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## The Impact of Perinatal Methamphetamine Exposure on Infant Outcome

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*(Editor's note: Dr. Rizwan Shah is a Clinical Associate Professor of Pediatrics at the University of Iowa's Carver College of Medicine and directs the CAIRE Clinic at Blank Children's Hospital in Des Moines. Dr. Shah is a nationally recognized authority on the pediatric effects of prenatal exposure of the fetus to illicit drugs. We are grateful to her for sharing her knowledge with us. FJZ)*

The state of Iowa has been among the "leaders" in methamphetamine abuse for the past decade. The manufacturing, trafficking, and use of methamphetamine have resulted in increased drug convictions and incarcerations. The Iowa Substance Abuse Reporting System (SARS) registered an increase in methamphetamine use from 1% to 16% among substance abuse treatment seekers in the past decade. Thirty percent of the clients are women; 10% of these are pregnant.

A study of the prevalence of drug use among pregnant Iowa women in 1995-1996, reported a 4% prevalence. Marijuana was most commonly abused, followed by opioids, cocaine, and methamphetamine. Prevalence was highest among 19 to 23 year olds, followed by women age 24 to 27.<sup>1</sup>

A survey of Iowa hospitals done in 1998 to document newborn screening practices revealed that of 1111 neonates tested for illegal drugs (about 3% of Iowa births), 17% were positive.<sup>2</sup> More recent data suggest methamphetamine abuse in 2 to 3% of pregnant Iowa women.

Maternal substance abuse is associated with multiple risk factors, which can adversely affect infant outcomes. An awareness of these risks helps healthcare providers in planning appropriate interventions for both mother and infant. Because of the scarcity of information available regarding the impact of drug exposure on infants and children, professionals, as well as the lay public, tend to draw conclusions based upon their own perceptions of harm from drug exposure. Clinical data presented here will, I hope, answer some often asked questions regarding infants exposed to methamphetamine.

The CAIRE Clinic for the followup of drug exposed infants and children at the Blank Children's Hospital evaluates more than 200 infants and children each year due to drug exposure concerns. Infants are followed in the clinic at regular intervals to assess developmental outcomes. In addition, demographic information is gathered during the first visit. Some families use our clinic for routine healthcare visits. This has provided us with longitudinal data on our patients. Here is what our clinical experience tells us about this special population of children.

### 1. *Drugs of exposure.*

An infant is often exposed to four drugs prenatally. They are: tobacco, alcohol, marijuana, and one other illegal drug. Currently in 90% of our cases this drug is methamphetamine.

### 2. *Pattern of drug abuse.*

Pregnant women using methamphetamine in early pregnancy are more likely to continue using it in the third trimester. A majority of pregnant women using methamphetamine smoke cigarettes, and use alcohol or marijuana or both during pregnancy.

### 3. *Prenatal care.*

Forty percent of methamphetamine using women receive no prenatal care. This compares with 22% of cocaine using women in our experience and with a general rate in Iowa of no prenatal care of 2%.

### 4. *Preterm birth.*

Methamphetamine abusing women deliver preterm one quarter of the time. This is similar to that in cocaine abusing women and is 2-1/2 times as likely as in the general Iowa population.

### 5. *Infant outcomes.*

Concerns are often expressed regarding the impact of methamphetamine on fetal and infant growth. These concerns stem in part from our knowledge of methamphetamine abusing adults who frequently lose weight.

In our clinic population, 19% of methamphetamine exposed and 30% of cocaine exposed infants were below the 10<sup>th</sup> percentile for birth weight. Height was not affected in either of the methamphetamine-exposed or cocaine-exposed cohorts. Ten percent of methamphetamine exposed infants and 20% of cocaine-exposed infants had head circumference of less than the 10<sup>th</sup> percentile.

### **Common Signs Noted in Infants Exposed to Methamphetamine**

I am often asked if I can recognize or separate a methamphetamine-exposed infant from infants exposed to other drugs. I cannot. The fact is that most drug-exposed infants are born full term, look and act healthy, and leave the hospital without being identified as being exposed to drugs. The single most important clue to the identification of the drug-exposed infant is the self-report of drug use by the mother.

### **Neurobehavioral Indicators of Drug Exposure**

In contrast to the opioid exposed neonate, the methamphetamine-exposed neonate does not go through drug withdrawal. The following signs can be noted in the first few months of life. They are not invariably present.

### **Lability of State**

The infant shifts between deep sleep and frantic crying with an inability to return to a calm state even with soothing measures.

### **Disorganized Suck and Swallow**

The methamphetamine exposed full term infant has the sucking abilities of a preterm infant. In our clinic population, this has resulted in feeding difficulties in more than one third of methamphetamine-exposed infants. When recognized, this results in multiple inappropriate changes of formula in the first few months of life and the increased diagnosis of colic in infancy.

### **Sleep Problems**

One of the early developmental tasks of the infant brain is to regulate the quality and quantity of sleep. Both of these functions can be adversely affected by exposure to methamphetamine prenatally. Thirty-nine

percent of infants in our methamphetamine-exposed cohort had sleep regulation difficulties. This figure is similar to the 44% in our cocaine-exposed cohort. It should be noted that sleeping difficulties in children often reflect environmental factors.

### **Quality of Movement**

Methamphetamine exposed infants show poor quality purposeful movements with or without the presence of tremors.

