Children’s Mercy Hospitals and Clinics Toxicology Laboratory offers several drug screens. The common sample types are urine, blood and meconium and vary depending on clinical needs. Depending on the drug screen, different methods such as immunoassays, spot tests, thin layer chromatography and gas chromatography mass Spectrometry (GC-MS) are employed. Brief description of the drug screens offered by our toxicology laboratory is given below:

**Comprehensive Urine Drug Screen:** Most of the drugs are excreted and concentrated in the urine. Therefore, in addition to ease of sample collection, urine makes a good specimen for comprehensive drug screen. This screen detects a large number of drugs (>300) and is useful in overdose situations when the history of drug ingestion is not known. The methods used include immunoassays, spot tests, thin layer chromatography and GC-MS. See the discussion below on the limitations of immunoassays under urine drugs of abuse. A partial list of drugs/toxins/metabolites detected by our comprehensive drug screen is given below. Some of the drugs are detected only in an overdose situation.


**Urine Drug of Abuse Screen**: This screen includes amphetamine/ methamphetamine, barbiturates, benzodiazepines, cannabinoids (marijuana), cocaine/cocaine metabolites, methadone, opiates, phencyclidine and propoxyphene by immunoassays. The screen also includes ethanol by gas chromatography. It is important to keep in mind that immunoassays are screening methods and are prone to false positive results. Therefore, before talking to a patient or parent about drug abuse, it is important to confirm the preliminary screen result by a specific method such as GC-MS. Some issues relating to drugs of abuse are discussed below:

**Amphetamine/Methamphetamine**: The assay is most specific for d-amphetamine and d-methamphetamine. However, high concentrations of medications containing sympathomimetic amines such as ephedrine, pseudoephedrine, phenylpropanolamine, phentermine and fenfluramine can cross-react and cause false positive results. Furthermore, many prescription drugs, for example Adderall and Deprenyl, may contain or metabolize to amphetamine or methamphetamine Therefore, it is important that the positive result be interpreted with caution and confirmed by a confirmatory method.

**Barbiturates**: Due to high therapeutic doses, barbiturates are generally detected in the urine. Most of the time, the positive results are due to therapeutic intervention.

**Benzodiazepines**: Due to significant differences in the doses and the cross-reactivity of the antibody with different benzodiazepines, detection of different benzodiazepines varies significantly. For example a diazepam dose may be 10 times higher than a clonazepam dose; flunitrazepam (rape date drug) is a very potent benzodiazepine and will go undetected under normal screening.

**Opiates/Opioids**: The opiate assay is most sensitive to morphine and can also detect codeine at moderate concentrations. The assay is not very sensitive to oxycodone, hydrocodone and hydromorphone. Potent opioids such as fentanyl, alfentanil and sufentanil are present in very low concentrations and the immunoassay is not designed for their detection. Therefore, these drugs will go undetected by the opiate assay.

**Serum Drug Screen**: Blood is the best specimen when specific drug levels are needed. Urine is generally a better specimen for drug screening as it has a higher concentration of drugs and is a cleaner medium for analysis. In addition, some methods are specifically designed for urine. For example, the benzodiazepine and opiates immunoassay are more sensitive to conjugated drugs than free drug, and urine contains higher concentrations of conjugated drugs than blood. In addition to drugs included in the urine drug of abuse screen, this screen includes acetaminophen, salicylates and tricyclic antidepressants.

**Meconium Drug Screen**: This screen uses immunoassays to screen for the same drugs included in the urine drug of abuse panel. As meconium is a very heterogeneous and complex-colored matrix, it is prone to false positive results. As discussed above, all positive screening results should be confirmed.