“Wisdom of Practice” in the Diagnosis and Treatment of Fetal Alcohol Spectrum Disorders

Paula J. Lockhart, MD
Director FASD Diagnostic and Treatment Program
The Kennedy Krieger Institute

Learning Objectives

- List three diagnostic criteria of Fetal Alcohol Syndrome
- Describe Alcohol Related Neurodevelopmental Disorder
- Analyze newer concepts of FASD
- Identify the individual at risk for an FASD
- Describe long term cognitive, learning and behavioral implications for the individual with prenatal exposure to alcohol
- Discuss the range of interventions most commonly required by individuals with FASD

Alcohol is a potent neurotoxic substance when exposed to a developing brain.

No Amount of Alcohol is safe to use in pregnancy

FASD-Fetal Alcohol Spectrum Disorders

- An umbrella term describing the range of effects that can occur in an individual whose mother drank during pregnancy. These effects may include physical, mental, behavioral, and or learning disabilities with possible lifelong implications.

- Bertrand et al. 2004

Fetal Alcohol Spectrum Disorders

1. **Individuals do not “grow out” of the central nervous system effects.**
2. **It is a diagnosis of exclusion, can appear like other disorders, and can co-exist with other disorders.**
3. **It is a serious life long developmental disability from the neurotoxic effects of prenatal alcohol on the developing brain.**

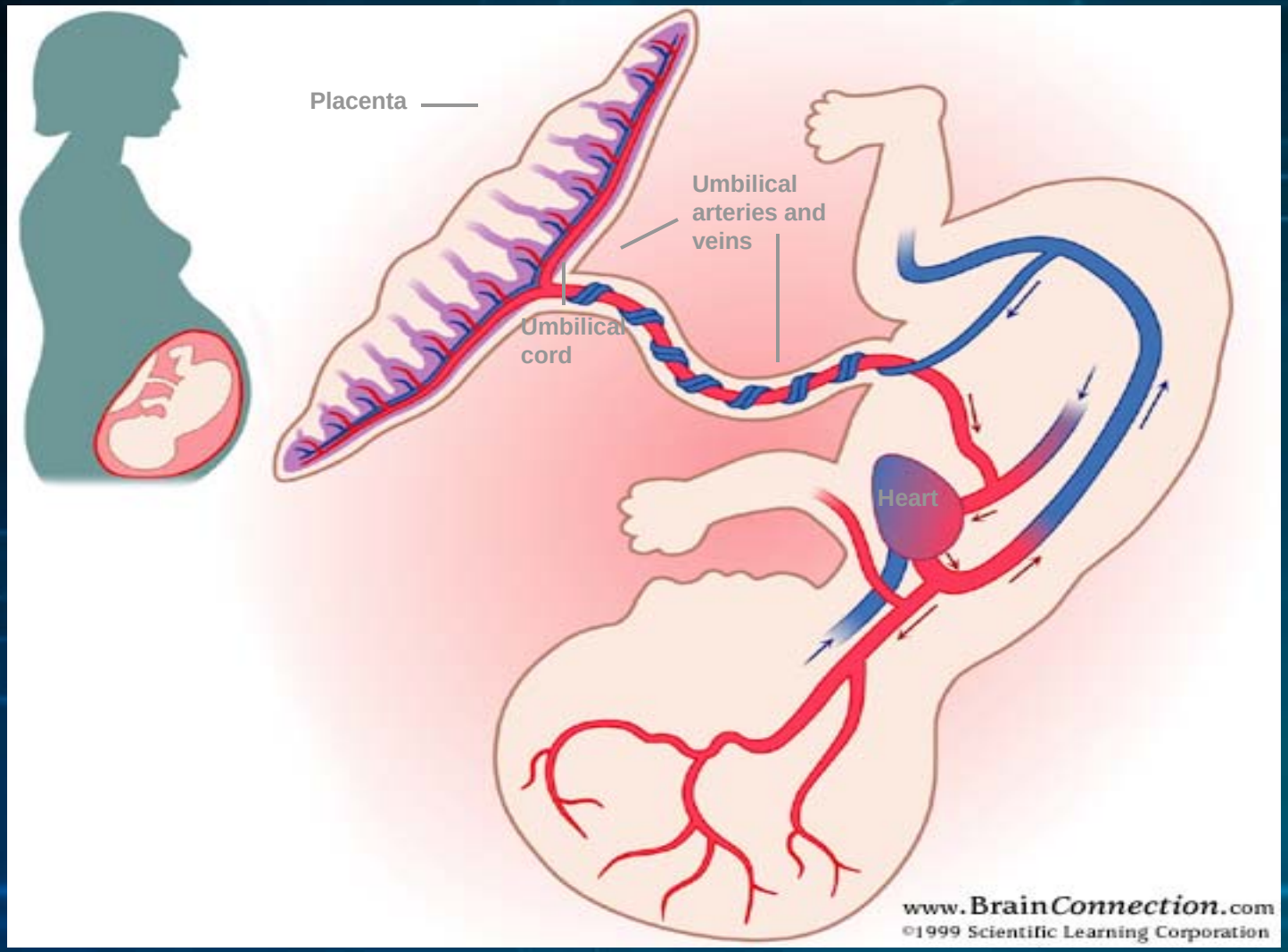
FASD Mental Health Issues Transcend DSM Criteria

