests, which are sensitive but not specific, and provide information on if a substance was present (qualitative), but not concentrations of the substance (quantitative). Urine Drug Screens can commonly test for: amphetamines, methamphetamines, MDMA ("ecstasy"), benzodiazepines, barbiturates, opiates, marijuana/THC, PCP, LSD, cocaine.

- Each manufacturer/brand of Urine Drug Screen can be different.
- Urine Drug Screens can have false positives and negatives. Discuss with the specific laboratory what could be common false positives/negatives that may be specific for the commercial test used.

Confirmatory Testing

Confirmatory testing is the gold standard, can be from any matrix (urine, blood, hair, meconium, umbilical cord), and is usually High-Performance Liquid Chromatography (HPLC) or Gas Chromatography (GC) paired with mass spectroscopy (MS). It is a specific test, meaning false positives and negatives are rare, and can determine drug specific exposure.

- Confirmatory screening is recommended for most unexpected results, or concerns for positive exposures in children.
- Some reference labs will reflexively send confirmatory results when screening tests are positive, but check with your reference labs.

Drug Concentrations

Urine drug concentrations (also known as levels) are difficult to interpret clinically and they are rarely useful in determining the level of intoxication or exposure route. Blood drug concentrations can be a better indicator of potential level of intoxication. However, this can vary based on the the drug itself, as well as chronicity and timeline of use.

- Detection of a systemic drug exposure in a child is of concern, regardless of the concentration whether in the urine or blood.

Details will vary based on the substance, the patient, and the testing panel. If there are any question or concerns on results or interpretation of a toxicological test (whether positive or negative results, or what test to order), please consult the lab and/or a medical specialist.

Toxicology Tests

Commonly Tested Biologic Matrices

Urine

For most categories of drugs, urine as a matrix can be used to determine recent exposure, usually in the past 1-4 days. Certain substances, including marijuana and benzodiazepines may be present in urine longer, up to about 30 days, depending on chronicity of use. While urine can indicate whether or not some substances were recently used, it cannot determine the exact amount used, the timeline, or the route of use (inhalation, ingestion, etc.). With urine, it is difficult to determine the level of intoxication. Additionally, there are various ways to attempt to falsify and adulterate urine results including dilution; supplements (such as niacin), bleach, acid; and using another person's urine.

Blood

Like urine, blood also can be used to indicate recent exposure, but it is a better matrix to correlate with intoxication. However, blood is best used in conjunction with a clinical examination or observation of behavior rather than on its own. Testing blood usually involves delayed results and can be both invasive and expensive.

Hair

Testing hair can help determine exposure in the past week to 3 months. To gain the most information, hair should be tested for both the parent compound (potential contaminant in the environment) and its metabolites (evidence for systemic exposure). Hair testing can be difficult for determining the level or route of exposure, and the level of intoxication. To detect a substance, hair samples need a minimum exposure--meaning a negative result does not mean no exposure occurred. Additionally, a person's natural hair color is a variable to how strongly a drug binds to it. There are various ways to falsify hair results including hair coloring, bleaching, and cutting.

Mouth Swab

Testing oral fluid using a mouth swab is a non-invasive method to detect drug exposure. It is less likely to suffer from tampering because it is an observed collection. However, food, lack of saliva, and collection technique can influence results. Mouth swabs are mainly used to test for amphetamines, cocaine, opioids, alcohol (ethanol) and marijuana, but other drugs can be secreted and detected in oral fluid. Depending on the drug, a mouth swab test can detected anywhere from 1 to 48 hours post use.

Drug testing is one form of determining how concerned we need to be about a family's substance use. In your assessment, when your "gut" tells you something isn't right, it's a sign that you should probe further to try to figure out why. One way of doing this is to talk with families and children about their daily routines - How do the children wake in the morning? Who makes breakfast? Gets them to school or childcare? If they stay home, what activities do they do on a daily basis? What toys do the children like to play with or what things do parents / caregivers enjoy doing with their children? How often and how much are infants being fed? Who does the feeding and how is this done - breastmilk or formula?

These types of questions may help you assuage or firm up your concerns and could lead you to have bigger worries about substance use or note strengths in care providing. Drug testing can be used in these instances of worry as a confirmatory agent in determining what types of substances are being used.

Toxicology Tests

Additional Considerations for Neonatal Testing

There are a few critical distinctions to keep in mind when reviewing toxicology results of a newborn:

- Newborns testing positive for a substance – other than a prescribed or recommended medical substance or an over-the-counter medication used as directed – require a heightened level of concern.

- It is important to remember that a positive drug test for a newborn could be a result of taking medications as prescribed (such as chronic pain management or medication-assisted treatment) or as a result of substance use before a woman began substance use disorder treatment. It is equally as important to remember that the absence of a positive test does not mean there was not an exposure.

- Due to variation in panels, biologic matrices, and timing, and whether screens and confirmatory testing were performed, maternal and newborn drug test results may or may not line up.

- While a positive test may or may not answer the question of whether or not a newborn was exposed to a substance, it necessitates further exploration to understand the impacts (including clinical symptoms) to the child's health and welfare. This may include implications for safe sleep practices and other environmental and behavioral risks.

- Determine if there are additional children living in the home, or who may have also been exposed or impacted, that need to be considered during this process. If there are any concerns or questions on interpretation of a toxicological test (whether positive or negative results, or what test to order), please consult a medical specialist.

Regardless of test results, newborns may or may not experience withdrawal symptoms (often referred to as Neonatal Abstinence Syndrome or NAS). NAS can occur as a result of recreational substance use, prescribed and monitored opioid use for chronic conditions, and prescribed and monitored medication-assisted treatment (MAT). Remember, a positive test and/or the presence of withdrawal symptoms alone do not give you a full picture of the family's capacity.

Toxicology Tests

Additional Considerations for Neonatal Testing

Unique considerations and biologic matrices when testing a newborn.

