**Faculty Disclosure**

Linda Christinsen-Rengel, BSN, RNC and Lorraine Victor, MS, RN, CNP have disclosed no actual or potential conflicts of interest in relation to this educational activity.

During this educational activity Linda Christinsen-Rengel and Lorraine Victor will not be discussing the use of any commercial or investigational product not approved for any purpose by the FDA.

**Methamphetamine Use:**

**Methamphetamine Use: Maternal, Fetal and Neonatal Effects**

Linda Christinsen-Rengel, BSN, RNC

The Birth Center,
United Hospital and Children’s Hospitals of Minnesota
St. Paul, Minnesota

Lorraine Victor, MS, RN, CNP

Children’s Hospitals and Clinics of Minnesota

The presentation will begin within one minute

**Program Objectives**

Upon completion of this program, participants should be able to:

- Identify the signs and symptoms of Methamphetamine use and short-term and long-term effects.
- Describe the medical complications and treatment/intervention for the mother and fetus exposed to Methamphetamine.
- Describe maternal and behavioral symptoms of infants exposed to maternal drug use in pregnancy.
- Utilize an assessment tool to identify severity of drug withdrawal symptoms in neonates.
- Describe interventions to facilitate state control and motoric organization in infants exposed to maternal drugs.

**Accreditation**

Children’s Hospitals and Clinics is accredited as a provider of continuing nursing education by the American Nurses Credentialing Center’s Commission on Accreditation.

Children’s Hospitals and Clinics of Minnesota designates this educational activity for 1 continuing education hour.

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Methamphetamine Use in Pregnancy

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The Birth Center
United Hospital and Children’s Hospitals of Minnesota
St. Paul, Minnesota

Methamphetamine is...

- A powerful addictive stimulant that dramatically affects the central nervous system
- “Speed,” “meth,” “chalk,” “ice,” “crystal,” “crank,” or “glass”
- May be smoked, snorted, injected, or orally ingested

Methamphetamine Effect

- Smoking produces a high that lasts 8-24 hours
- 50% of the drug is removed from the body in 12 hours
- If injected or smoked produces an intense “rush”
- Oral or intranasal use produces long lasting high (euphoria)
- Users may become addicted quickly

Methamphetamine Toxic Effects

- High doses of meth damage neuron cell endings
- Dopamine- and serotonin-containing neurons do not die, but the nerve endings are cut back with limited re-growth

Pet brain scans of a methamphetamine user and a control subject Jane Korepsak, Brookhaven National Lab
Short-term Effects
- ↑ attention
- ↓ fatigue
- ↑ physical activity
- ↓ appetite
- Euphoria and rush
- ↑ respiration
- Hyperthermia
- Irritability
- Insomnia

Long-term Effects
- Dependence and addiction psychosis
  - Paranoia
  - Hallucinations
  - Mood disturbances
  - Repetitive motor activity
  - Violent behavior
- Stroke
- Extreme weight loss

Medical Complications
- Increased heart rate and blood pressure
- Irreversible vessel damage
- Strokes
- Inflammation of heart lining
- Skin abscesses
- Convulsions
- Irregular heartbeat
- Extreme anorexia
- Lead poisoning
- Rotting teeth
- Cardiovascular collapse and death

Methamphetamine Abuse Patterns
- Low Intensity
  - Not psychologically addicted
  - Swallows or snorts drug
- Binge
  - Psychologically addicted
  - Smoke or inject drug
  - Consume drug continuously for up to 3 days without sleep
  - Has periods of withdrawal
- Tweaking
  - Period following binge
  - Severe depression
  - Worsening paranoia
  - Belligerence
  - Aggression
### Methamphetamine Abuse Patterns

- **High Intensity**
  - Inject every 2-3 hours
  - Extremely paranoid
  - Doesn’t usually have withdrawal period

### Withdrawal Symptoms

- Severe craving
- Insomnia
- Restlessness
- Mental confusion
- Depression

### Pregnancy Effects

<table>
<thead>
<tr>
<th>Maternal</th>
<th>Fetal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased maternal blood pressure and heart rate</td>
<td>Premature delivery or spontaneous abortion</td>
</tr>
<tr>
<td>Reduced blood flow to the placenta</td>
<td>PROM</td>
</tr>
<tr>
<td>Reduced blood flow to the fetus = ↓ O² and ↓ nutrients = IUGR</td>
<td></td>
</tr>
</tbody>
</table>

### Methamphetamine crosses the placenta

- ↑ fetal blood pressure = fetal strokes, heart or organ damage
- ↑ or extremely variable FHR
- Withdrawal symptoms at delivery