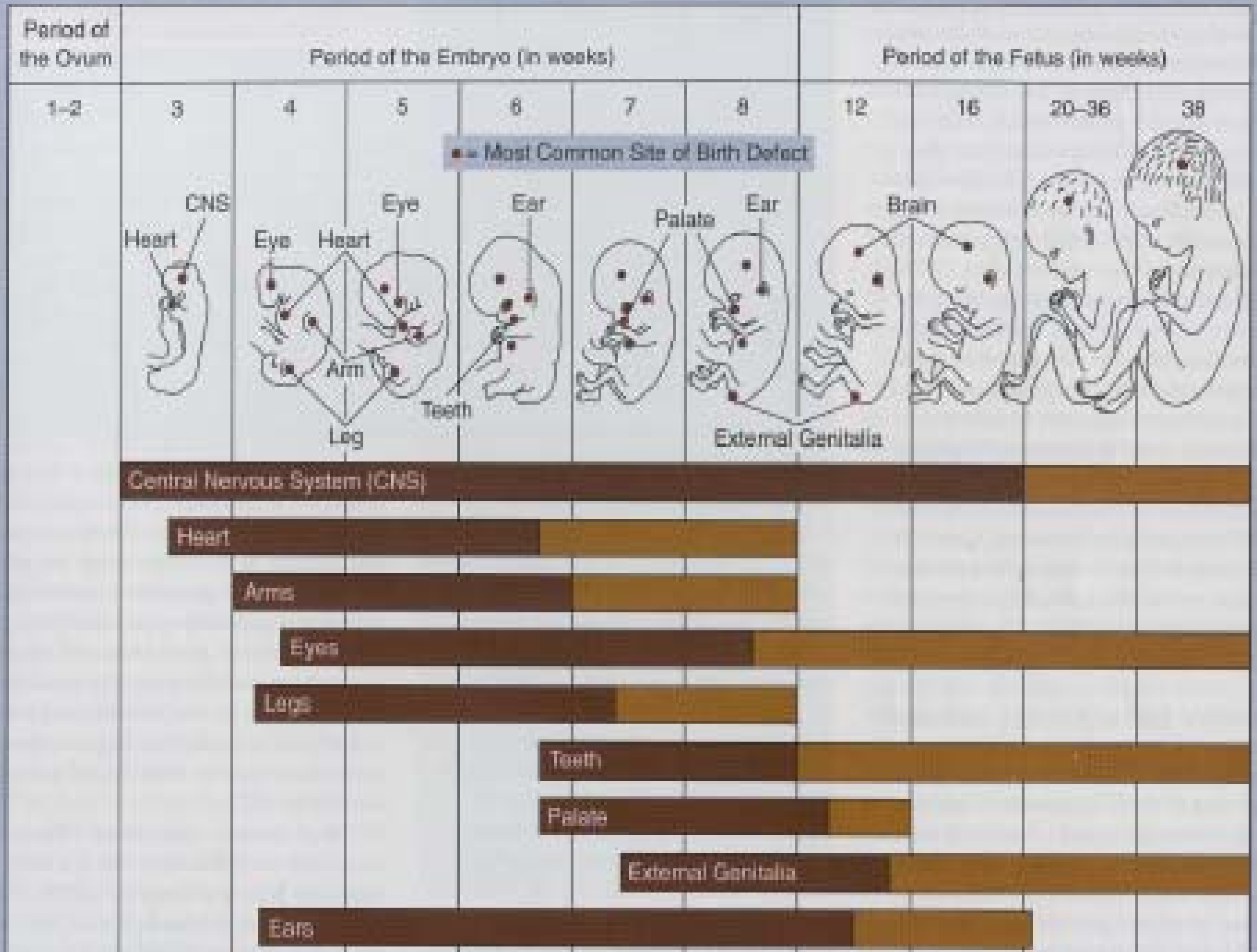
- When meds are helpful there are still unexplained and seemingly unprovoked behavioral episodes
- Family or caretaker is exhausted and often angry, depressed or bewildered
- After years of psychotherapy and medication patient may still be unsuccessful or not progressing

