Umbilical Cord Blood Testing for Alcohol Biomarkers
By Joseph Salerno, Science Writer, USDTL

Phosphatidylethanol (PEth) testing is a powerful tool to identify alcohol biomarkers in newborn blood samples. PEth is a direct alcohol biomarker that is produced when red blood cells encounter ethanol. Studies have shown PEth analysis to be 2-5 times more sensitive than other alcohol tests for detecting biomarkers in newborn fluids and tissues.¹,²

Results from research conducted at the Charleston Area Medical Center (CAMC) compared umbilical cord blood PEth testing to maternal urine screening for alcohol biomarkers.² Maternal urine testing identified alcohol biomarkers in only 1.2% of specimens. PEth testing in cord blood was nearly five times more effective, identifying biomarkers in 5.8% of samples.

Another recent study from the University of New Mexico (UNM) College of Pharmacy showed PEth testing to be twice as sensitive as any other alcohol biomarker test.¹ Researchers from UNM also found the accuracy of PEth in detecting biomarkers in newborn blood samples approached 100%, when compared to maternal self-report of alcohol consumption.

PEth can be measured in dried blood spots similar to those collected for genetic screening of newborns. Five dried blood spots is sufficient for PEth screening and confirmation of presumptive positive results. Dried blood spots can be collected from umbilical cord blood or newborn heel sticks.

Collecting blood from the umbilical cord has several advantages. Umbilical cord is a universal sample, in contrast to meconium, which is not available for collection in up to 20% of newborns. The umbilical cord contains more than enough blood to provide five complete dried blood spots. In some cases, heel sticks do not provide enough blood spots for both genetic testing and PEth testing.³

It is possible to wait one or two days to collect dried blood spots with an additional heel stick, although this is not best practice. The half-life of PEth in blood is approximately four days. Waiting several days to test using a fresh heel-stick may reduce a PEth result by half. Collecting cord blood immediately at birth ensures the true PEth value is measured in a newborn’s blood sample.

Research has demonstrated that PEth levels are not affected by gender or disease state.⁴ When collected on standard filter paper, such as that used in newborn genetic testing, the formation and degradation of PEth is halted. As a result, dried blood spot cards can be shipped internationally without refrigeration, without any risk of changes in the amount of detectable PEth.

To learn more about PEth testing using umbilical cord blood, please contact our Perinatal Testing Group at 800.235.2367 or at perinataltesting@usdtl.com.

References
Dr. Charles Plate Becomes Our New Research Director as USDTL Welcomes Dr. Adam Negrusz as Our New Laboratory Director

Des Plaines, IL - USDTL is proud to welcome Dr. Adam Negrusz, Ph.D., F-ABFT, as our new Laboratory Director. Dr. Negrusz succeeds to the position following the previous Laboratory Director, Dr. Charles Plate, Ph.D., who is transitioning to Research Director for USDTL’s Research & Development Group.

Dr. Negrusz comes to us from the University of Illinois at Chicago where he remains an Adjunct Associate Professor in the Department of Biopharmaceutical Sciences, College of Pharmacy. Dr. Negrusz received his Bachelor of Pharmacy from Nicholas Copernicus Medical University in Krakow, Poland (1981), as well as his Ph.D. in Pharmaceutical Sciences (1989). In 2001 he received a Habilitated Doctor degree (senior doctorate degree) from Jagiellonian University, Krakow, Poland. Dr. Negrusz is a registered pharmacist (1981) and licensed toxicologist (1987) in Poland.

After 8 years at the Department of Toxicology Medical University in Krakow, he joined the University of Illinois at Chicago in 1990 where he developed various procedures including the analysis of meconium, amniotic fluid and umbilical cord for cocaine. After completion of his postdoctoral training, he worked for one year as a toxicologist at the Cook County Office of the Medical Examiner.

In 1993 Dr. Negrusz rejoined the University of Illinois. In 1995 he became an Assistant Professor of Forensic Sciences and the Assistant Director of graduate studies in Forensic Sciences. In 2002 Dr. Negrusz was promoted to the rank of Associate Professor with tenure. In 2004 he was appointed Director of the University of Illinois at Chicago Animal Forensic Toxicology Laboratory. He remained in this capacity until his departure from the University in 2014.