### Pregnancy Effects

<table>
<thead>
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</thead>
<tbody>
<tr>
<td>Methamphetamine crosses placenta as well as toxins from the manufacture of meth.</td>
<td>Abnormalities</td>
</tr>
<tr>
<td>- Developmental system</td>
<td></td>
</tr>
<tr>
<td>- Central nervous system</td>
<td></td>
</tr>
<tr>
<td>- Cardiovascular system</td>
<td></td>
</tr>
<tr>
<td>- Intestinal system</td>
<td></td>
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<tr>
<td>- Urogenital system</td>
<td></td>
</tr>
<tr>
<td>- Extremities</td>
<td></td>
</tr>
<tr>
<td>- Suspicious causation from meth. use</td>
<td></td>
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</tbody>
</table>

### Pregnancy Effects

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<td>IV drug use → HIV, Hepatitis B and C</td>
<td></td>
</tr>
<tr>
<td>Sexually transmitted diseases → Gonorrhea, Syphilis, HPV, etc</td>
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### Pregnancy Effects

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Treatment and Intervention

- Drug screen for toxicology
- Treat immediate symptoms:
  - Hyperthermia
  - Convulsions
  - Elevated BP and heart rate
- Provide safe, quiet environment
- Anti-anxiety medications
- Electronic fetal monitoring

Determination Of Effect Of Drugs On Fetus

- Gestational age at time of exposure
- Fetal metabolism
- Frequency & amount of exposure
- 1/2 life of drugs
- Other drugs used at same time

Minnesota Mandated Reporting Law

- Heroin
- Cocaine
- Amphetamine
- Methamphetamine
- PCP

Problems With Drug Studies

- Small numbers
- Erroneous recall or denial of drug use
- Poly-drug use
- Numerous modes of use
- Time during gestation
- Quantity
- Duration of use
- Lack of long term outcome studies

What Crosses the Placenta

- Molecular weight < 600
- Lipid soluble
- Ionization
- Recycling
**Drug Molecular Weight**
- Alcohol 46
- Methamphetamine 44
- Nicotine 162
- Ecstasy 193
- THC 314
- Caffeine 314
- Insulin 6000

**Onset and Duration of Withdrawal Symptoms**
Depends on:
- Gestational age
- Fetal accumulation
- Lipid solubility
- Metabolic disposition
- Excretion time
- 1/2 life of drug

**Neonatal Drug Testing**
- **Urine**
  - May be positive when maternal urine negative
  - History of recent exposure within past 24-48 hours

**Neonatal Drug Testing**
- **Meconium**
  - History of last 3 months of pregnancy
  - First meconium passed is best sample
  - Results available in 1 week

**Neonatal Drug Testing**
- **Hair**
  - Reflects drug use over last 3 months
  - Available for analysis until fetal hair shed

**Neonatal Drug Testing**
- **Umbilical Cord**
  - 10 cm portion of homogenized tissue
  - May get results sooner
  - Consistent with meconium for identifying methamphetamine, cocaine, opiates and cannabinoids
**Methamphetamine Effect on Fetus**

- Meconium
- Prematurity
- IUGR,
  - Smaller OFC in infants exposed to combination of methamphetamine and cocaine

**Methamphetamine Effect on Fetus**

- Elevated BP
  - Risk for cerebral infarct
- Birth Defects?
  - Clefting deformities in animal studies
  - Gastroschisis

**Methamphetamine Effect on Neonate**

- Neurologic changes
  - Behavior effects
- Neurologic effect in animal studies
  - Deficits in spatial learning and memory in adult rats due to changes in neurons after exposure to methamphetamine

**Methamphetamine Withdrawal**

- Toxicity-depends on time of maternal last use
  - Dilated pupils
  - Hypertension
  - Tachycardia
  - Tachypnea
  - Seizures

**Methamphetamine Effect on Neonates**

- Diaphoresis
- Episodes of agitation alternating with lethargy
- Poor wake/sleep cycle
  - State regulation is marker of CNS integrity
- Gaze aversion
- High pitched cry characteristic of CNS reactivity
Methamphetamine Effect on Neonates

- Aversion to touch on hands & feet
- Excessive jitteriness
- Tremors
- Poor feeding
- Hypertonia

Methamphetamine Effect on Neonates

- Hyperthermia
- Possible increased incidence of SIDS

Methamphetamine

- Ongoing childhood effects
  - Developmental delay
  - Poor head growth
  - Learning disabilities
  - Failure to thrive
  - Frequent ER visits

Dangers for Children Living in a Meth Lab

- Chemical contamination
- Fires and Explosions
- Firearms
- Needles
- Abuse & neglect

Methamphetamine & Cocaine

- Abnormal sleep/wake pattern
  - Quick vacillation between states
- Tremors
- Tremors/startles
  - Hands
  - Arms
  - Legs
  - Chin
  - Tongue

Methamphetamine & Cocaine

- Hypertonia/Hyperreflexia
  - Increased extensor tone
  - Interferes with motor development
  - May be perceived by parents as rejecting
- Sneezing
- High-pitched cry
**Methamphetamine & Cocaine**