1 in 100 individuals may have a FASD

University of Washington

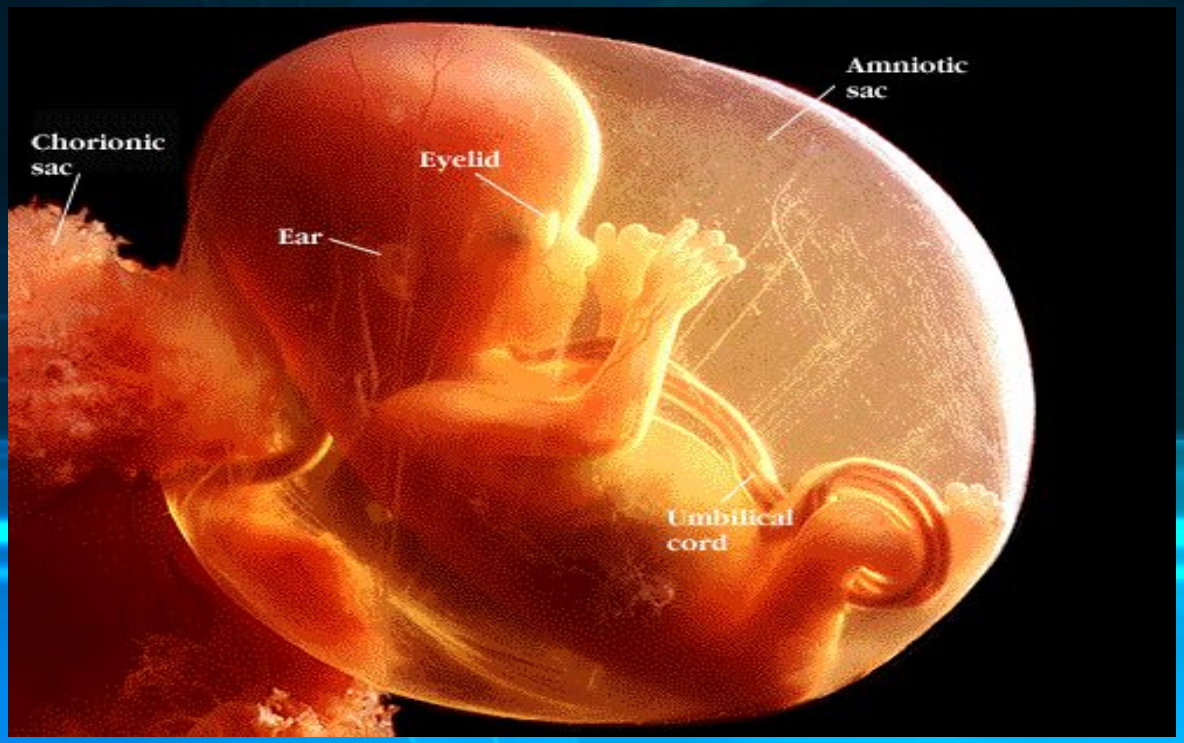
Alcohol Diffuses to the Fetus during Gestation and in Breast Milk during Breastfeeding




Period of the Ovum
Period of the Embryo (in weeks)
Period of the Fetus (in weeks)
1–2
3
4
5
6
7
8
12
16
20–36
38
Most Common Site of Birth Defect
CNS
Heart
Eye
Eye
Heart
Ear
Palate
Ear
Brain
Arm
Leg
Teeth
External Genitalia
Central Nervous System (CNS)
Heart
Arms
Eyes
Legs
Teeth
Palate
External Genitalia
Ears

Deleterious effects appear multifactorial

Fetuses are differentially susceptible to the effects of alcohol exposure



Institute of Medicine Nomenclature

Fetal Alcohol Spectrum Disorders (FASD)

1. FAS-Fetal Alcohol Syndrome
2. pFAS-Partial Fetal Alcohol Syndrome
3. ARBD-Alcohol Related Birth Defects
4. ARND- Alcohol Related Neurodevelopmental Disorder

Fetal Alcohol Syndrome

- Low birth weight
- Central Nervous system effects
- Facial Dysmorphology

(Modern description of FAS published in early 1970's)

Updated Criteria for Fetal Alcohol Syndrome

Criteria for Diagnosis:

1. Growth retardation-height and/or weight
2. 3 Dysmorphic facial features (short palpebral fissures, flattened philtrum, thin upper lip)
3. Cognitive Disability(at least 3 of the following: motor skills, speech and language, adaptive living skills problems, executive functioning, social skills disability, attention, hard neurological findings, LD, MR, etc.)
4. The presence of prenatal alcohol exposure helpful but not needed for this diagnosis

Canadian Criteria

The Facial Features of FAS in mouse fetus that was exposed to single binge of alcohol during 1st trimester.