Dr. Negrusz brings a wealth of experience to USDTL, including over 33 years in academic forensic toxicology and drug analysis. He has published nearly 60 peer-reviewed research articles and several chapters of academic textbooks. Dr. Negrusz has presented nearly 70 abstracts at scientific meetings, over 30 professional analytical chemistry reports for sponsors, and many standard operating procedures.

He is a Fellow (Toxicology Section) of the American Academy of Forensic Sciences where he served for one year as a Section Chair. Dr. Negrusz is a member of the Society of Forensic Toxicologists, where he served as a member of the Board of Directors for three years; The International Association of Forensic Toxicologists; The Society of Hair Testing; the Midwest Association for Toxicology and Therapeutic Drug Monitoring; and the Polish Society of Toxicology.

As our research efforts continue to expand at a rapid pace, Dr. Charles Plate inaugurates the new Research Director position for USDTL. In his 10 years as Laboratory Director, Dr. Plate has secured nearly three million dollars in U.S. National Institutes of Health research funding for USDTL resulting in many innovative substance abuse testing tools, such as drug and alcohol testing in umbilical cord tissue, ethyl glucuronide testing in hair and nail specimens, and phosphatidylethanol (direct alcohol biomarker) testing in dried blood spots.

Ask The Toxicologist

Q: Is there any explanation for a positive mCPP (meta-chlorophenylpiperazine) result from an umbilical cord tissue drug test other than the use of the designer drugs known as “Bath Salts?”

A: Yes, mCPP is a major metabolite of two antidepressant medications, Trazodone and Nefazodone, as well as being a stand-alone compound found in some preparations of synthetic cathinones, better known by their street name “Bath Salts.” A legally obtained prescription for either of these antidepressants would be a legitimate explanation for a positive mCPP result in an umbilical cord test.
The opioid prescription drug buprenorphine has seen a sharp rise in non-medical abuse. In 2003, buprenorphine was present in 21 drug seizures by state and local law enforcement across the country. By 2009 that number had grown to more than 8,000. In the United States, 5.9% of pregnant women will use an illicit substance during their pregnancy. A study from the University of Michigan Health System found that opiate use during pregnancy, including buprenorphine, increased more than 370% between the years 2000 and 2009. States are required by the Child Abuse Prevention and Treatment Act to report cases of newborns exposed to illegal substances.

The supply of buprenorphine, used to treat addiction to heroin, hydrocodone, and other opioid substance, has increased more than 100 times since 2003. Unfortunately, the diversion of buprenorphine for illegal use has increased as well. When a preferred opiate drug is not available, addicts can turn to buprenorphine to tide them over and prevent withdrawal symptoms. Others, hoping to quit their opiate addiction but unable to afford the cost of a treatment facility, may self-medicate with illegally obtained buprenorphine.

To treat opiate addiction, buprenorphine is given in one of two forms: Suboxone and Subutex. Both are taken orally. Subutex is a buprenorphine-only product. Suboxone is a mix of buprenorphine and the drug naloxone. Naloxone is included to prevent abusers from crushing and injecting Suboxone. Naloxone blocks the opiate receptors, and sends opiate addicts into an instant state of drug withdrawal. Naloxone’s effects only work when it is injected. When taken orally, naloxone is destroyed by stomach acids and does not produce withdrawal symptoms.

Buprenorphine use in the last 20 weeks of pregnancy can be detected by testing umbilical cord samples. A common question from healthcare professionals is whether or not testing can discern buprenorphine in the cord sample. Because the naloxone in Suboxone is destroyed in the stomach when ingested, it is not possible to distinguish between Suboxone and Subutex use. Buprenorphine, norbuprenorphine, or both may be detected when testing the umbilical cord.

Buprenorphine exposure in the womb, like other opiates, can cause newborns to experience low birth weight, respiratory distress, and drug withdrawal. Forensic drug testing of newborn samples such as umbilical cord tissue is a tool for healthcare practitioners to objectively identify prenatal substance exposure. To learn more about umbilical cord testing, please contact the Perinatal Testing Group at USDTL at 800.235.2367 or at perinataltesting@usdtl.com. As well, USDTL toxicologists are always available to answer client questions.

References

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Upcoming Events:

- November 13-15 – Critical Care in Obstetrics – Mesa, AZ
- November 20-22 – World Symposium of Perinatal Medicine – San Diego, CA
- December 7-10 – Hot Topics in Neonatology – Washington, DC

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