Urine of Infant

It may be difficult to obtain a sample of urine shortly after delivery and results can be inaccurate in a newborn.

Meconium

Meconium (newborn's first stool) is produced by the fetus from 12 weeks gestation and accumulates until delivery, so it can be an indicator of drug exposure during the second and third trimesters. Meconium is typically expressed 1-3 days after delivery but also can be passed before or during labor and delivery. It is not homogenous so results can be dependent on the collection methods and dependent on laboratory extraction techniques. It can be difficult to determine clinical significance and amount of exposure (accumulative). Immunoassays can have high false-positive rates.

Umbilical Cord

Cord tissue forms beginning in the fifth week of gestation and can indicate exposure during pregnancy. Drug concentrations can be lower compared to meconium, but there are many other potential benefits such as immediate access, some improved sensitivity for specific drugs, no complex collection or extraction. Cord blood will detect a shorter window of time, similar to maternal blood.

Neonatal Hair

Hair is formed at 6 months gestational age, and needs a minimum exposure, thus a negative result does not necessarily mean no exposure.

Breast Milk

Depending on the properties of the drug and how much is used, some substances can transfer into breast milk. There are many variables to consider with breast milk and substance use and further expert consultation is recommended pertaining to questions about specific drugs, potential for symptoms in the breastfeeding infant and expected drug testing results.

Toxicology Tests

Additional Considerations for Neonatal Testing

Early identification of maternal use is critical for intervention and prevention of complications. Perinatal testing can be difficult to determine timing, dose, frequency, and potential maternal intoxication from substance exposure during pregnancy.

Medication-assisted treatment (MAT) for opioid use disorder combines the use of medications with counseling and behavioral therapies. Methadone, buprenorphine, or naltrexone may be prescribed for pain reduction or for use in MAT for opioid use disorder (OUD). Research shows that MAT has the longest-term effectiveness, in cases where patients stick to it for 1 to 2 years. The medication is only one part of MAT, working alongside other therapeutic modalities such as group therapy. Cessation from opioids is seen by clinicians as a long-term goal, not a quick fix.

Toxicology Tests

Additional Considerations for Testing Children

There are a few critical distinctions to keep in mind when reviewing toxicology results of an adult versus a child:

- Children testing positive for a substance – other than a prescribed or recommended medical substance or an over-the-counter medication used as directed – require a heightened level of concern.

- It is important to remember that based on the type of test and the substance being tested for, a positive drug test result could mean either ingestion of a substance by a child or environmental exposure to a substance.

- While a positive test may or may not answer the question of whether or not a child was exposed to a substance, it necessitates further exploration to understand the circumstances and impacts (including clinical symptoms) to the child's health, safety, and well-being. This may include implications for environmental and behavioral risks.

- Determine if there are additional children living in the home, or who may have also been exposed or impacted, that need to be considered during this process.

- With adolescents, drug exposures can still be unintentional, but concerns for recreational use also need to be considered. As opposed to young children, where exposure is likely either malicious or unintentional.

If there are ANY concerns or questions on interpretation of a toxicological test (whether positive or negative results, or what test to order), please consult a medical specialist.

Signs & Symptoms

Common Signs and Symptoms of Toxicity (Toxidromes) of Substances

Sedative/Hypnotic Toxidrome

- Example substances: alcohol, benzodiazepines, some muscle relaxants, barbiturates, anti-seizure medications
- Symptoms: sedation (sleepiness), coma, bradypnea (slow breathing), hypotension (low blood pressure), ataxia (unbalanced), nystagmus (shaky eyes), slurred speech

Sympathomimetic Toxidrome

- Example substances: amphetamines, methamphetamines, cocaine, synthetic cannabinoids (k2, spice, etc), synthetic cathinones (bath salts, etc), stimulants
- Symptoms: anxiety, agitation, diaphoresis (sweaty), psychosis, delusions, mydriasis (large pupils), tachycardia (fast heart rate), tachypnea (fast breathing), hypertension (high blood pressure), pressured speech

Opioid Toxidrome

- Example substances: oxycodone, heroin, fentanyl, hydrocodone, methadone, etc
- Symptoms: sedation, coma, miosis (small pupils), bradypnea (slow breathing), hypotension (low blood pressure), slurred speech

Hallucinogenic Toxidrome

- Example substances: MDMA (ecstasy), LSD, peyote, PCP, ketamine, dextromethorphan, psilocybin mushrooms
- Symptoms: hallucinations, delusions, psychosis, altered mental status, agitation, nystagmus (shaky eyes), tachycardia (fast heart rate), tachypnea (fast breathing), hypertension (high blood pressure), slurred speech

Cannabis

- Examples: traditional buds, concentrations which include dabs, budders, waxes, and edible products using different strains of the cannabis plant, including THC and CBD
- Symptoms: There is no typical presentation for marijuana intoxication. It can consist of the more classic symptoms of sleepiness, slowed reaction times, mydriasis (dilated pupils), injected eyes, but can also include more anxiety, paranoia, psychosis, and agitation. In young children, symptoms can be prolonged and more severe including breathing difficulties, ataxia (unbalanced), and rarely, coma.

When considering how a substance may or may not be affecting care or safety of a child, these signs and symptoms can be helpful in knowing what questions to ask children, parents and caregivers, and other support people involved in a family's life.

For example, alcohol, marijuana, and prescription medications while legal substances, still may be cause for concern if caregivers aren't able to discern when it's safe for them to drive a car. On the other hand, families often know their members best and may already have a plan that a grandparent picks up and drives the children to and from childcare when necessary.

Talk with caregivers about environmental safety concerns, such as safe storage of substances in the home or on the property - including alcohol, prescription medications, cannabis products, other drugs, and paraphernalia, as well as household cleaners, fertilizers, and other hazardous materials.

It's important to determine what impact a substance may have, and if a family is already aware of and controlling for this on their own.