child with FAS

Narrow forehead

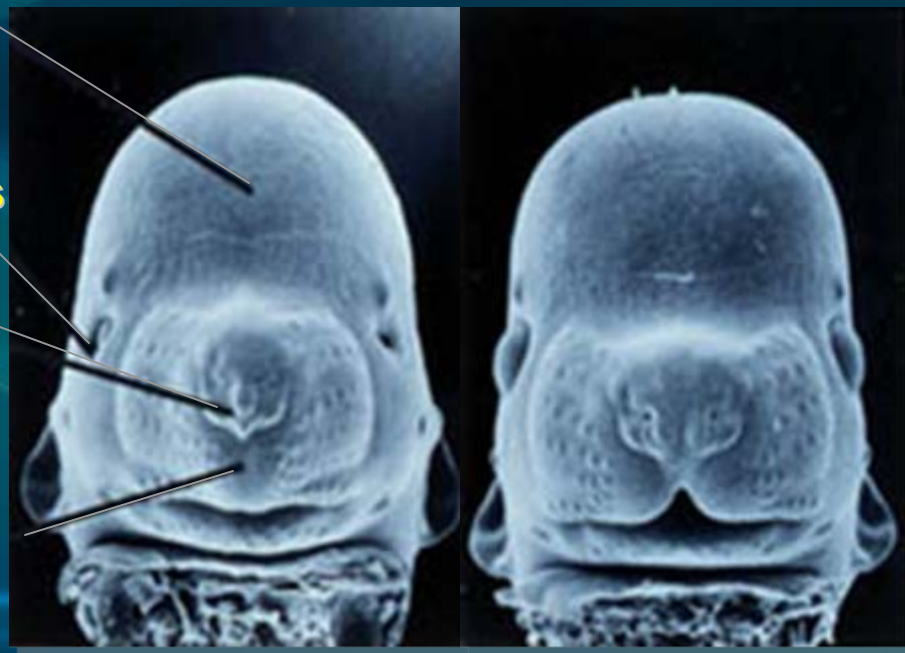
Short palpebral fissures

Small nose

Small midface

Thin upper lip with flattened philtrum

mouse fetus



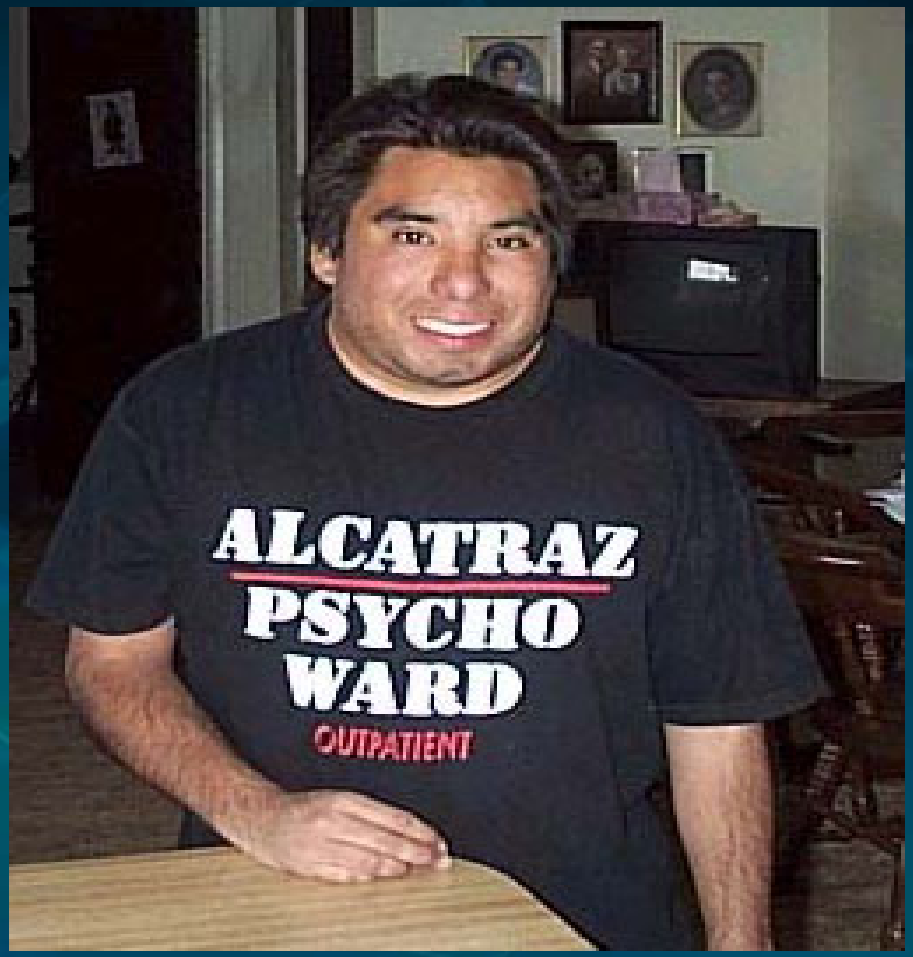
alcohol-exposed

normal

Sulik, 1996

Photos: Sterling Clarren

Fetal Alcohol Syndrome


ALCATRAZ
PSYCHO
WARD
OUTPATIENT

Examples of Physical Manifestations of FAS

- Growth- pre and/or post natal growth retardation
- Average IQ-65 range 20-105
- Poor eye hand coordination, tremulousness
- Irritability and hyperactivity
- Microcephaly, short palpebral fissures, maxillary hypoplasia, short nose, smooth philtrum and thin and smooth upper lip, micrognathia
- Joint abnormalities, abnormal position or function
- Cardiac abnormalities, ptosis
- Ophthalmic abnormalities

