



Meconium Drug Testing

Reasons for the early identification of the drug exposed infant:

Drug abuse during pregnancy is a major health problem since the associated perinatal complications are high. These include a high incidence of stillbirths, meconium stained fluid, premature rupture of the membranes, maternal hemorrhage and fetal distress. In the newborn infant, mortality and morbidity rates are high. The latter includes a high incidence of asphyxia, prematurity, low birth weight, aspiration pneumonia, congenital malformations, cerebral infarction, drug withdrawal and infection, including AIDS. Similarly, long term sequelae in the infants are not uncommon and include delays in physical growth and mental development, sudden infant death syndrome and learning disabilities. Because of these immediate and long-term problems, infants born to women who have abused drugs during pregnancy should be identified soon after birth so that appropriate intervention and follow up can be instituted. Accurate identification of the drug exposed neonate is important for other reasons such as epidemiologic surveys, to identify women who will need support and or to assess the effectiveness of programs designed to reduce the incidence of drug abuse among pregnant women¹.

Identification of the drug exposed infant is not easy:

Unfortunately, the drug-exposed neonate is not easy to recognize. Many of the drugs which the fetus was exposed to do not produce immediate, recognizable effects. Maternal admission to the use of illicit drugs is often inaccurate because of fear of the consequences stemming from such admission. Even with maternal cooperation, information on the type and/or extent of drug usage is often inaccurate. One alternative is to test the infant's urine for drugs, but this procedure has its limitations since the successful detection of drug metabolites in the infant's urine is dependent on time of the last drug intake by the mother or when after birth the infant's urine was collected. The high rate of false negative urine test in the infant often arises from the mother's abstention from the use of the drug a few days before she delivers or to the inability to obtain a sample of the infant's urine soon after birth. Recently, analysis of the infant's hair for drugs has been used. Technical problems in the analysis and sample collection make this method not practical in the neonate¹.

Meconium drug testing:

Meconium drug testing is a new and sensitive method for identifying infants who have been exposed to drugs in utero². Meconium represents the first series of green stools, which the infant excretes after birth. The concept behind meconium testing was based on initial research in animals, which showed, that a high concentration of the drugs, which the pregnant animal was exposed to, were present in the meconium of their fetuses³. Drugs, which the fetus is exposed to during pregnancy, are metabolized by its liver into water-soluble metabolites and excreted into the bile or urine. It is postulated that drug deposition in meconium occurs either through bile secretion or through swallowing by the fetus of its urine via the amniotic fluid.

Clinical studies:

A number of human, clinical studies have validated the sensitivity of the meconium drug test⁴⁻⁸. The initial study compared drug detection in 20 infants of drug dependent mothers by meconium and urine analysis⁴. Whereas most meconium samples contained either cocaine, opiate or cannabinoid, only 37% of the urine tested was positive for these drugs. Subsequent studies have corroborated these findings.

Meconium was analyzed for cocaine, morphine, codeine and marijuana in 28 neonates born to women suspected of drug abuse ⁵. Compared with the combination of maternal and newborn urine testing, meconium testing had an 82% positive predictive value and a 91% negative predictive value. Collection of meconium was also found to be easier and more reliable than collection of urine. In another study, the sensitivity of meconium and urine drug analyses to detect cocaine exposure in 59 infants were compared using radioimmunoassay and gas chromatography ⁶. Meconium analysis was found to be more sensitive than urine analysis ($p < 0.02$); urine immunoassay failed to identify 60% of the cocaine exposed infants. The largest clinical study using the meconium drug test involved a study of drug prevalence in a large, high risk, obstetric population ⁷. The superiority of meconium testing over maternal history was demonstrated. A fourfold (44.3% vs. 11.1%) higher incidence of drug exposure was found among 3010 infants tested by meconium analysis as compared to maternal history. In a recent study, detection of cocaine exposure in 50 maternal/infant dyads was compared using maternal history and analysis of meconium, maternal urine and infant's urine by GC/MS and enzyme and radioimmunoassay. Meconium analysis was found to be superior to either maternal or infant urine in detecting in utero cocaine exposure, although the need for concomitant maternal histories in some cases was emphasized ⁸. The meconium drug test has been adapted for mass drug screening of newborn infants ⁹ and selection criteria for routine testing of infants have been formulated ¹⁰.

In summary, meconium drug testing is ideal in the newborn period for several reasons: (1) the test is highly sensitive and specific, (2) collection of meconium is easy and non invasive, and (3) drugs in meconium are present up to the third day after birth; thus late testing of the infant for drugs is possible. Meconium drug testing has therefore become a useful tool for clinical and research purposes.

References

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