Signs & Symptoms

SEDATIVE/HYPNOTIC TOXIDROME (CENTRAL NERVOUS SYSTEM DEPRESSANTS)

ALCOHOL, BENZODIAZEPINES (DIAZEPAM, ALPRAZOLAM), MUSCLE RELAXANTS (CYCLOBENZAPRINE, BACLOFEN), ETC.

- Increases the amount of time required to react
- Movements may be slowed
- Difficulty concentrating on simple tasks
- Tolerance to side effects will develop with chronic use
- Slurred Speech
- Clumsiness
- Difficulty with walking
- Poor Judgment
- Sleepy
- Small pupils

SYMPATHOMIMETIC TOXIDROME (CENTRAL NERVOUS SYSTEM STIMULANTS)

COCAINE, METHAMPHETAMINE, CAFFEINE, METHYLPHENIDATE

- Increased heart rate, respirations
- Elevated blood pressure
- Pressured and fast speech
- Difficulties in sitting still
- Increased body temperature
- Hyperactivity
- Hyperexcitability
- Irritability, Anxiety, or Paranoia
- Lack of Appetite
- Dilated pupils

HALLUCINOGENS

MDMA/ECSTASY, SALVIA, PEYOTE, PSILOCYBIN/MUSHROOMS, DEXTROMETHORPHANE, KETAMINE

- Can be both slowed or hyperactive behavior, however they cause the user to hallucinate – experience something that does not exist outside of the mind (smelling sounds, feeling colors).
- Reacting to Stimuli that does not exist
- Inappropriate Comments
- Dilated Pupils

OPIOID TOXIDROME

HEROIN, FENTANYL, OXYCODONE, HYDROCODONE, MORPHINE

- Used to treat pain
- Delayed or slow movements
- Slow Speech
- Flaccid Muscle Tone
- Sleepy
- Small pupils

While all of this toxicology information is informative and helpful for assessment, the Colorado Family Safety Assessment Tool is a tool to be used with a family to help guide your practice to identify current or impending danger, risk, strengths and protective capacities.

Using substances in and of itself is not necessarily a child welfare concern. This is why it's so important to put your critical thinking skills to the test! The Colorado Family Safety Assessment tool helps us to remember to do a complete assessment to see what's working and what's not in each unique household.

This Toxicology Resource Guide can help you to know what to ask and why, as well as when different types of drug screens might be most effective. It can also help you think through potential complications in order to help a family be most successful in writing a manageable safety or support plan.

Substance by Substance
Alcohol (Ethyl Alcohol, Ethanol)

Examples
Recreational spirits (beer, wine, hard alcohol), hand sanitizer, food extracts (vanilla, almond, etc.)

Routes of Use
Ingestion, smoke (vape alcohol), via rectum or vagina

Observed Symptoms
- Adult: Sedation, slurred speech, ataxia (difficulty balance)Withdrawal (begins as early as 6 hours after cessation): anxiety, autonomic hyperactivity (tachycardia, hypertension, diaphoresis), hallucinations, insomnia, nausea/vomiting, psychomotor agitation, tremor, seizures
- Child: same, respiratory depression (slowed breathing), hypoglycemia (low blood glucose)

Prenatal Exposure
There is no known safe amount of alcohol use during pregnancy. Fetal alcohol spectrum disorders (FASDs) is an umbrella term describing the range of effects that can occur as a result of prenatal exposure to alcohol. Effects may include physical, mental, behavioral, and/or learning disabilities with possible lifelong implications and can range from mild to severe. Alcohol use can cause withdrawal symptoms in infants such as hyperactivity, irritability, tremors, seizures, and poor sleep - which can begin as early as 3-12 hours after delivery and may last weeks to months.

Breastfeeding
Breastmilk alcohol levels closely parallel blood alcohol levels, and can be highest in milk 30-60 minutes after an alcoholic beverage.

When caregivers are exhausted they can fall asleep easily and unexpectedly and may have more difficulty waking up. Alcohol intoxication increases these risks for any adult, not just a mom, who may be co-sleeping or laying on a couch or recliner with a baby. The best way to prevent overlay deaths is to provide families with necessary education on safe sleep, potential risks of intoxication while caregiving, and to support them in identifying alternative options.

Substance by Substance
Alcohol (Ethyl Alcohol, Ethanol)

Breathalyzer
Breathalyzers can be used to estimate blood alcohol during acute intoxication. There are several different alcohol breathalyzers available with various technologies to detect blood alcohol content, including the use of oxidation and infrared spectroscopy. It will take the concentration of alcohol in breath and convert it assuming a blood-breath alcohol ratio, anywhere from 2100-2400:1.

Ethanol Urine
Urine usually tests for ethanol parent and/or metabolites (Ethyl glucuronide and/or fatty acid ethyl esters (FAEE)). Urine ethanol metabolites can be positive for up to 2-5 days, depending on the amount consumed, however urine ethanol is a poor marker of exposures and intoxication, especially in lower concentrations. If Urine Drug Screen is positive for ethanol in a child, obtaining an immediate BAL to confirm the exposure is recommended.

Blood (Serum) Ethanol
Blood Alcohol Level (BAL) is a good marker for toxicity for a naïve user, but with chronic alcohol use, an individual can be clinically sober and have much higher BAL concentrations. Therefore, concentrations can be difficult to correlate with intoxication depending on the tolerance of the user. Most people will metabolize blood alcohol down 20-30 mg/dl/hr. For example, if an individual begins at 200 mg/dl, then they will get down to 80 mg/dl in 4-6 hrs.

Meconium
Ethanol metabolites are often used to identify ethanol consumption. It is difficult to quantitate level of maternal consumption.

Umbilical Cord
Testing for ethanol metabolites can be performed and can be a marker for maternal consumption. Difficult to quantitate level of maternal consumption.

Hair
Ethanol metabolites can be tested in hair samples. Some values are available to determine chronic excessive alcohol intake, however it can be difficult to quantitate level of maternal consumption. Hair tests are not typically helpful in acute use settings.