### **The Neuromuscular Examination**

Most methamphetamine-exposed infants have a normal examination. I have observed more hypertonicity in cocaine-exposed infants. Some methamphetamine-exposed infants have suffered intracranial bleeding before birth. These infants have neurological signs including seizures, apnea, and paralysis.

### **Management of Infants Exposed to Methamphetamine**

Infants exposed to methamphetamine prenatally do not require medication for irritability or feeding difficulties. Education of caregivers to provide consistency and stability in the environment is essential. Healthcare professionals need to monitor developmental milestones and educate the caregiver in handling sleep and feeding problems. If neuromuscular signs are present, early intervention services should be implemented.

**IT CANNOT BE EMPHASIZED ENOUGH THAT A STABLE POSTNATAL ENVIRONMENT IS CRUCIAL FOR THE OPTIMAL DEVELOPMENTAL OUTCOME OF INFANTS AND CHILDREN PRENATALLY EXPOSED TO DRUGS.**

—*Rizwan Shah, M.D.*

### **References**

1. Chasnoff, I.J. Drug use in pregnancy: a study of prevalence in the state of Iowa. Iowa Department of Public Health Report, July, 1996.
2. State of Iowa Hospital Drug Testing Policy as Related to Newborns: Survey Report. Council on Chemically Exposed Infants/Children. September, 1998.

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## Newborn Toxicology Screening

In a recent update the National Survey on Drug Use and Health (NSDUH) reported that in 2002 and 2003, 4.3 percent of pregnant women aged 15 to 44 had used illicit drugs in the past month. These drugs included opiates, marijuana, cocaine, alcohol, hallucinogens, inhalants, tranquilizers, stimulants, and sedatives. This number is up from 3.8 percent of pregnant women in 2001. The rate of drug use for pregnant teenagers, 15 to 17, was higher still, upwards of 15 percent. The NSDUH data also suggest that women increased their substance use during the year *after* giving birth.

Increasing rates of substance abuse during pregnancy translate into higher numbers of drug-exposed infants. Iowa hospitals are experiencing this trend with an increasing number of newborns being screened for substances of maternal abuse. Prenatal drug exposure poses several risks to the fetus and newborn. The drug(s) may have a teratogenic effect on the developing fetus. Abrupt cessation of maternal drug supply at delivery may result in acute withdrawal in the newborn. There may be long-term effects on neurodevelopment that alter behavior and learning. If maternal substance abuse is not identified prior to discharge of mother and baby, the drug-exposed infant is also at high risk for abuse and neglect.

For these reasons it is essential that newborns in Iowa be appropriately screened for the presence of illegal drugs. Screening for maternal substance abuse must begin with thorough history taking. All pregnant women should be questioned about their use of prescribed and unprescribed drugs. Recent trends of drug use in the United States suggest that the predisposition for drug abuse is similar through all racial, economic, and educational strata. Comprehensive screening of newborns is not currently recommended due to concerns of cost and privacy. Instead, infants are selectively screened for the presence of drugs when the mother's history of drug use is confirmed or suspected or when symptoms suggestive of withdrawal are present in the newborn.

Several Iowa hospitals have developed protocols for screening newborns based on the identification of clinical and social risk factors known to be associated with the presence of illegal drugs in infants. The unexplained presence of one or more of the following risk factors is an indication for toxicology testing.

Neonatal drug screens can reliably detect the presence of maternal drugs in newborn hair, serum, urine, and meconium. Testing methods vary by institution. In Iowa, urine and meconium sampling are the most fre-

### CLINICAL RISK FACTORS

MOTHER	INFANT
No prenatal care Late prenatal care (first visit after 16 weeks' gestation) Poor prenatal care (4 visits or fewer) Abruptio placentae Seizures Inadequate weight gain Acute episode of hypertension Out-of-hospital delivery Precipitous labor and delivery (less than 3 hours duration) Presenting to the hospital in the second stage of labor Physical and/or behavioral characteristics of drug use	Stillbirth Premature delivery <37 weeks' gestation Birth weight <10 <sup>th</sup> percentile on GA assessment Small head circumference Congenital anomalies Seizures Physical and/or behavioral characteristics of drug withdrawal

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**SOCIAL RISK FACTORS**

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Admission of homelessness  
Admission of substance abuse  
Known history of maternal substance abuse  
Known history of paternal substance abuse  
Report of substance abuse by a third party  
Incarceration  
Maternal history of depression or major psychiatric illness  
History of removal of other children to foster care

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quently performed. Urine testing is least expensive, but it has limited sensitivity with a higher incidence of false-negative results. The validity of urine testing depends on the elimination half-life of the substance in question. Even a drug with a long elimination half-life can only be detected in urine for a maximum of three to four weeks after use. Meconium testing is an effective tool for verifying drug exposure in utero from the second trimester (as early as 14-16 weeks' gestation) to birth. The procedure is more costly, but meconium testing has the highest sensitivity for detecting exposure of all of the substances studied. The limitation for using meconium is the narrow time-frame for sampling. In order for the test to be accurate, meconium must be collected within the first one to two days of life or the first three

stools. Serum testing and neonatal hair analyses are not routinely done in Iowa.

It is important that every institution have a procedure for documenting "chain of custody" in handling all specimens obtained for the purpose of newborn toxicology testing. Coordinated follow up with hospital social services and referral to the Department of Human Services should occur whenever prenatal drug exposure is confirmed.

— *Penny K. Smith, RNC*  
Nurse Clinician Specialist  
Department of Pediatrics

*(References available from the author on request)*