FASD: Not just another pretty face
Effects of prenatal alcohol on brain and behavior

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Presented FASD: Best Practice in Prevention and Intervention
Muskegon, MI
August 2004
Some Definitions

- **Teratology** - The study of birth defects
- **Teratogen** - Any agent (e.g. drug) that causes abnormal development
- **Behavioral Teratogen** - Any agent (e.g. drug) that causes impaired cognitive, affective, social, reproductive, and/or sensorimotor behavior, even in the absence of obvious physical problems
Fetal soap opera addiction found in babies if mothers watched sagas

By Allan Parachini
Los Angeles Times

LOS ANGELES — Carmen Bank found her 1985 pregnancy rather boring. So, to pass the time, she started doing something she would never have dreamed of: watching a soap opera.

Unexpectedly, she found herself hooked. And so she spent almost every morning in front of her television set, ready for the familiar theme of “Ryan’s Hope.” After Melissa was born that October, Bank bought a videocassette recorder so she could tape the show when she was too busy to watch.

Bank isn’t sure when she discovered the behavior, but, shortly after Melissa was born, Bank realized that the baby seemed to recognize the “Ryan’s Hope” theme and would stop fussing when the program began. “She’d just sit there and watch the whole introduction and then she would start imitating what they do on the show,” Bank said. “This has been going on forever!”

While this could appear to be one baby’s quirky behavior, an Irish medical researcher would argue otherwise.

Working with the babies of women who regularly watch a British soap, the researcher identified a pattern of fetal learning behavior so striking he calls it “fetal ‘soap’ addiction.”

The British medical journal *Lancer* published a description of the phenomenon two weeks ago, in the form of a letter to the editor from researcher Peter Hepper of the Laboratory for Recognition Research at Queen’s University of Belfast.

Fetal soap addiction, Hepper explained, consists of behavior after birth indicating that a newborn has become familiar with a soap opera theme while still in the uterus. The behavior includes a baby’s clear response to the first bars of the tune by focusing rapt attention on the television screen. A crying baby who absorbed the soap theme in the uterus is likely to stop crying when the program begins while the baby of a non-watcher will keep wailing.

Hepper drew these conclusions from a study of the newborns of seven women who regularly watched “Neighbors.” Some of the women watched twice daily — at the normal time and then again in repeats during the evening. Their babies were evaluated four or five days after birth. Reactions from infants of a control group of eight mothers who didn’t watch the soap were gauged for comparison.

“The results indicate that the reaction of a newborn baby to ‘watching’ television may reflect long-term exposure to the theme tune of the program during pregnancy,” Hepper wrote in the medical journal. “This attention exhibited by the newborn may be a result of prenatal learning.”
Lightning strikes pregnant mom, now...

ELECTRIC BABY LIGHTS
BULBS BY TOUCH
Picture of alcohol bottle deleted because of copyright issues.
Objectives

■ Overview FAS and its general features

■ Discuss the effects of heavy prenatal alcohol exposure on brain and behavior
Collaborators and Acknowledgements

Sarah Mattson, Ph.D.          SDSU
Jennifer Thomas, Ph.D.         SDSU
National Institute on Alcohol Abuse and Alcoholism
  ■ Ken Warren
  ■ Faye Calhoun
  ■ Sam Zakari

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Elizabeth Sowell, Ph.D.         UCLA
Historical view of alcohol as a teratogen

- “Foolish, drunken, or harebrain women most often bring forth children like unto themselves”
  Aristotle in *Problemata*

- “Behold, thou shalt conceive and bear a son: And now, drink no wine or strong drink.”
  Judges 13:7

Rosett, 1984
Safety of Alcohol and Reproduction in the 20th Century

“...the idea of germ poisoning by alcohol in humans may be safely dismissed..

Jellinek, E.M., & Jolliffe, N.
Journal of Studies on Alcohol 1, 1940

“The offspring of alcoholics have been found defective not because of alcoholism of the parents but because the parents themselves came from a defective stock.”

View on the absolute safety of alcohol in pregnancy continued into the 1960’s and 70’s

- The ethanol drip was used in obstetrics for threatened premature labor.
  - One of few medical uses of ethanol.
  - Involved I.V. ethanol infusion for 6–10 hours, reaching BAC as high as 160 mg/dl
AVENIR DES ENFANTS DE MÈRES ALCOOLIQUES
(ÉTUDE DE 165 CAS RETROUVÉS À L'ÂGE ADULTE)
ET QUELQUES CONSTATATIONS D'INTÉRÊT PROPHYLACTIQUE.

P. LEMOINE, MD

THE LANCET, SATURDAY 9 JUNE 1973

RECOGNITION OF THE FETAL ALCOHOL SYNDROME IN EARLY INFANCY

Kenneth L. Jones

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Summary

Recent studies indicate that the fetus of an alcoholic mother is at risk of developing the fetal alcohol syndrome. Among the diagnostic criteria for this condition are growth retardation, microcephaly, and characteristic facial features. These observations are consistent with the hypothesis that alcohol exposure during pregnancy can cause developmental abnormalities in the fetus.