Substance by Substance
Sedative / Hypnotics

Examples
benzodiazepines, barbiturates, gamma hydroxybutyrate (GHB)

Routes of Use
typically ingestion

Observed Symptoms
- Adults: Sedation, slurred speech, ataxia, nystagmus (shaking eyes)
  - Withdrawal: similar to alcohol: irritability, anxiety, tremor, sleep disturbance nausea, seizures and psychosis.
- Child: same, respiratory depression

Prenatal Exposure
Prenatal exposure to benzodiazpines may lead a newborn to experience withdrawal symptoms known as neonatal abstinence syndrome. Symptoms of withdrawal include: feeding difficulties, diaper rash, excessive suck, difficulty sleeping, irritability, muscle tightness or tremors, increased temperature, fast breathing. NAS occurs within a week of birth, usually within 48 hours and symptoms may last weeks to months. Exposure to benzodiazepines in utero has concerns for facial clefts, cardiac malformations, but no syndrome has been identified.

Breastfeeding
The amount that enters the breastmilk will vary depending on the specific drug. Prescribed medications may be considered safe, consult a physician to clarify unique circumstances.

If we know that a caregiver is using Benzodiazepines, for example, one of the possible withdrawal symptoms is seizures and/or psychosis. This is important to know in planning when a caregiver should or shouldn't be alone with or even around a child. This can be helpful in asking caregivers and support systems what they see and what they're worried about.

Substance by Substance
Sedatives / Hypnotics

Urine
Many of the commonly used benzodiazepines (lorazepam, alprazolam, midazolam) may not return a positive benzodiazepine screen. If the result is unexpected (whether positive or negative), or evaluating for specific benzodiazepine use is needed, a confirmatory test is recommended. Most benzodiazepines and barbiturates are positive for a 1-3 days after acute use, some up several weeks depending on chronicity of use.

Blood
There are blood tests available to measure concentrations of various sedatives / hypnotics at most reference laboratories. However, clinical examination / observation and confirmatory urine are usually sufficient. Concentrations can be difficult to correlate with intoxication depending on the tolerance of the user.

Meconium
Assays for several benzodiazepines and barbiturates can be tested to evaluate for maternal use.

Umbilical Cord
Assays for several benzodiazepines and barbiturates can be tested to evaluate for maternal use.

Hair
Assays for several benzodiazepines and barbiturates can be tested to evaluate for exposure.

Substance by Substance
Amphetamines / Stimulants

Examples
methamphetamine (L, legal; and D, illicit), MDMA (ecstasy), MDA, methylphenidate

Routes of Use
ingestion, intranasal, injection, inhalation

Observed Symptoms
- Adults: tachycardia, hypertension, hyperactivity, pressured speech, diaphoresis, hyperthermia, psychosis, mydriasis, seizures
  - Withdrawal: also described as “amphetamine washout” with symptoms of fatigue, lethargy, hyperinsomnia, and mood disturbance and dysphoria after significant use. May mimic severe depression.
- Child: similar

Prenatal Exposure
Prenatal exposure to stimulants includes risks for preterm labor, intrauterine growth restriction, small for gestational age, low birth weight, poor fetal growth, and miscarriage.

Breastfeeding
There are some studies that demonstrate methamphetamine does transfer into breastmilk, most becomes undetectable after an average of 72 hours from last use. Methamphetamine is contraindicated during breastfeeding. Prescribed medications may be considered safe, consult a physician to clarify unique circumstances.

Methamphetamines are used with concerning paraphernalia and hazardous chemicals that leave children vulnerable to the possibility of harmful exposures. If pipes or needles are left on a coffee table that is accessible to a child, this could leave the child vulnerable to the possibility of being stuck with a used hypodermic needle or sucking on a pipe with methamphetamine residue.
Methamphetamines can be smoked and if done in the presence of children can lead to other health concerns. If you are concerned that a child may have been exposed to the use or production of methamphetamines, it is best practice to have them evaluated by a qualified medical provider to ensure there are no health complications.

Substance by Substance
Amphetamines / Stimulants

Urine
Most amphetamines can be detected for up to 3 days after acute use. Some testing assays may separate amphetamine, methamphetamine and MDMA, as they can all cross react and may also detect various decongestants, ADHD medications, and weight loss supplements. A confirmatory test is recommended if urine screen is positive, especially with methamphetamine.

Blood
Blood tests are not typical, as clinical examination and observation, along with urine tests are sufficient for intoxication and/or exposure. Specific amphetamine concentrations can be obtained if the situation is unclear.

Meconium
Assays for amphetamine and methamphetamine can be tested to evaluate for maternal use.

Umbilical Cord
Assays for amphetamine and methamphetamine can be tested to evaluate for maternal use.

Hair
Assays for amphetamine and methamphetamine can be tested to evaluate for exposure.

Substance by Substance
Cocaine

Examples
crack, speed ball (cocaine + heroin), rock candy

Routes of Use
ingestion, intranasal, injection, inhalation

Observed Symptoms
- Adult/Child: Similar to amphetamines/stimulants, in addition to myocardial infarction (heart attack), stroke
  - Withdrawal: similar to amphetamine and “wash-out” with symptoms of fatigue, lethargy, hyperinsomnia, and mood disturbance and dysphoria. May mimic severe depression.

Prenatal Exposure
- Risks of prenatal exposure include: preterm labor, intrauterine growth restriction, small for gestational age, low birth weight, miscarriage, behavioral lability and irregularities in heart rate and blood pressure, abnormal alertness, tone, and motor development.

Breastfeeding
Cocaine can be found in high levels in the breastmilk after maternal use and breastfeeding is not recommended.