- Excoriation of skin
- Cranial abnormalities similar to HIE

**Neurobehavioral Deficit with Cocaine or Methamphetamine**

- Poor feeding
  - Uncoordinated suck-swallow
  - Inability to stabilize tongue in midline
  - Tongue thrusting & tremors
  - Diarrhea/constipation

**Cocaine Related Congenital Malformations?**

- Eye deformities
  - ROP
- Cardiac defects
  - ASD
  - VSD
- GI defects
  - NEC
  - Bowel obstruction

- Limb reduction defects
- Skull defects
  - Exencephaly
  - Encephalocele

**Marijuana**

- Most commonly used illegal drug
- THC has high affinity for lipid and accumulates in fatty tissues
- Increases CO & may result in hypoxia
- Effect on fetus
  - LBW
  - Lack of visual attention
  - Increased risk of SIDS
**Narcotics**

- Rapid placental transfer
  - Fetal dependence with frequent or prolonged use
- Reservoir effect with exposure to active metabolites

**Neonatal Abstinence Syndrome (NAS)**

- Abrupt removal from drug
- Other conditions to rule out
  - Sepsis
  - Hypoglycemia
  - Hyperthyroidism
  - Hypocalcemia
  - Hypomagnesemia
  - Birth depression

**Signs & Symptoms Of NAS**

- **CNS irritability**
  - High pitched cry
  - Tremors
  - Disturbed sleep
  - Excoriated skin

**Signs & Symptoms Of NAS - Poor State Control**

- Prolonged periods of wakefulness
  - Responds strongly to stimulation with frantic crying
- Remains in deep sleep despite external stimulation
  - Agitated sleep state
- Stressed by external stimuli
  - Startles
  - Color changes
  - Whimpering

**Signs & Symptoms Of NAS - Poor State Control**

- Vacillation between sleep wake states
  - Crying and agitated with handling
  - Deep sleep when not handled
- Panicked awake state
  - Alert state for short periods at cost of stress & fatigue
  - Needs help to stay calm

**Signs & Symptoms Of NAS**

- GI dysfunction
  - Poor feeding
  - Vomiting
  - Diarrhea
  - Excessive weight loss
**Signs & Symptoms Of NAS**

- Respiratory distress
  - Do not give Narcan
  - Periodic breathing
  - Apnea
  - Increased incidence of SIDS

- Autonomic instability
  - Mottling
  - Sneezing
  - Yawning
  - Diaphoresis
  - Increased temperature

**Withdrawal Assessment Tools**

- 50-60% of infants exposed to opiates
- Valid/Reliable for opiates including heroin, Vicodin, Dilaudid, Oxycontin

- Neonatal Abstinence Score (Finnegan score)
  - Assess q 4 hours
  - Assess q2 hours with score > 8
  - Discontinue when score < 7 and no need for treatment by 72 hours

**Treatment of Withdrawal with Medications**

- NAS Score (Finnegan score)
  - > 8
  - Average of 3 consecutive scores 8 or >
  - Total score 12 or > for 2 consecutive scoring intervals
  - Average of any 2 consecutive scores 12 or greater

**Successful Treatment of Neonatal Abstinence Syndrome**

- Score < 8
- Easily consoled
- Maintains rhythmic sleep and feeding cycle
- Steady weight gain

**Treatment Of Neonatal Abstinence Syndrome**

- Tincture of opium
- Methadone
- Oral morphine sulfate
- Phenobarbital
- Ativan
- Paregoric
- Diazepam
- Chlorpromazine
**Intervention Strategies**

- Decrease environmental stimulation
  - Decrease noise
  - Turn down lights
  - Place infant in area with decreased activity
  - Limit extraneous conversation when caring for infant

- Assist with state control
  - Boundaries
  - Swaddle or use “Snuggly”
  - Hold en face
  - Talk gently and rhythmically
  - Observe for time out cues
  - Assist with self-consoling
  - Always respond to crying

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Healey, T.  *Guiding Your Child Through Pre-Term Development*, (1985)
Recommendations for Breastfeeding

- Alcohol - discourage
- Cocaine and amphetamines
  - Not recommended
  - Stays in system up to 60 hours
- Marijuana
  - Not recommended
- Heroin
  - Not recommended

Recommendations for Breastfeeding

- Methadone
  - Compatible with breastfeeding
  - Milk transfer is considered minimal
- Sedatives/hypnotics
  - Discontinue if infants have weight loss or lethargy

Intervention Strategies

- Assist with feeding
  - Wake if necessary for feedings
  - Quiet environment
  - Semi-sitting position with arms flexed forward & trunk slightly flexed
  - Keep chin tucked downward
  - Allow frequent rest periods

Developmental Follow-Up

- Provides baseline
- Opportunity to assess response to environment
- Opportunity to enhance care provider interaction
**Parental Intervention**

- Encourage ventilation of concerns
- Make mother feel welcome
- Encourage early participation in care
- Explain normal & abnormal infant behaviors in non-judgmental manner
- Show mother interventions to facilitate state control and interaction
- Provide for support and safety at home

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