Partial FAS

- Confirmed prenatal alcohol exposure
- Evidence of 3 or more central nervous system domains:
  - Memory, brain structure, adaptive functioning, social communication, ADHD, soft neurological signs
- Simultaneous presentation of 2 facial anomalies at any age:
  - Short palpebral fissure length
  - Smooth or flattened philtrum
  - Thin upper lip

Alcohol Related Birth Defects

- Congenital anomalies
- Dysplasias
- Confirmed alcohol exposure

Alcohol-Related Neurodevelopmental Disorder

- Confirmed Alcohol Exposure; and
- Evidence of 3 or more central nervous system domains:
  - Memory, brain structure, adaptive functioning, social communication, ADHD, soft neurological signs, etc.(2 standard deviations below the mean)

Costs of FASD in the United States

- FAS costs US $5.4 billion in 2003
- An FAS birth carries lifetime health costs of $860,000 although can be as high as $4.2 million
- Including quality of life, FAS prevention may be “cost effective” at up to $850,000 per child

National Organization on Fetal Alcohol Syndrome

Russian prosecutors to investigate adoption procedure of boy who died in US

AP Worldstream; August 5, 2005; MARIA DANILOVA, Associated Press Writer; 343 Words

... about the fate of Russian-born children adopted ... prompted a senior Russian lawmaker to call on halting adoptions by U.S. citizens ... Merryman was the 13th Russian-born child to die ... allowed foreign adoptions in the early 1990s ... said. Some 260,000 Russian orphans are ...

South African Study

- “….. the rate of Fetal Alcohol Syndrome was about 45 per 1,000 school entry children, in the first study. About 70 per 1,000 in the second study. It may be as high as 85 per 1,000 in the third study".

Professor Denis Viljoen, head of Human Genetics at Wits University in Johannesburg.

Susceptibility (Risk) Factors

- Pattern
- Duration
- Timing
- Dose
- Genetic factors
- Parity
- Age of the mother
- Binge drinking
- Smoking
- Other drug use
- Constitutional factors
- Physical health
- Poor nutrition
- Trauma
- Stress

How much alcohol is safe???

- Cannot ever be sure
- Risk is based on multiple factors
- Binge drinking may be more dangerous
- Genetic vulnerability across populations for both mother and child
- Environmental factors play an unappreciated role in affecting outcome

Animal models – Example of the comparability of effects

- Growth retardation
- Facial characteristics
- Heart, skeletal defects
- Microcephaly
- Reductions in basal ganglia and cerebellar volumes
- Callosal anomalies
- Hyperactivity, attentional problems
- Inhibitory deficits
- Impaired learning
- Perseveration errors
- Feeding difficulties
- Gait anomalies
- Hearing anomalies

Driscoll, et al., 1990; Samson, 1986

Alcohol is More Neurotoxic than Cocaine, Heroin, PCP or Marijuana

Alcohol Dose

- 1 drink/week-hyperactive and aggressive behaviors
- Moderate to heavy use-delinquent behavior and overall problem behavior
- Any alcohol use in pregnancy
  - 3.2X the risk for delinquent behavior

Sood et al. 2001

Brain-Behavior Principles

- The extent of damage is in a “dose-response” relationship although this is modulated by genetic variability (Binge drinking is worse)
- There appears to be a synergistic effect of certain added compounds like cocaine on the developing CNS

