

## Fetal Alcohol Spectrum Disorders Understanding Effects Improving Outcomes



John Kellerman at age 5 (left), 12 (centre) and 19 (right): "I just want to keep him out of prison and out of the morgue."

Part 3: Baby's First Environment  
Presentation by Teresa Kellerman  
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Arizona Division of Developmental Disabilities

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## Part 3: Baby's First Environment

- Review diagnosis and symptoms
- Review birth mother statistics
- How alcohol affects development
- How alcohol impacts brain/behavior
- Primary and secondary disabilities

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## What Does FASD Look Like?

There may or may not be

- physical symptoms
- birth defects
- facial features
- developmental delays

*In most cases, the child with FASD looks  
just like any other child.*

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## Neurological signs during childhood

- Difficulties with bonding and attachment
- Inappropriately affectionate to strangers
- Inability to form healthy relationships
- Memory deficits (forget the rules)
- Poorly formed conscience (lying/ stealing)
- Stubborn, compulsive, perseverate, tantrums
- Arrested social development ("Think Young")
- Poor judgment, lack of impulse control

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## Most Symptoms are Invisible

- Memory deficits (forget the rules)
- Impulsivity (acts without thinking)
- Emotional dysmaturity ("Think Young")
- Poor judgment

They make the same mistakes over and  
over, in spite of the consequences

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## FASD Diagnostic Guidelines

Go to [www.fascrc.com](http://www.fascrc.com)

Scroll down to "Doctor's Office"

- IOM guidelines for FAS diagnosis
- Clarren-Astley 4-digit code (March of Dimes)
- New IOM guidelines include ARND:

A Practical Clinical Approach to Diagnosis of Fetal Alcohol  
Spectrum Disorders: Clarification of the 1996 Institute of  
Medicine Criteria - *Pediatrics* 205;115:39-47  
by H. Eugene Hoyme, MD, Philip A. May, PhD, Kenneth  
Lyons Jones, MD, and Luther K. Robinson, MD et al

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## Women who drink when pregnant:

- **Women with college education**  
(CDC Study: Obstet Gynecol. 1998 Aug;92(2):187-92)
- **Household income over \$50,000**  
(CDC Study: Obstet Gynecol. 1998 Aug;92(2):187-92)
- **Women who were prenatally exposed and affected themselves** (1996 Ann Streissguth)
- **Of women who are pregnant (1<sup>st</sup> trimester), 23% admit to recent alcohol use** (2008 National Survey on Drug Use and Health)

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## Alcohol is a Toxic Substance

- Alcohol is a toxin
- Alcohol is a carcinogen
- Alcohol is a teratogen
- Alcohol causes more damage to the developing baby's brain than any other substance, including marijuana, cocaine, meth, and heroin.

-- Institute of Medicine Report to Congress

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## Look Who's Drinking!

- **Whatever is developing at the time of exposure is at risk of damage**
- **The organs are developing during the first trimester**
- **The brain is developing all during pregnancy**
- **There is no safe amount, no safe time, no safe type of alcohol during pregnancy**



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## Effects of Ethanol Exposure on the Developing Embryo

- **Induces cell death during the formation of new brain cells.**  
Alcohol Clin Exp Res. 2007 Apr;31(4):665-74.
- **Disrupts the proliferation and differentiation of brain cells.**  
Alcohol Clin Exp Res. 2007 Apr;31(4):694-703



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## Effects of Ethanol Exposure on the Developing Embryo

- **Suppresses breathing movements during time before birth.**  
Can J Physiol Pharmacol. 1991 May;69(5):550-69.
- **Interferes with function of lungs with resultant lower viability after premature birth.**  
Alcohol Clin Exp Res. 2007 Feb;31(2):308-16

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## Effects of Ethanol Exposure on the Developing Embryo

- **Alters common signaling pathways causing shift in cell motion and metabolism.**  
Dev Dyn. 2007 Feb;236(2):613-31
- **Alters expression of certain genes involved in cell proliferation, tissue growth, differentiation, brain cell growth.**  
J Lab Clin Med. 2005 Jan;145(1):47-54.

