#24b : Concordance of Newborn and Maternal Drug Screen Results by Immunoassay and Mass Spectrometry

Hannah M. Brown, Stephen M. Roper, Dennis J. Dietzen, Bridgit O. Crews
[1]Department of Pathology & Immunology, Washington University in St. Louis School of Medicine, St. Louis, MO

BACKGROUND

- Drug testing is widely used to assess for drug exposure, misuse or abuse, and prescription compliance.
- Immunoassay (IA) is the most widely used method but suffers from poor specificity and sensitivity.
- More recently, mass spectrometry (MS) methods have been developed to serve as first tier testing, circumventing immunoassay screening protocols.
- Newborn urine drug testing faces preanalytical and analytical challenges due to difficult sample collection protocols, low drug concentrations, and unique drug metabolites differing from target analytes.
- For these reasons, paired testing of urine and meconium is often performed.

OBJECTIVE

- This study is a follow-up to an initial assessment of high-sensitivity neonatal urine drug testing to paired meconium samples

METHODS

- Retrospective analysis of 1,424 neonates with paired urine and meconium specimen collections between January 2020 and December 2022 at St. Louis Children's Hospital (SLCH).
- Within this patient cohort, a subset of 831 newborns with mothers having a UDS performed at SLCH within three days of birth were identified
- UDS was performed at SLCH using an in-house LC-MS/MS method; all positive urines were retested with a second aliquot from the same sample prior to reporting
- Meconium testing performed at Mayo Clinic Laboratories (screen with ELISA; confirm with LC-MS/MS)

Sensitive LC-MS/MS analysis of paired neonatal and maternal urine detects more instances of in utero drug exposure than meconium, with the exception of cannabinoids.

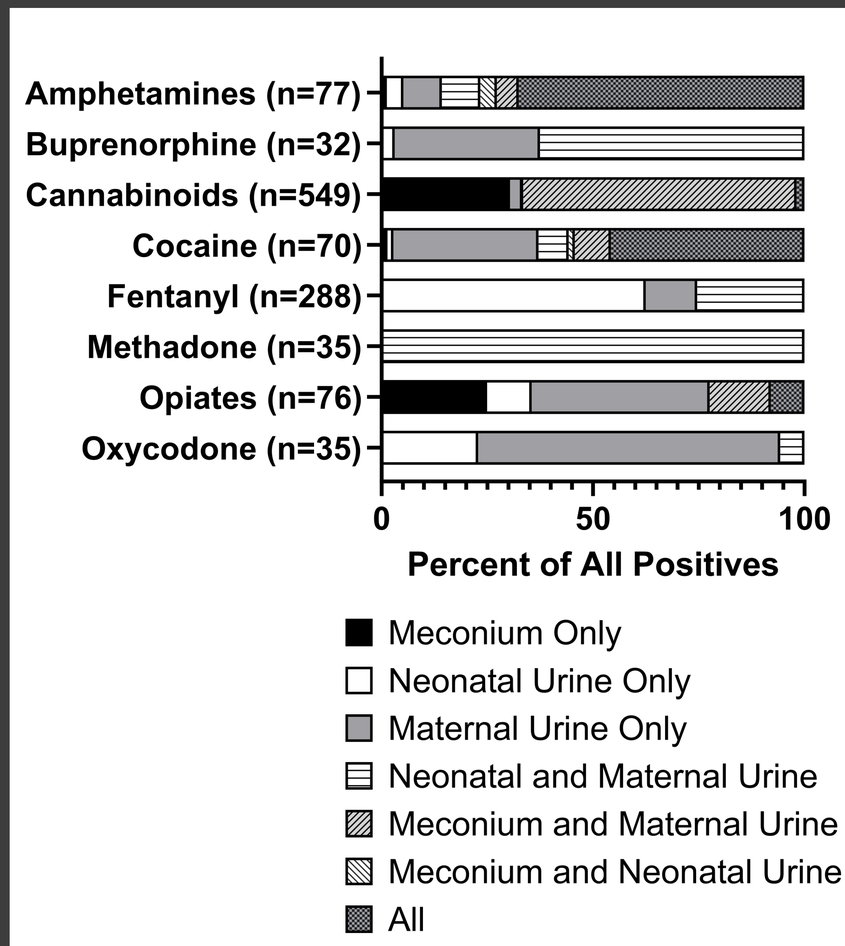


Figure 1: Comparison of positivity rates of individual drug classes by specimen type in 831 paired newborns and mothers.