Brain-Behavior Principles

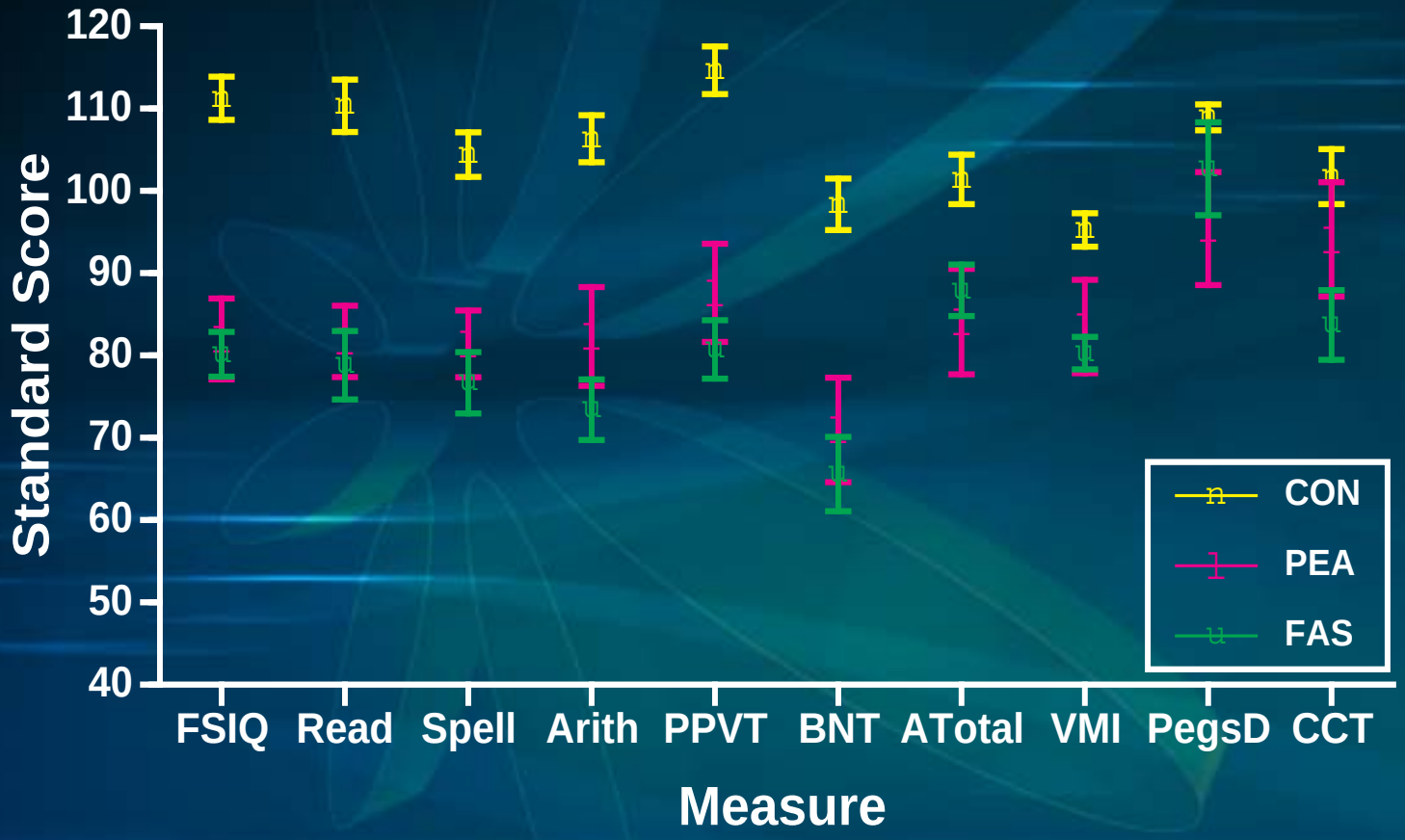
- Parts of the brain are affected differentially by alcohol
- Certain regions of the brain are damaged and other regions are spared
- Certain cell types are damaged whereas certain cell types are spared
- Most neurotransmitters systems appear to be affected
- The absence of dysmorphology does not indicate that the individual is spared

Neuropsychological Findings

- Verbal learning
- Visual motor integration
- Memory
- Academic skills
- Fine motor skills and speed
- Language skills
- Mathematics skills
- Executive functioning

Mattson and Riley, 2000

Neuropsychological Performance



Mattson, et al., 1998

CNS Effects

- Depends upon developmental period the exposure occurs
- Depends upon the sensitivity of the region to alcohol's toxic effects
- Cell types throughout the CNS and within the same structure are differentially sensitive to the toxic effects during certain times in gestation

Neuronal Effects

- neurogenesis
- neuronal differentiation
- neuronal migration
- arborization
- synaptogenesis

