Effects of Prenatal Illicit Drug Use on Infant and Child Development

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Objectives for Presentation

At the end of this presentation, participants can describe:

- Prevalence of substance use and abuse in pregnancy
- Neonatal effects of substance use
- Child development effects of prenatal drug exposure
- What role family medicine will play in changing the outcomes

Note: Pictures shown are not of families receiving services
NM Study of Alcohol and Drug Use at Time of Pregnancy Testing 1990-95

- Use in past month (questions and UDS) in 1995 cohort
- Marijuana use in past month 20%
- Other drugs in past month 6%
  - Methamphetamine 2.8%
  - Cocaine 3%
  - Opiates 0.6%

- Use of drugs with alcohol and tobacco
- Implication: 5,400 infants with drug exposure
- Autism risk 1 in 150 by comparison

* NM Department of Health, Division of Epidemiology, 1996
<table>
<thead>
<tr>
<th>Albuquerque</th>
<th>Drugs</th>
<th>National</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.84%</td>
<td>Amphetamines</td>
<td>4.57%</td>
</tr>
<tr>
<td>15.59%</td>
<td>Cocaine</td>
<td>10.01%</td>
</tr>
<tr>
<td>4.37%</td>
<td>Opiates</td>
<td>7.01%</td>
</tr>
<tr>
<td>13.17%</td>
<td>Cannabinoids</td>
<td>11.31%</td>
</tr>
<tr>
<td>1.9%</td>
<td>Sedatives</td>
<td>2.03%</td>
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<tr>
<td>2.86%</td>
<td>Methadone</td>
<td>4.41%</td>
</tr>
<tr>
<td>12.84%</td>
<td>FAEE</td>
<td>13.29%</td>
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</tbody>
</table>

By permission Tricore Laboratories and United States Drug Testing Laboratories, Inc
Critical Times for Embryo

Dr Mark Hill (2007), University of New South Wales
Effects of Drugs on the Development of the Fetal Brain

- Brain differentiation in first 13 weeks gestation
- Brain grows most in last 13 weeks gestation
  - Premature delivery adds stresses
  - Brain injury can occur with prematurity < 37 weeks
- Mother’s overall health affects brain size
- Drugs move from pregnant woman to fetus
- Areas of fetal brain potentially affected
- Effects illustrated by adult brain
Areas of Fetal Brain Affected: Example Adult Brain Exposed to Cocaine

Yellow areas indicate binding of cocaine to receptors in specific areas of the brain (Striatum) occurring over a defined time in an adult brain.
Specific Effects Related to Drugs

- Ethanol causes birth defect pattern
  - Affects brain cortex neuron development & growth
  - Results in facial malformations
- Opiate drugs cause withdrawal (NAS)
  - Opiate receptors modulate dopamine
- Cannabinoid receptors affect GABA, glutamate release
- Stimulants affect fetal circulation and placental irritability leading to premature birth
- Stimulants modulate synaptic dopamine levels
Anticipated Specific Issues from Prenatal Opiate Exposure

- Withdrawal (NAS) from opiate exposure
  - Heroin, morphine, codeine, oxycodone
  - Methadone
- 90% have symptoms needing treatment by 96 hrs
- Treatment with methadone is standard
  - Carrie Tingley Pediatric unit if available (ICN3 other option)
  - Symptoms closely monitored using scoring system
  - Infants discharged off methadone
- Buprenorphine with reduced duration of symptoms
Studies of Effects of Drugs on Child and Adolescent Development

- No single study is perfect
- Best of longitudinal studies
  - Marijuana exposed infants Hamilton, Ontario (OPPS Study)
  - Maternal Lifestyles Study, multiple centers, and cocaine use in pregnancy
  - Pittsburgh cohort study, Maternal Health Practices and Child Development Study (MHPCD)
  - IDEAL Study of methamphetamine exposure
- All have comparison groups from birth
- Relatively good matching for use of other drugs such as tobacco and cocaine
Effects Seen with Marijuana Use

- Exposed pregnancies with same weight gain
- Infant weight reduced in US (2\textsuperscript{nd} trimester effect)
- 20+ year follow up studies OPPS and MHPCD
  - Problems with tasks that required visual memory, analysis, and integration age 13-16
  - Altered processing in visual-spatial working memory age 19-20 by functional MRI
- Negative effects on aspects of executive function
- Earlier teen marijuana use in prenatally exposed
Summary of Cocaine Studies

- Between exposed and comparison groups
- Infants with exposure have:
  - Disturbed state regulation
  - Increased muscle tone
- Developmental differences lessen 3 to 7
- Functional brain studies of teens in process
  - Cohorts reaching 20 years of age
  - Cocaine exposed have visual processing delays
Long Term Exposure Effects; Results Pending

- As study kids approached adolescence
- Stronger evidence for behavioral problems
- Possible tendency to start use earlier
- Subtle effects on brain function
- Visual attention on tasks lower
- Executive function affected
- Setting priorities when facing multiple tasks
- Demonstrate selective attention
Study of Combine Opiate and Cocaine Exposure With Home Visiting Intervention

- Cohort of exposed kids follow up at age 7
  - Began in study as newborns
  - Home intervention first 18 mos of life
  - Intelligence, academic performance collected
  - Child behavior checklist
  - Environmental conditions

- Comparison group enrolled at age 5
  - Same neighborhood, same clinic
  - No history of drug exposure, - toxicology at birth
  - No substance use history by self report

Results of Environmental Descriptors in Longitudinal Study

- Caregiver IQs 81.2-81.7 (+ 12.3-10.5) low normal
- Kids with exposure
  - More caregiver changes, possible loss of parents
  - 44% lived with relative not mother
  - Higher ongoing drug & tobacco use in home
- Kids in comparison group
  - 100% with mother
  - 92% of caregivers employed
- Depression present for 12-13% in caregivers
- Exposed kids had greater numbers of ACEs
Results of Child Testing After 18 Months of Home Visiting