Withdrawal from cocaine can lead to mood disturbance in adults. Infants also withdrawing after birth have high pitched cries that can be especially difficult for caregivers, particularly those withdrawing as well. This combination of factors could lead to frustration in caregiving and may increase danger for babies and toddlers who, by nature, need attentive care and supervision.The risk of shaken baby syndrome/abusive head trauma, feeding injuries from bottle jamming, or potty training injuries is high. If safety planning with parents around substance use, consider these risks and be thoughtful around planning an alternate caregiver for the children during and after use, including periods of potential withdrawal. This is where engaging the family around what their use looks like - including what their triggers for use are, how long the high lasts, and then how long the coming down period affects them - is imperative for safe planning care for children.

Substance by Substance
Cocaine

Urine
Screens and confirmatory tests for cocaine metabolite benzoylecgonine, can be positive for 3-5 days after last use.

Blood
Both parent compound and metabolite can be tested, however it is atypical as parent compound is rapidly metabolized. Clinical examination and observation in conjunction with history and/or urine is typically reliable.

Meconium
Assays for cocaine and metabolites can be tested to evaluate for maternal use.

Umbilical Cord
Assays for cocaine and metabolites can be tested to evaluate for maternal use.

Hair
Assays for cocaine and metabolites can be tested to evaluate for exposure.

Substance by Substance
Opioids

Examples
Opiates (naturally occuring): heroin, morphine, codeine
Opioids (synthetic & semi-synthetic): fentanyl (and associated analogs), tramadol, oxycodone, hydromorphone, oxymorphone, buprenorphine, methadone

Routes of Use
ingestion, intranasal, injection, inhalation

Observed Symptoms
- Adult: miosis, bradycardia, hypotension, sedation, constipation, respiratory depression
  - Withdrawal: diaphoresis, agitation, diarrhea, vomiting, tachycardia, yawning, body aches, abdominal pain, flu-like illness
- Child: same

Prenatal Exposure
Prenatal opioid exposure may lead a newborn to experience withdrawal symptoms known as neonatal abstinence syndrome. Symptoms of withdrawal include: feeding difficulties, diaper rash, excessive suck, difficulty sleeping, irritability, muscle tightness or tremors, increased temperature, fast breathing. NAS occurs within a week of birth, usually within 48 hours and symptoms may last weeks to months. Prenatal opioid exposure includes risk for miscarriage, preterm delivery, still birth, and low birth weight.

Breastfeeding
Amount in breastmilk and breastfeeding recommendations can vary depending on the specific opioid. Heroin can be transferred in breastmilk and is considered a contraindication to breastfeeding. Prescribed opioids or medication assisted treatment may be considered safe. Consult a physician to understand each unique siutation and circumstances.

What if opiates are prescribed to a caregiver? Consultation with a medical professional can be helpful when considering if there is a concern. If your "gut" tells you something is off, dig deeper to determine what. Is the caregiver taking the medications as prescribed? Are medications being mixed with other medications or other substances? The prescribing medical professional should be able to help you determine how the medication should affect the patient and how this may impact their caregiving abilities.

Substance by Substance
Opioids

Urine

- Urine drug screens test well for common metabolite of codeine, heroin and morphine, but will be unable to distinguish between the three. Depending on the UDS, it may react with synthetic opioids such as oxycodone, but not routinely, therefore many UDS have oxycodone as separate drug screen. Likewise, fentanyl will not be detected by Urine drug screens for opiates - such as heroin - due to its synthetic nature. It is necessary to specify opioids when testing for fentanyl. Depending on the opioid or opiate, tests can be positive up to 4 days after acute use.
- Confirmatory tests can distinguish between specific opiates (including heroin from morphine) and synthetic opioids (oxycodone, hydrocodone, fentanyl, etc). A confirmatory test is recommended if specific opioid exposure evaluation is needed.

Blood

Blood tests are typically not sent as clinical examination and observation of behavior, along with targeted urine tests, are sufficient for exposure. Concentrations can be difficult to correlate with intoxication depending on the tolerance of the user, however, specific opioids / opiates concentrates can be obtained from reference labs.

Meconium

Assays for opiates, opioids and their respective metabolites can be tested to evaluate for maternal use.

Umbilical Cord

Arguably preferred for fentanyl. Otherwise assays for opiates, opioids and their respective metabolites can be tested to evaluate for maternal use.

Hair

Assays for opiates, opioids and their respective metabolites can be sent to evaluate for exposure.

Substance by Substance
Opioids

When strategizing interventions for fentanyl users, remember that people use fentanyl for largely the same reasons that people use other substances. Some use it to experience an associated feeling of euphoria, others use it without knowing that it has been introduced to other substances they use, and still others may use it knowingly in order to meet the physical needs associated with opioid use disorder. As with all substance use disorder interventions, be sure to take a holistic approach that addresses underlying issues that may be driving substance use, as well as the substance use itself.

Substance by Substance
Marijuana

Examples
Hash, budders, waxes, shatters, edibles

Routes of Use
inhalation, ingestion

Observed Symptoms
- Adult: tachycardia, hypertension, agitation, sedation, psychosis, anxiety, vomiting
  - Withdrawal: irritability, cravings, sleep disturbance, headaches, mood changes
- Child: sedation, ataxia. Symptoms can be more prolonged in children

Prenatal Exposure
There is no known safe amount of marijuana use during pregnancy. Potential risks include small for gestational age, low birth weight, and impact on future cognitive development.

Breastfeeding
THC from marijuana passes into breastmilk and may affect development. The amount of time THC can be present in breastmilk is not entirely known and can depend on the chronicity of use. The long term impact on the child is also not entirely understood. However, it is not recommended to use marijuana while breastfeeding.

Marijuana is legal, so what? This can be a tricky question to answer. A few questions to consider when determining if there is an impact of marijuana use on a child may include: When and where are families using? Where are their kids when this is happening? If it's being ingested, how is it being stored so kids can't accidentally ingest it? What's the reason for use? If to get high, what's the high like? How long does it last? Once we find out answers to questions like these and many others we can help families determine if/how marijuana use is impeding caregiving. Then we have an opportunity to educate families on what we see and plan together around how to maintain safety for kids.