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## Effects of Ethanol Exposure on the Developing Embryo

- **Yields ocular and forebrain abnormalities after early exposure.**  
Alcohol Clin Exp Res. 2006 Oct;30(10):1791-8
- **Alters genetic expression of tissue in craniofacial areas resulting in smaller face, eyes, nose, and jaw, and under-development or cleft in lip or palate.**  
J Toxicol Environ Health A. 2004 Dec;67(23-24):2073-84

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## Effects of Ethanol Exposure on the Developing Embryo

- **Changes the expression of certain genes in the developing neural tube during early stages of development with resultant damage to central nervous system.**  
Brain Res Dev Brain Res. 2003 Aug 12;144(1):9-23
- **Compromises development of the midline neural tube and forebrain.**  
Developmental Brain Research 144 (2003) 43–55.

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## Effects of Ethanol Exposure on the Developing Embryo

- **Causes alterations in GABA(A) receptor expression in the hippocampus, thus contributing to behavioral disorders and difficulties with spatial learning.**  
Behav Brain Res. 2004 Apr 2;150(1-2):117-25
- **Decreases the prenatal testosterone surge in male offspring.**  
Neurotoxicol Teratol. 1998 Jul-Aug;20(4):483-90

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## Effects of Ethanol Exposure on the Developing Embryo

- **Increases levels of maternal cortisol (stress hormone) that can have negative impact on brain development.**  
J Neuroendocrinol. 2005 Sep;17(9):600-8
- **Causes long-term disruption in regulation of vasopressin, a neurotransmitter associated with social behaviors and mating.**  
Alcohol. 1989 May-Jun;6(3):193-8

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## Effects of Ethanol Exposure on the Developing Embryo

- **Disrupts production of oxytocin in females, interfering with maternal behaviors.**  
Alcohol and Alcoholism. 2009 Nov-Dec;44(6):555-60.
- **Impacts the limbic system and reduces capacity to adapt to maternal separation and other stress**  
Child Dev. 2004 Jan-Feb;75(1):96-109.

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## Effects of Ethanol Exposure on the Developing Embryo

- **Alters serotonin neurotransmission in discrete brain regions permanently**  
Brain Research, Volume 856, February 2000, pp 184-192
- **Slows the migration and reduces the development of serotonin neurons by 20%-30%**  
Developmental Brain Research, Volume 126, Issue 2, 28 February 2001, pp 147-155

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## Most Serious Effect: Neurobehavioral Disorders



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## Effects of Ethanol Exposure on the Developing Embryo

- **Disrupts neurotransmitter systems:**
    - **Dopamine** (Druse et al., 1990),
    - **Serotonin** (Tajuddin and Druse, 1999; Sari et al., 2001),
    - **Glutamate** (Farr et al., 1988; Kelly et al., 1986),
    - **Histamine** (Rawat, 1980),
    - **Choline** (Light et al., 1989),
    - **Norepinephrine** (Detering et al., 1980)
- ALCOHOLISM: CLINICAL AND EXPERIMENTAL RESEARCH  
Vol. 29, No. 9, September 2005

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## The Alcohol Damaged Brain

Brain of normal baby - Brain of baby with FAS

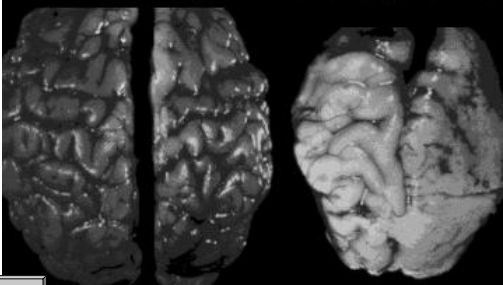
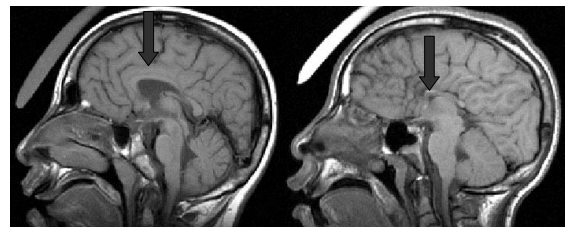


Photo courtesy of Dr. Sterling Clarren

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The corpus callosum is  
sometimes smaller than normal

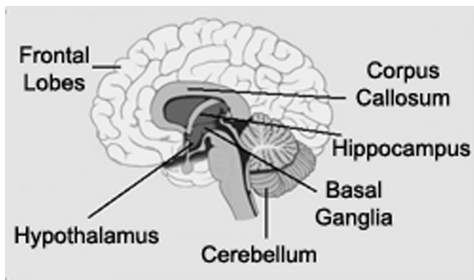


MRI graphics courtesy of Dr. Ed Riley

But most persons with FASD will have an  
MRI that appears to be normal. --2003 Ed Riley