- No statistical differences between groups
- Exposed had lower scores in 15/16 subtests for cognition
- Both groups IQ scores below mean (< 95)
- Behavior problems not different
- Exposed led in 8/10 subtests behavioral problems
- Few significant differences from prenatal exposure
- Associations of lower scores and caregiver depression
Program Approaches: Effects of Home Visiting by Program at 18 Months

- Maternal behavior in mother-child interaction
  - Decreased by ongoing drug use; cocaine and heroin
  - Inhibited by poor parenting attitude
- Case management intervention not delivered
- Intervention group should have had weekly visits for 6 mos
  - Mean was 8.9 visits (not 24), mean length 30 minutes
  - Average contact 4.5 hours
- Home intervention had no overall effects

Human Prenatal Exposure to Methamphetamine

- Should have similar effects as cocaine
- "Concern," the 2nd highest level of possible effect for humans
  - Neurobehavioral alterations from prenatal exposure
  - Methamphetamine
- Human studies not interpretable currently
  - Lack of controls and confounding factors
  - Absence of purity of drugs
  - Potential presence of contaminants
- Animal studies had evidence for poor outcomes

NATIONAL TOXICOLOGY PROGRAM Center for the Evaluation of Risks to Human Reproduction (NTP-CERHR) 2005
FOCUS Case Management

- **FOCUS service coordinator model**
  - Starts when baby referred to program
  - Funding from Part C for early child intervention for child
  - Home based parenting and development
  - Birth to 3 years (2x longer than study), weekly to monthly
  - Addresses parent issues; safety, addiction, health
  - Provides insight to medical team about family
  - Not medically trained, limited access to PCO
  - Very knowledgeable about health and life issues
  - Present in FOCUS clinics
Case Management for Pregnant Women in Milagro

- Reflejos Familiares grant funded program
  - Referrals from Milagro counselors or prenatal
  - Not currently co-located
  - Service coordinator assigned
  - Challenge to engage pregnant women
  - When engagement happens, services start, not paid for
  - Basic needs, issues for housing, safety, older children
  - Prepares women for parenting role

- After delivery service coordinator continues contact

- Parenting groups, infant mental health model, 12 weeks
Many Pregnant Women Use Substances

- Which mom will stop or reduce use?
  - What are motivators to change?
  - How does newborn create change?
- Resources to support change
  - Counseling services accessible?
  - Counseling services appropriate?
  - Financial considerations?
  - Impact of partner and family?
- How will better health be achieved?
The Medical Model Is Necessary But Not Sufficient to Deliver Health for These Families

- Change in behaviors are difficult
- Needs of child replace interest in drugs
- Different way of rebuilding dopamine system
- The health of the parents directly impact the children
- Primary care must address the physical and mental
- Service coordinators are the “rock” for most mothers
Cases for Effects of Prenatal Substance Exposure

Case 1: Cheryl Wildman and baby Russ
Cheryl W. Delivers Baby Russ on L&D

- Had chronic pain
  - Prescribed Percocet
  - Took 12 to 16 per day
- Plans to breastfeed
- Mom agrees to toxicology
- Negative for drugs
- Baby has positive toxicology
  - Positive for opiates
  - Positive for cannabinoids

www.whattoexpect.com
How Will You Manage Care?

- How to assess risk of NAS for Russ?
- What are plans related to breastfeeding?
- What counseling will you provide?
Factors Related to Mom’s Social Status

- Cheryl’s pain condition under care
  - Mom has prescription
  - May be using too much
  - May access other sources
  - Possible risk of addiction
  - Not disclosed to prenatal provider
- Positive screen implications
  - Marijuana used for nausea
  - Hospital may refer to CYFD
Factors Related to Russ’ care

- Russ has had exposures
  - Opiates; risk of neonatal abstinence
  - Exposure started early in pregnancy
  - Marijuana used regularly
- Observation for 96 hours
- Breastfeeding may be good for both
  - Mom’s first UDATR negative
  - Discuss baby’s screens
  - Request repeat UDATR
Russ Observed in Carrie Tingley

- Cheryl can room in
- Her daily UDATRs are negative
- Breastfeeding established
- Cheryl requests buprenorphine induction
- Starts on 12 mg per day
- Breastfeeding continues
- Cheryl and Russ have FOCUS appointments
Renee Brings Daughter Lorena for Well Visit

- Renee used cocaine and marijuana prenatally
- Lorena born at 37 weeks, 5% for OFC
- Renee did well for 6 months after starting care in FOCUS
- She relapsed and disappeared for 9 months
- Made contact with service coordinator
- Developmental assessment done
Results of Lorena’s Assessment

- Gross Motor – age equivalent 11.5-13 mos
- Fine Motor - 11.5-13 mos
- Language/Communication - 15.5-18 mos
- Emotions and Feeling States - 11.5-13 mos
- Self-Help - 15.5-18 mos
- Relationship to Person – 7-10 mos
How To Assess Results?

- How significant are the delays?
- What information does Renee need?
- What does Lorena need?
- What other considerations come into play?
Further Evaluation for Lorena

- History of sleep, growth
- History of behavior
- Growth chart for head size
- Examine for syndrome
- Examine ears for chronic OM
- Audiology referral for hearing
- Early intervention referrals
- FOCUS services started
- Community agencies

sfcrime.wordpress.com
We Help a Family Become Healthier

Overall hope of FOCUS Programs

Goals of FOCUS Programs are to support the normal development of infants and children

Thank You