Substance by Substance
Marijuana

Urine

- Urine screens test well for THC and related metabolites. Tests can be positive for 1 week after acute naïve use, and several weeks with chronic use.
- Confirmatory testing is suggested if results are unexpected, otherwise screening results are fairly reliable.

Blood

THC concentrations can be evaluated for acute use and toxicity. After smoking, concentrations will peak and fall quickly (within 15-30 min), while ingestion will rise slower and lower (2-4 hours). Concentrations can be difficult to correlate with intoxication depending on the tolerance of the user. Blood tests are typically not sent, as history and symptoms typically verify exposure.

Meconium

Arguably better than umbilical cord to evaluate for maternal use, usually testing for THC metabolites (THC-Carboxy).

Umbilical Cord

Assays for THC parent compound and metabolites can be tested to evaluate for maternal use.

Hair

Assays for THC parent compound and metabolites can be tested to evaluate for exposure.

Substance by Substance
Hallucinogens

Examples
LSD, PCP, Ketamine and associated analog drugs

Routes of Use
ingestion (sublingual), inhalation, intranasal

Observed Symptoms
- Adult: visual and auditory hallucinations, nystagmus, ataxia, sedation, slurred speech, psychomotor agitation, delirium
- Child: same

Prenatal Exposure
- Risks for low birthweight, irritability, potential neurodevelopmental impact

Breastfeeding
Data on the presence of hallucinogens in breastmilk is very limited, and the effects on the breastfed infant are largely unknown. PCP has been detected in breastmilk, and is not recommended during breastfeeding.

Is it a hallucinogen or is it a mental health concern? Asking a family and their support network what mental health diagnoses they have can be beneficial in helping us to determine how to best plan with them. If no previous diagnosis exists, it still might be a mental health issue. Hallucinogens often come with other signs and symptoms like slurred speech. If you're on the fence, a toxicology test or consult with a mental health professional might help, but in the meantime, make a plan with the family to ensure safe caregiving for the kids.

Substance by Substance
Hallucinogens

Urine Screen
Many urine drug screens will evaluate for LSD and PCP, and can be positive for up to 3-4 days after acute use. However, Ketamine and Dextromethorphan (found in cough medications), will cross react with PCP. There is no routine testing available for Peyote. A confirmatory test for unexpected results and pediatric exposures is recommended.

Blood
Blood tests can be obtained to verify acute toxicity, although they are not routinely obtained as clinical examination and observation of behavior in conjunction with urine is typically sufficient.

Meconium
Assays available for various hallucinogens are limited with exception of PCP.

Umbilical Cord
Assays available for various hallucinogens are limited with exception of PCP.

Hair
Assays are limited for Hallucinogens.

Common Potential Positives & Negatives on Standard Urine Toxicology / Drug Screens

DRUG CLASSIFICATION	POTENTIAL POSITIVES	POTENTIAL NEGATIVES
Amphetamines	ADHD Medications Decongestants MDMA Buproprion Ephredrine Phenyethylamines	
Benzodiazepines	Diazepam Temazepam	Alprazolam Clonazepam Lorazepam Midazolam
Cannabinoids (Marijuana)	Promethazine Efavirenz	Synthetic cannabinoids Cannabidiol (CBD)
Opioids	Codeine Heroin Morphine	Semi-synthetic opioids (oxycodone, hydrocodone, etc) Synthetic opioids (fentanyl, methadone, etc)
Phencyclidine (PCP)	Dextromethorphan Ketamine Diphenhydramine Venlafaxine	

This table is NOT all inclusive for potential positives and/or negatives. Refer to specific commercial product details for more information about the sensitivity of the specific commercial assay.

Working with families who may be using substances is one of the most difficult things Child Welfare workers do. This is where engagement, observation, and leaning into your critical thinking skills come in handy! Families are generally worried about what may happen when child protection gets involved with their family. Television and print media often portray removal as the first, best and only option with children, and we know this is only one of the many paths that a child welfare case may take. How do we balance the perceived power of child welfare so we can work with families to address safety and risk concerns?

We hope you use this Toxicology Resource to help guide your decision making when you see symptoms or behaviors that might impact child safety. This guide can also help you to figure out what substance the caregiver might be using, and if a test is warranted, which test? If you are seeing behavior that is concerning for child safety, this guide can help to determine how long a substance might be in a caregiver's system in order to determine when a support person or network might be necessary. Families usually have support networks they can use in a crisis and completing the Colorado Family Safety Assessment tool can often help identify who they are. Many of the families we work with appear isolated and don't feel they have a support network. Get creative when asking this kind of question - who would they ask to pick up their kinds in an emergency? Who's programmed into their cell phone? Who are their facebook, instagram, or snapchat friends? Specific questions like this help to focus people in a crisis situation to build a specific safety network that can help to support the family.

Being transparent and leaning into the Colorado Family Safety Assessment Tool can be helpful. This tool can help provide a balanced assessment, looking at areas of danger, harm and risk along with strengths and protective capacities of caregivers and children. When the Colorado Family Safety Assessment tool is completed with family members, they know why child welfare is involved and that they have strengths to build on to mitigate danger, harm or risk.

Additional Information

Considerations When Testing Newborns, Children, or Adolescents

There are critical distinctions to keep in mind when reviewing toxicology results of a newborn, child, or adolescent:

- Newborns and children testing positive for a substance – other than a prescribed or recommended medical substance or an over-the-counter medication used as directed – require a heightened level of concern.
- It is important to remember that the absence of a positive test of a newborn, child, or adolescent does not mean there was not an exposure.
- Based on the type of test and the substance being tested for, a positive drug test result could mean either prenatal exposure to a substance, ingestion of a substance, or environmental exposure to a substance.
- While a positive test may answer your question about if a newborn or a child was exposed to the substance, it necessitates further exploration to understand the impacts (including clinical symptoms) to the child's health, safety, and well-being. This may include implications for environmental and behavioral risks.
- If one child has been exposed to a substance, consider additional children living in the home, or who may have also been exposed or impacted, that need to be assessed during this process.
- The testing methods do not change for children, adolescents, or adults.With adolescents, drug exposures can still be unintentional, but concerns for recreational use also need to be considered.