IMPACT TO THE CLINICAL LABORATORY

Additional studies that evaluate the utility of different neonatal matrixes to detect illicit opioid use are needed.

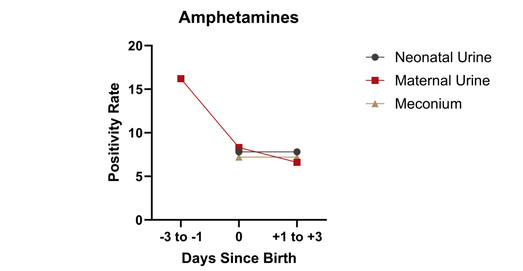
RESULTS

Table 1: Agreement between each specimen type for individual drug classes.

Drug	Neonatal Urine| Meconium Weighted Kappa (95% CI)	Neonatal Urine| Maternal Urine Weighted Kappa (95% CI)	Meconium| Mother Urine Weighted Kappa (95% CI)
Amphetamines	0.87 (0.81-0.94)	0.86 (0.80-0.93)	0.85 (0.78-0.92)
Buprenorphine	n/a	0.76 (0.63-0.89)	n/a
Cannabinoids	0.1 (0.00-0.02)	0.02 (0.01-0.04)	0.57 (0.52-0.62)
Cocaine	0.83 (0.74-0.92)	0.68 (0.58-0.78)	0.69 (0.59-0.79)
Fentanyl	n/a	0.27 (0.20-0.33)	n/a
Methadone	n/a	1 (1)	n/a
Opiates	0.22 (0.06-0.38)	0.17 (0.4-0.30)	0.37 (0.23-0.50)
Oxycodone	n/a	0.09 (0.00-0.23)	n/a

Table 2: Positivity rates for individual drug classes in neonatal urine, maternal urine, and meconium.

Drug	Neonatal urine	Maternal urine	Meconium
Amphetamines	7.8	8.4	7.2
Buprenorphine	2.5	3.7	n/a
Cannabinoids	1.4	45.8	64.0
Cocaine	4.7	8.1	4.8
Fentanyl	30.4	13.0	n/a
Methadone	4.2	4.2	n/a
Opiates	1.7	5.9	4.3
Oxycodone	1.2	3.2	n/a



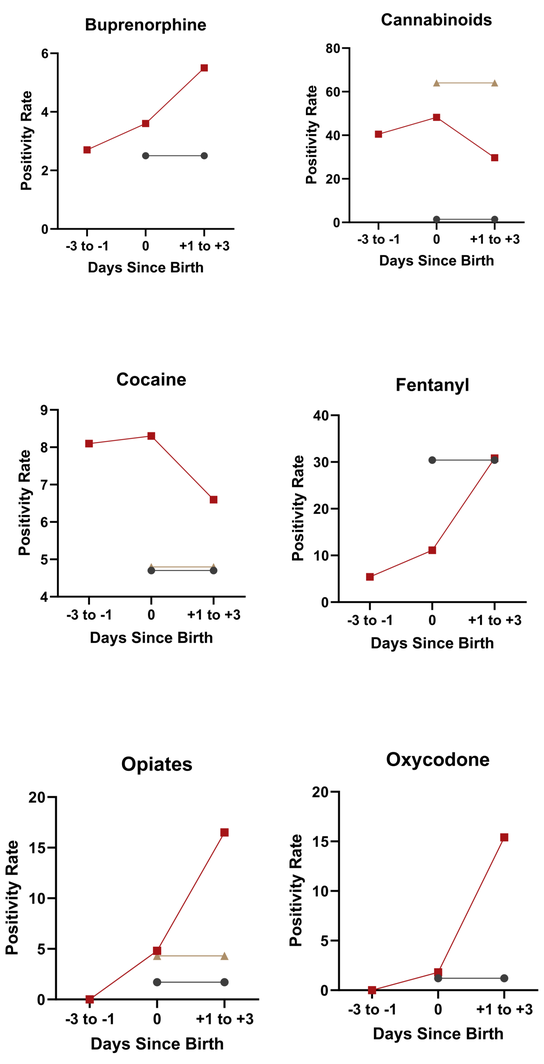


Figure 2: Variation in positivity rates in maternal urine for individual drug classes tested before, at, and after delivery is observed.