Miller, 1986

Regions of the Brain Most Commonly Affected By Prenatal Alcohol Exposure

Frontal Lobes

Parietal Lobes

Corpus Callosum

Basal Ganglia

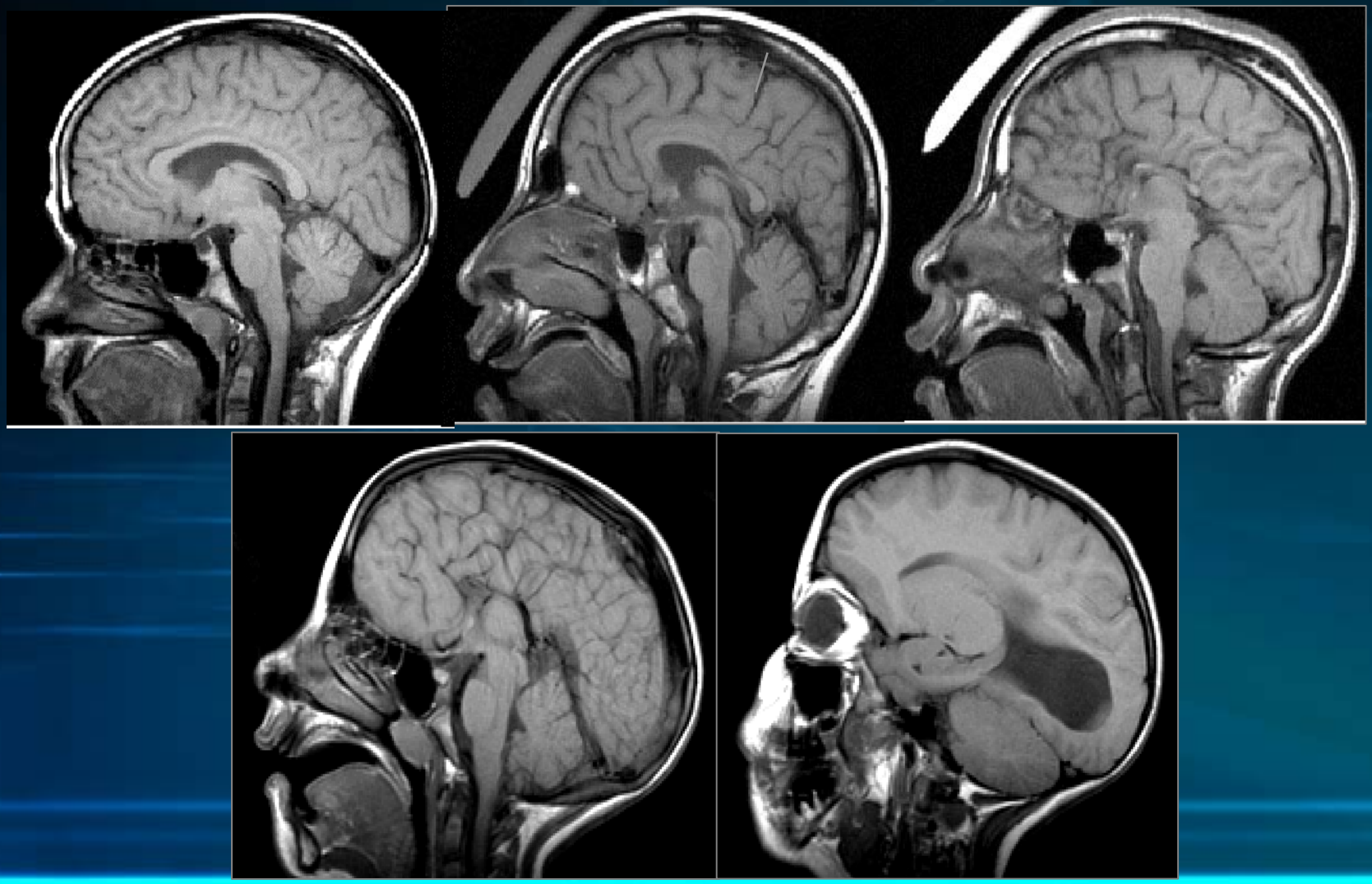
Cerebellar Vermis

Alcohol is a Midline Teratogen

- Key facial changes are related to midface hypoplasia.
- In 2001, Astley and Clarren evaluated the correlation of facial dysmorphology with brain dysfunction in a group of children with prenatal alcohol exposure
- They found more children with more severe facial phenotypes demonstrated more impaired levels of cognitive, neuropsychological, and visual motor functioning.