If there are ANY concerns or questions on interpretation of a toxicological test (whether positive or negative results, or what test to order), please consult a medical specialist.

Frequently Asked Questions

Q: Does a positive toxicology screen mean someone was intoxicated?

- A: Not necessarily. Depending on the drug, the user (naïve or chronic), and the modality of testing, it may or may not translate into intoxication. See pages 3-4.

Q: Can passive smoke exposure to a drug lead to a positive urine drug screen?

- A: Depending on the specific drug, passive smoke exposure in most naturally occurring environments usually is not enough of an exposure to lead to a positive standard screening urine drug screen. However, there are circumstances (prolonged high level of exposures in a very small, poorly ventilated space) that may lead to enough inhalational exposure to lead to a positive urine drug screen. As there tend to be many factors which could impact results in these situations, consider seeking a medical specialist to review. See page 8.

Q: Is there one matrix (blood, urine, hair, saliva) of testing that is the universally the best for drug exposure?

- A: No, each matrix of testing is unique in what it can test, how well it can test, and for what time frame it can detect drug exposure. See page 5.

Q: Does a negative standards urine drug screen equal no drug exposure?

- A: No. Remember, standard urine drug screens only test for a selective number of drug categories and can have many false positives and negatives. If there are specific concerns, they should be followed with selective confirmatory drug laboratory assays. See pages 3-4.

Q: Do all drug tests screen for the same drugs?

- A: No. There are many different commercial drug tests available. Also, some hospitals specifically do not screen for some drug categories, such as marijuana, due to the high incidence of public use and positive results. See pages 4-8.

Q: Does positive hair follicle testing equate to intoxication?

- A: No, it can be difficult to determine intoxication from hair testing. Hair follicle testing can be representative of drug exposure - either environmental exposure or systemic exposure - over the past few months. However, it should not be used to evaluate for acute exposure or intoxication. Given that a hair follicle test will only confirm whether or not exposure occurred over the past few months, but not the details surrounding how it occurred, how many times it occurred, or how much exposure occurred, hair follicle testing of children is not recommended as an effective method of confirming caregiver use. See page 5.

Frequently Asked Questions

Q: Is drug testing for adolescents different than drug testing children?

- A: The testing methods do not change for adults, adolescents, or children. With adolescents, drug exposures can still be unintentional, but concerns for recreational use also need to be considered. As opposed to young children, where exposure is likely either malicious or unintentional. See page 9.

Q: What is the difference between a UA & a UDS?

- A: UA stands for urine analysis. It is used to detect urine infections. UDS is urine drug screen. The correct term to refer to a toxicology test is UDS. See page 4.

Q: Do decreasing levels on urine drug screens mean a person has decreased or stopped their use of a substance?

- A: Urine drug concentrations (also known as levels) are rarely useful in determining the amount of use or level of intoxication. Blood drug concentrations can be a better indicator of potential level of intoxication. This can vary based on the the drug itself, as well as chronicity and timeline of use. It can be difficult to conclude abstinence by only following drug concentrations over time as this will depend on the speed of metabolism of the specific drugs and the matrix used for testing. See page 4.

Q: If fentanyl is known to be lethal in such small doses, why do people continue to use it?

- A: People use fentanyl for the same variety of reasons that they use other substances, including other opioids. Some users with opioid use disorders have chosen to use it as a cheaper and/or more powerful alternative to other opioids. Others may find that fentanyl has been surreptitiously added to other substances such as methamphetamines or cocaine.

Q: What can be done to help someone with an opioid use disorder who is using fentanyl?

- A: The CDC recommends intervening early with individuals at highest risk for overdose, expanding non-pharmacological and non-opioid therapies, and expanding the distribution and use of naloxone to prevent overdose fatalities.

Glossary of Terms

Assay: a method of lab testing

Ataxia: unbalanced

Biologic Matrices: bodily fluids that can be tested - urine, blood, hair, saliva, meconium, umbilical cord

Bradycardia: low heart rate

Bradypnea: slow breathing

Chronicity: chronic and/or habitual use

Diaphoresis: sweaty

False negative: undetected substance, despite exposure. This may occur of the concentrations are below the limits of detection, beyond the time of detection, or the assay does not detect the substance despite being in the drug category.

False positive: detected substance, despite no exposure. This may occur if a drug has a similar structure to the drug category, such as dextromethorphan and PCP.

Hypertension: high blood pressure

Hypoglycemia: low blood sugar

Hypoplastic philtrum: underdevelopment of the upper lip

Hypotension: low blood pressure

Immunoassay: a biochemical test measuring the presence of a substances, typically using an antibody or antigen

Maxillary hypoplasia: underdevelopment of the cheek bones

Meconium: A newborn's first stool, or poop, which is sticky, thick, and dark green and is composed of materials ingested during pregnancy beginning around week 12

Metabolite: compounds that have resulted from metabolism of the original drug

Glossary of Terms

Microcephaly: small head

Micrognathia: small jaw

Miosis: small pupils

Mydriasis: large pupils

Nystagmus: shaking eyesPalpebral fissures: opening between the eyelids

Parent Compound: original drug

Perinatal: around time of birth

Prenatal: before birth

Postpartum: after delivery

Qualitative: results will be positive or negative. A positive test must meet a minimum concentration. Thus, will not tell you if the results have extremely high levels. On the contrary, low level exposures that are below the limit of detection will return negative

Quantitative: results will be in a concentration: ie mg/dl, etc.

Sensitivity: The ability of a drug test to correctly identify those with a drug exposure

Specificity: The ability of a drug test to correctly identify those without a drug exposure

Systemic Exposure: a drug that actually gets absorbed (any route) and can become detectable.

