USDTL®
The Leader in Newborn Toxicology
QUARTERLY NEWS
January 2014 Vol. 5 Issue 1

Neonatal Abstinence Syndrome And Variations in Expression

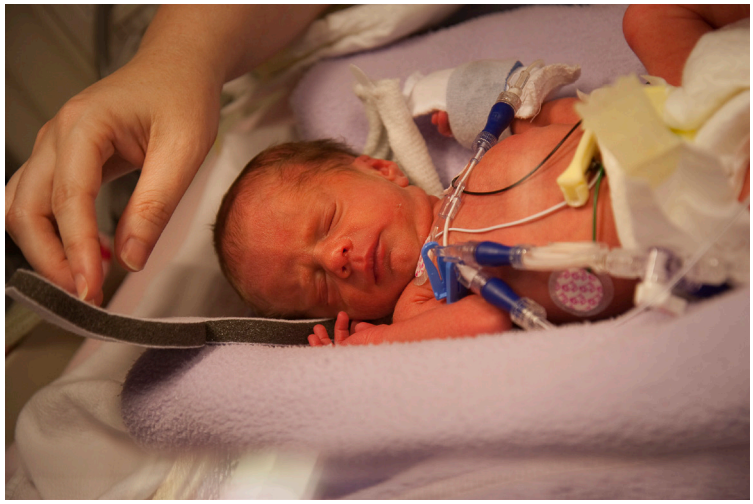
By Loretta P. Finnegan, M.D.

Burgeoning numbers of infants exposed to a variety of substances which cause untoward effects are seen in major hospitals across the United States. A 2012 report indicated that between 2000 and 2009, the number of mothers using opiates increased from 1.19 to 5.63 per 1,000 hospital births per year. Additional data from this study compared discharges for Neonatal Abstinence Syndrome (NAS) versus all other hospital births in 2009. NAS was diagnosed at a rate of 3.39 per 1000 hospital births per year. Newborns with NAS were 19% more likely than all other hospital births to have low birth weight and 30% more likely to have respiratory complications. Compared with all other hospital births, newborns with NAS, in addition to being significantly more likely to have respiratory diagnoses and low birth weight, also had feeding difficulties and seizures more often. In the US, the incidence of smoking in pregnant women is reported as 17.3 %. Concomitant smoking in opioid dependent women in treatment can approach more than 90%.

Because of their low molecular weight and lipid solubility, psychoactive medications easily pass through the placenta from the mother to the fetus at varying degrees depending on the properties of the individual drugs. Once the drugs pass across the placenta and accumulate in the fetus, there is an equilibrium established between maternal and fetal blood. Disruption of the trans-placental passage of drugs at birth, when the umbilical cord is cut, terminates the drug supply to the baby with the potential of the development of symptoms of withdrawal or abstinence. This constellation of symptoms constitutes a multisystem disorder involving the central nervous system, gastrointestinal system, respiratory system and the autonomic nervous system, which is termed the Neonatal Abstinence Syndrome.

If not recognized and not treated, NAS can cause death in the infant due to excess fluid losses, high temperatures, seizures, respiratory instability, aspiration of fluid into the lungs or cessation of breathing. However, with current medical knowledge concerning drug abuse in pregnancy and the care of the newborn, no infant mortality should occur as a result of NAS.

An assessment tool permits an accurate evaluation of the signs and symptoms and the severity, avoids unnecessary treatment of mildly affected infants and provides a



iStock photo

methodology for effective dosing and tapering of medications. The Finnegan Neonatal Abstinence Score (FNAS) is recommended by the American Academy of Pediatrics for assessment of the baby who may develop NAS as a result of *in utero* exposure to opioids. The FNAS rates the individual signs and symptoms assigning each a relative weight based on the relationship to newborn morbidity—the higher score of an item relates to more severe morbidity. The score becomes a valuable objective measure to assess the onset, progression, and diminution of symptoms of abstinence. Routine prophylactic pharmacological treatment is not recommended for NAS since not all drug-exposed newborns experience abstinence symptoms, however, it is very important to closely observe the newborns for symptoms that may occur over the first 4-5 days of life. Treatment should be provided based on principles of accurate assessment and diagnosis. The diagnosis should be confirmed by maternal history of opioid use and a urine or meconium toxicology screen.

Assessment for other neonatal conditions should also be considered since the symptoms of NAS can mimic such conditions as septicemia, encephalitis, meningitis, post-anoxic CNS irritation, hypoglycemia, hypocalcemia and cerebral hemorrhage, all of which the infant born to the substance misusing woman are at risk for, especially because of maternal infections and pre-term birth.