Introduction

Developmental abnormalities associated with alcohol exposure during pregnancy have been documented. These range from subtle differences in growth and development to more severe conditions such as the fetal alcohol syndrome. The purpose of this study was to evaluate the incidence of these abnormalities in a population of women who consumed alcohol during pregnancy.

Patern of Malformation in Offspring of Women Alcoholic Patients

Kenneth L. Jones

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Summary

EIGHT women whose children were born to women alcoholic patients. The children were divided into two groups: those born to mothers who consumed alcohol during pregnancy and those born to mothers who did not. The results indicated that the offspring of alcoholic mothers were more likely to exhibit developmental abnormalities than those of non-alcoholic mothers.

No affected

Performance

Free movement deficits

Refractory growth deficits

Developmental delay

Conclusion

The findings suggest that alcohol consumption during pregnancy can have a significant impact on fetal development. Further research is needed to determine the specific mechanisms by which alcohol exposure affects fetal growth and development.

The Lancet - Saturday 9 June 1973
Fetal Alcohol Syndrome

- Specific pattern of facial features
- Pre- and/or postnatal growth deficiency
- Evidence of central nervous system dysfunction

Photo courtesy of Teresa Kellerman
Facies in Fetal Alcohol Syndrome

Discriminating Features
- Epicanthal folds
- Low nasal bridge
- Minor ear anomalies
- Micrognathia
- Short palpebral fissure
- Indistinct philtrum
- Thin upper lip

In the young child

Streissguth, 1994
Other Examples of Children with FAS

Pictures deleted because of copyright issues

- Short palpebral fissure
- Indistinct philtrum
- Thin upper lip
Eye Anomalies

Examples deleted because of confidentiality issues
Lip-Philtrum Guide

Examples deleted because of copyright issues. Please direct inquiries to Susan Astley at the University of Washington
Hockey Stick Palmer Crease

Example deleted because of confidentiality issues
Comparison: Child with FAS and mouse fetus with fetal alcohol exposure

Child with FAS

- Short palpebral fissures
- Small nose
- Small midface
- Long philtrum; Thin upper lip

Mouse fetuses

- Small head

alcohol-exposed

normal
FAS – Only the tip of the iceberg

- Fetal alcohol syndrome
- Fetal alcohol effects ARND/ARBD
- Appear normal but clinical suspect
- Normal, but never reaching their potential
Fetal Alcohol Spectrum Disorders

- Reflects a continuum of prenatal alcohol effects
- Acknowledges that the facial features occur as a result of exposure during early pregnancy
- But, significant neurobehavioral deficits can result from exposure, perhaps at any time.

NIAAA, 2003
Examples of dysmorphic FASD (FAS)

Examples deleted because of confidentiality issues
Examples of nondysmorphic FASD

Examples deleted because of confidentiality issues
Growing up with FAS

Examples deleted because of confidentiality issues

Courtesy of Ann Streissguth
Substance Use in Pregnancy

- Overall rates of alcohol use among pregnant women have declined since 1995. But rates of frequent and binge drinking remain at high levels.
- More than 130,000 pregnant women per year in the US consume alcohol at risk levels.

- 1 in 30 women who know they are pregnant reports “risk drinking”
- 1 in 7 women of childbearing age engage in "risk drinking"
  - Birth defects associated with alcohol exposure can occur before a woman knows she is pregnant
  - Nearly 50% pregnancies are unplanned
Prevalence of FAS

- Different studies show prevalence rates for FAS in the US ranging from .3 to 2.2/1,000 births.
  - Some groups may be as high as 10/1000

- Each year in the US, as many as 8,800 cases of FAS occur.
  - Maybe 4 times as many affected by alcohol but without FAS (these are the nondysmorphic FASD cases)
Five-day-old with FAS
Autopsy findings

- Microcephaly
- Hydrocephaly
- Cerebral dysgenesis
- Neuroglial heterotopias
- Corpus callosum anomalies
- Ventricle anomalies
- Cerebellar anomalies
Behavioral descriptions of children with FAS

- “too lively, ceaselessly agitated, turbulent and quarrelsome”  Lemoine et al., 1968
- “tremulous, hyperactive and irritable”  Jones and Smith, 1976
- “fidgety, distractible, always on the go, and never sitting still”  Streissguth et al., 1978
Image Analysis

T1-Weighted
Skull stripped tissue segmented
Surface rendering
Take Home Message 1

Prenatal exposure to alcohol, at least high doses of alcohol, can cause permanent changes in the brain and it is these changes that underlie the behavioral problems (either directly or indirectly).
Diagnostic Groups

- Fetal Alcohol Syndrome (FAS) - Dysmorphic FASD
  - Children with all of the required diagnostic criteria and a confirmed history of heavy prenatal alcohol exposure

- Prenatal Exposure to Alcohol (PEA) - Non Dysmorphic FASD
  - Children with a known history of significant alcohol exposure, but without the physical features necessary for a diagnosis of FAS

- Non-exposed Control (CON)
  - Children who have no history of exposure to alcohol or other known teratogens