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## Areas of Brain Affected by Alcohol



--NIAAA

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## Brain Functions That May Be Impaired

- **Corpus Callosum** - processes information between right brain and left brain
- **Cerebellum** - motor control
- **Basal Ganglia** - processes memory
- **Hippocampus** - learning, memory, judgment
- **Frontal lobes** - executive functions, impulse control, judgment

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## “Executive Functions” of the prefrontal cortex

- Inhibitions
- Planning
- Time perceptions
- Internal ordering
- Working memory
- Self monitoring
- Verbal self-regulation
- Motor control
- Regulation of emotions
- Motivation

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## FASD and Social Development

Research on comparison of  
social abilities among:

- Children with FAS
- Children with same IQ (no FAS)
- Control group (normal children)

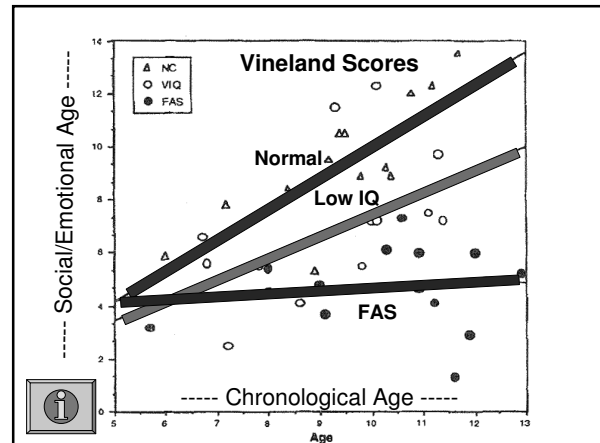
Researchers: Ed Riley and associates

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## Social Abilities Assessment

- Vineland Adaptive Behavior Scales
- Parent Version
- “VABS-II”
- Administered by school psychologist

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## Research Citation

### Comparison of social abilities of children with fetal alcohol syndrome to those of children with similar IQ scores and normal controls

Thomas SE, Kelly SJ, Mattson SN, Riley EP.. Alcohol Clin  
Exp Res 22:528–533, 1998.

Medline link:  
<http://ncbi.nlm.nih.gov/pubmed/9581664?dopt=Abstract>

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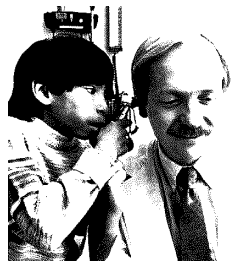
## Arrested Social Development

- Social developmental age is reflected in emotional regulation and conscience development.
- With FAS, social development is arrested rather than delayed (Riley et al 1998).
- **Behavioral profile of children with FAS does not change when they become adults** (Steinhausen et al 1993).
- The 18-21 year old with FAS may be functioning intellectually at the level of a 12-16 year old but socially-emotionally at the level of a 4-6 year old.

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## Primary Disabilities

- Delayed development
- Physical defects
- Hyperactivity
- Attention deficits
- Low functional abilities
- Lack of social inhibition



**Primary disabilities are organic, permanent**

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## Secondary Conditions

- 94% - Mental health issues (depression)
- 80% - Trouble with independent living
- 80% - Trouble with employment
- 70% - Trouble in school
- 60% - Trouble with the law
- 60% - Confinement in prison or institution
- 45% - Legal problems with sexual behaviors
- 50% - 70% Adults abuse alcohol/drugs

-1996 Ann Streissguth



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## Greatest Challenges for Teens

- Behavior problems become more pronounced
- Physical symptoms are less apparent
- More than half of adults with FASD have clinical depression.
- 43% have threatened or contemplated suicide.
- 23% have attempted suicide. --Streissguth 1996

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## Protective Factors

- Early diagnosis
- Eligibility for services
- Appropriate intervention services
- Stable home environment
- No domestic violence

Between 75%-80% of children with FAS are in foster/adoptive care

-- 1996 Ann Streissguth



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## Review

- Alcohol causes more damage to the developing baby than any other substance
- There is no safe amount, type, or time
- Alcohol can cause structural damage (cell death) and functional damage (limbic system, neurotransmitters, reward cycle)
- Most serious effects are neurobehavioral
- In most cases, there are no physical signs
- 94% = serious mental health issues

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## Next Session

Intervention Strategies for All Ages

All handouts for all sessions:

<http://fasarizona.com/FASDtrain/Handouts/>

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