Pharmacological treatment is provided according to the

Continued on page 2, NAS

Continued from page 1, NAS
severity of the score which monitors the infant's clinical response to medication and the amount necessary to control the symptoms followed by progressive tapering of the dose. Clinicians should provide an opioid medication in the treatment of NAS using a titration method to increase the dose (in mg/kg) according to severity of the scores. Prompt escalation of dose with aggressive decreases in dose as symptoms abate are essential principles. Specific medications generally administered for neonatal opioid abstinence include oral morphine or methadone according to body weight and score. Both are recommended by the American Academy of Pediatrics (2012). In the United Kingdom 94% and in the United States, 83% of physicians use morphine or methadone to treat neonatal opioid abstinence. Sublingual administration of buprenorphine has been studied in the treatment of neonatal abstinence and a dose schema has been developed.

Provision of supportive interventions, many of which are traditional methods of soothing a newborn infant, are important in the treatment of neonatal abstinence. Some of these supportive interventions include: offer a pacifier (Non-Nutritive Sucking); skin to skin contact with the mother; swaddling snugly with hands available for sucking; do not overdress the baby; aspirate naso-pharynx; feed small amounts frequently (q 2hrs) if poor feeding persists but do not over feed; and positioning the baby to right side-lying to reduce aspiration if vomiting or regurgitation is a problem.

During prenatal exposure and in the postpartum period, many issues can influence the expression of Neonatal Abstinence Syndrome. Amongst those identified as having a decreased effect upon NAS expression are the following: the time needed to excrete the psychoactive medication (the longer that it takes, as in pre-term babies, the less severe the NAS); illness in the neonate; breastfeeding; certain genes such as OPRM1 and COMT; rooming-in with the mother versus admission to the NICU. Those issues that can enhance NAS expression include: maternal concomitant drug use (i.e., opioids plus benzodiazepines); maternal methadone versus buprenorphine; and maternal smoking.

References and the second half of Dr. Finnegan's article will be published in the April 1, 2014 Quarterly Newsletter. To access the full text article now online, visit www.USDTL.com/assets/finnegan_jan_2014.pdf

Dr. Loretta Finnegan and colleagues first created the Finnegan Neonatal Abstinence Scoring System in 1975, and it is now in widespread use in the United States and other countries. She is the founder and owner of Finnegan Consulting, LLC, of the Greater Philadelphia, PA area. Dr. Finnegan was a Senior Medical Advisor to the National Institutes of Health from 1990 to 2006. She has published more than 170 scientific papers and received numerous awards for her work addressing women's and newborn health, and perinatal drug addiction.

Ask The Toxicologist

Client Question:

We are currently treating a baby for withdrawal. Treatment started on the day of birth. The mother admitted to using Percocet, Valium, and marijuana. She also said she used Oxycodone twice. All were street drugs. I was very surprised when the umbilical cord test came back negative. With the range of medications admitted to by the mother, why might none of them have been detected in the baby's umbilical cord sample?
- Neonatal Nurse Practitioner

USDTL Toxicologist Answer:

A few things may explain the negative umbilical cord result. First, self-report of drug use is often unreliable. The mother may not be reporting all the substances she is using, and the actual drug causing the withdrawal may not have been included in the umbilical cord analysis. Also, the baby may be withdrawing from a substance not normally tested for in umbilical cord, such as synthetic cannabinoids.

Umbilical cord testing is not designed to detect therapeutic levels of medications, i.e. medication taken following the proper dosage specified by a legally-obtained prescription from one's doctor. If the mother's usage was at or below therapeutic levels, it would be unlikely to cause a positive test result.

The immediate onset of withdrawal symptoms suggests this is a classic case of nicotine withdrawal, especially if it was within the first day of life. Opioid withdrawal typically does not occur until day 2, 3, or 4. Nicotine withdrawal may last several days, but will not be as unpleasant as opioid withdrawal for the baby. As well, the combination of nicotine and opioid exposure in the womb has been shown to intensify NAS symptoms. (See this issue's cover story by Dr. Loretta P. Finnegan for more detail regarding nicotine and neonatal withdrawal.)

CAP ACCREDITED™

USDTL is a Forensic Drug Testing Laboratory certified by The College of American Pathologists providing newborn toxicology.

USDTL Awarded NIAAA Funding to Investigate The Epigenetics of Prenatal Alcohol Exposure

By Joseph Salerno, Scientific Copywriter, USDTL

USDTL (United States Drug Testing Laboratory, Inc.) researchers will investigate the relationship between in utero alcohol exposure and epigenetics using Small Business Innovation Research (SBIR) funding from the National Institute on Alcohol Abuse and Alcoholism (NIAAA). The goal of USDTL's new research program is to identify epigenetic patterns that are associated with prenatal alcohol exposure in newborns. Aileen Baldwin, Ph.D., MPH, Senior Scientist at USDTL, will lead the project.