Tachycardia: fast heart rate

Tachypnea: fast breathing

Toxidrome: constellation of signs and symptoms consistent with a specific or category of substances.

Resources

Examples of reference laboratories and other resources (not all inclusive list), with additional information pertaining to lab testing, both general and specific:

- NMS Labs, https://www.nmslabs.com/
- ARUP Laboratories, https://www.aruplab.com/
- LabCorp, https://www.labcorp.com/
- Drugs & Lactation Database: LactMed, https://toxnet.nlm.nih.gov/newtoxnet/lactmed.htm

Resources for Additional Information or Consultation:

- Colorado Department of Human Services Office of Children, Youth and Families Division of Child Welfare - Suzy Morris, Substance Exposed Newborn Specialist, Child Protection Services Unit, 303-866-4268, susan.morris@state.co.us
- Child Abuse & Neglect Expert Staffing (CANES) through Illuminate Colorado - www.illuminatecolorado.org/canes or canes@illuminatecolorado.org
- Medical Toxicology Consultation & START Team through the Kempe Center for the Prevention and Treatment of Child Abuse and Neglect - http://www.ucdenver.edu/academics/colleges/medicalschool/departments/pediatrics/subs/can/START/Pages/START.aspx or KempeSTART@UCDENVER.EDU
- Child Welfare Training System Web Based Training - The Substance Use Puzzle: Putting Together the Pieces https://learning.coloradocwts.com/course/view.php?id=126
- Narcan/Naloxone Resources:
  - In Denver: https://us.openforms.com/Form/0b3ab074-c139-481b-9912-331b3c9b147b
  - In Colorado: https://cdphe.colorado.gov/prevention-and-wellness/injury-prevention/overdose-prevention/naloxone-standing-orders

References

1. Colby JM. Comparison of umbilical cord tissue and meconium for the confirmation of in utero drug exposure. Clin Biochem. 2017 Sep;50(13-14):784-790. doi: 10.1016/j.clinbiochem.2017.03.006.
2. Cotton SW. Drug testing in the neonate. Clin Lab Med. 2012 Sep;32(3):449-66. doi: 10.1016/j.cll.2012.06.008.
3. Cuypers E, Flanagan RJ. The interpretation of hair analysis for drugs and drug metabolites. Clin Toxicol (Phila). 2018 Feb;56(2):90-100. doi: 10.1080/15563650.2017.1379603.
4. Dolan K, Rouen D, Kimber J. An overview of the use of urine, hair, sweat and saliva to detect drug use. Drug Alcohol Rev. 2004 Jun;23(2):213-7.
5. Grunbaum AM, Rainey PM. Laboratory Principles. In: Nelson LS, Howland M, Lewin NA, Smith SW, Goldfrank LR, Hoffman RS. eds. Goldfrank's Toxicologic Emergencies, 11e New York, NY: McGraw-Hill.
6. Huestis MA, Choo RE. Drug abuse's smallest victims: in utero drug exposure. Forensic Sci Int. 2002 Aug 14;128(1-2):20-30.
7. Jones AW. Medicolegal Acohol Determination: Blood or Breath-Alcohol Concentration? Forensic Sci Rev. 2000 Jan;12(1-2):23-47.
8. Kintz P, Villain M, Cirimele V. Hair analysis for drug detection. Ther Drug Monit. 2006 Jun;28(3):442-6.
9. Kocherlakota P. Neonatal abstinence syndrome. Pediatrics. 2014 Aug;134(2):e547-61. doi: 10.1542/peds.2013-3524.
10. Lozano J, García-Algar O, Vall O, de la Torre R, Scaravelli G, Pichini S. Biological matrices for the evaluation of in utero exposure to drugs of abuse. Ther Drug Monit. 2007 Dec;29(6):711-34.
11. Moeller KE, Kissack JC, Atayee RS, Lee KC. Clinical Interpretation of Urine Drug Tests: What Clinicians Need to Know About Urine Drug Screens. Mayo Clin Proc. 2017 May;92(5):774-796. doi: 10.1016/j.mayocp.2016.12.007.
12. McDonnell MG, Skalisky J, Leickly E, McPherson S, Battalio S, Nepom JR, Srebnik D, Roll J, Ries RK. Urine Ethyl Glucuronide in Urine to Detect Light and Heavy Drinking in Alcohol Dependent Outpatients. Drug Alcohol Depend. 2015 Dec 1;157:184-187.
13. Drummer OH. Drug Testing in Oral Fluid. Clin Biochem Rev. 2006 Aug;27(3):147-159.
14. Palmer KL, Wood KE, Krasowski MD. Evaluating a switch from meconium to umbilical cord tissue for newborn drug testing: A retrospective study at an academic medical center. Clin Biochem. 2017 Apr;50(6):255-261. doi: 10.1016/j.clinbiochem.2016.
15. Raffaeli G, Cavallaro G, Allegaert K, Wildschut ED, Fumagalli M, Agosti M, Tibboel D, Mosca F. Neonatal Abstinence Syndrome: Update on Diagnostic and Therapeutic Strategies. Pharmacotherapy. 2017 Jul;37(7):814-823. doi: 10.1002/phar.1954.
16. Saitman A, Park HD, Fitzgerald RL. False-positive interferences of common urine drug screen immunoassays: a review. J Anal Toxicol. 2014 Sep;38(7):387-96. doi: 10.1093/jat/bku075.
17. Stauffer SL, Wood SM, Krasowski MD. Diagnostic yield of hair and urine toxicology testing in potential child abuse cases. J Forensic Leg Med. 2015 Jul;33:61-7. doi: 10.1016/j.jflm.2015.04.010.
18. Wabuyele SL, Colby JM, McMillin GA. Detection of Drug-Exposed Newborns. Ther Drug Monit. 2018 Apr;40(2):166-185. doi: 10.1097/FTD.0000000000000485.

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