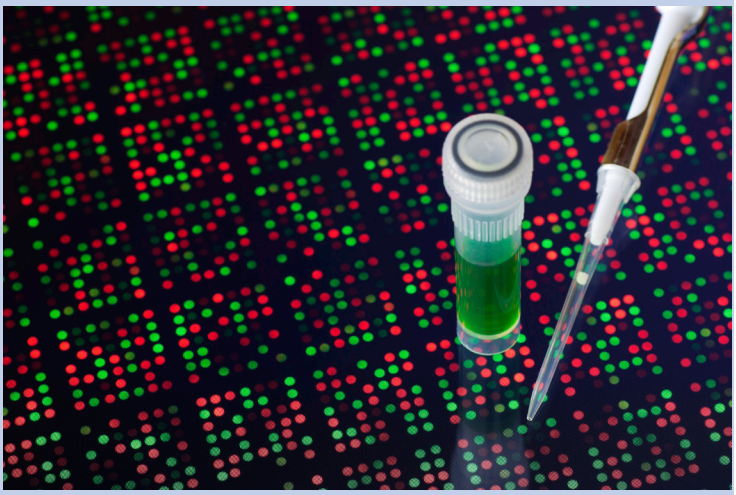
At The Forefront of Newborn Toxicology

USDTL is currently able to detect and identify for research purposes the direct ethanol biomarker phosphatidylethanol (PEth) in newborn dried blood samples. PEth is produced by the body when a person drinks alcohol[1], and can be measured in blood samples up to three weeks following alcohol consumption. Research suggests that PEth can be detected in blood samples from newborns that were exposed to alcohol in late pregnancy following maternal consumption. Working with the University of Chicago Genomics Core Facility, USDTL will use the SBIR funds in basic research to examine if there are epigenetic changes in newborn dried blood samples that have tested positive for PEth.

Epigenetics involves changes to gene expression that are not caused by changes in the sequence of DNA. The addition of molecules called methyl groups to DNA (DNA methylation) is one such epigenetic change, which plays a critical role in newborn development. Studies using animal models have demonstrated that prenatal alcohol exposure alters DNA methylation patterns. These studies suggest that harmful effects from alcohol on the developing embryo occur through an epigenetic mechanism. USDTL researchers will investigate the patterns of DNA methylation of newborns that have been exposed to alcohol in the womb. According to Dr. Baldwin, "This research will be the first study to explore alcohol-associated epigenetic alterations using newborn blood spot samples." According to the 2012 National Survey on Drug Use and Health, 8.5% of pregnant women drink during pregnancy, including 2.7% who report engaging in risky drinking behavior (www.samhsa.gov/data/NSDUH).

Bringing Expertise to Newborn Toxicology

As the principal investigator of this project, Dr. Baldwin has more than 10 years of experience in biomedical research in laboratory, clinical, and public health sectors. Dr. Baldwin received her doctorate and a Masters of Public Health degree from the Feinberg School of Medicine at Northwestern University. Prior to joining USDTL, Dr. Baldwin was awarded the Emile Roux and M. Cantarini postdoctoral fellowships to complete studies at the Pasteur Institute in Paris, France. Dr. Baldwin brings critical molecular genetics expertise for this project to bolster USDTL's decades of innovation and research in detecting alcohol exposure in newborns. "Coupling USDTL's PEth testing technology with epigenetics provides a unique approach to investigate prenatal alcohol exposure," said Dr. Baldwin.



iStock photo

As part of the National Institutes of Health, NIAAA provides SBIR funding support to organizations with the expertise to meet the challenges of alcohol-related health issues. USDTL was the first laboratory to develop a commercially available alcohol biomarker to screen newborns for prenatal alcohol exposure, and has continued to lead the advancement of newborn toxicology.

1. Mueller, G., Fleming, M. Lybrand, G. and Barry, K. (1988). Synthesis of phosphatidylethanol - A potential marker for adult males at risk for alcoholism. Proceedings of the National Academy of Sciences, 85, 9778-9782.

Like what we have to share?

Follow us! We participate in the following social media and contribute new information on a timely basis.

Channel USDTL | facebook.com/USDTL | usdtlblog.blogspot.com | @USDTL

© 2014 United States Drug Testing Laboratories, Inc.

January 2014 Vol. 5 Issue 1

USDTL®
The Leader in Newborn Toxicology

United States Drug Testing Laboratories, Inc.

Quarterly Perinatal Newsletter

Upcoming Events:

- January 11-17 – NEO Prep: An Intensive Review and Update of Neonatal/Perinatal Medicine – San Diego, CA
- January 29-February 2 – DB:PREP - An Intensive Review of Developmental-Behavioral Pediatrics – Atlanta, GA
- February 5-8 – The 27th Annual Gravens Conference on the Physical and Developmental Environment of the High Risk Infant – Clearwater Beach, FL
- February 20-23 – NEO: The Conference for Neonatology – Orlando, FL
- March 10-11 – March of Dimes 39th Annual Perinatal Nursing Conference: Improving Birth Before & Beyond – Lombard, IL
- March 14 – Nurses Advisory Committee for Perinatal Education Pot O' Gold Conference – Spokane, WA
- March 22-25 – 2014 Mednax Medical Director's Meeting – San Diego, CA

A Certified Forensic Drug Testing Laboratory

1700 S. Mount Prospect Rd. | Des Plaines, IL 60018 | 800.235.2367 | www.USDTL.com

For more articles and scientific abstracts visit www.USDTL.com or simply scan our QR code and connect now.