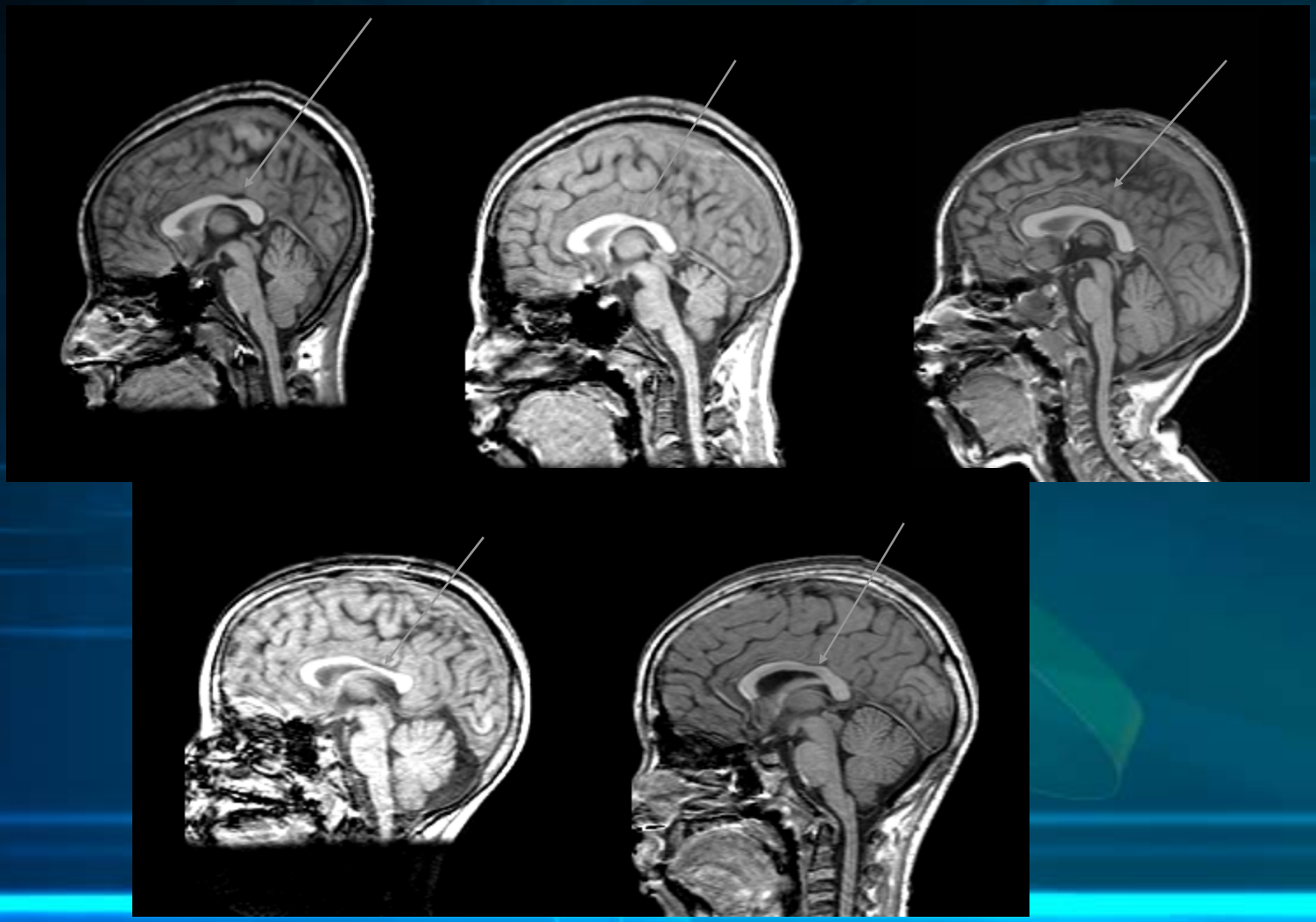
Astley and Clarren, 2001

Corpus callosum abnormalities



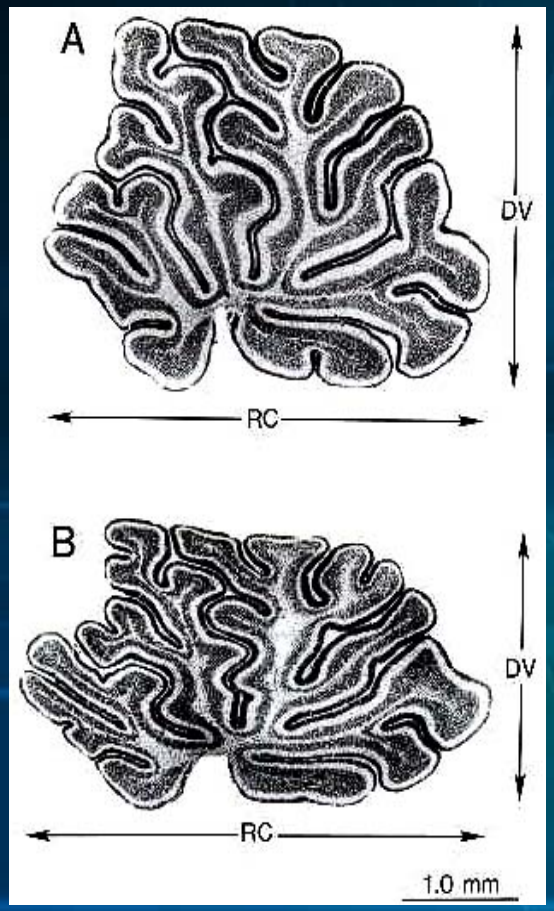
Mattson, et al., 1994; Mattson & Riley, 1995; Riley et al., 1995

Corpus Callosum Abnormalities



Lockhart, P, Mahone, M., Mostofsky, S unpublished data

Alcohol and the Cerebellum



Purkinje Cell Layer

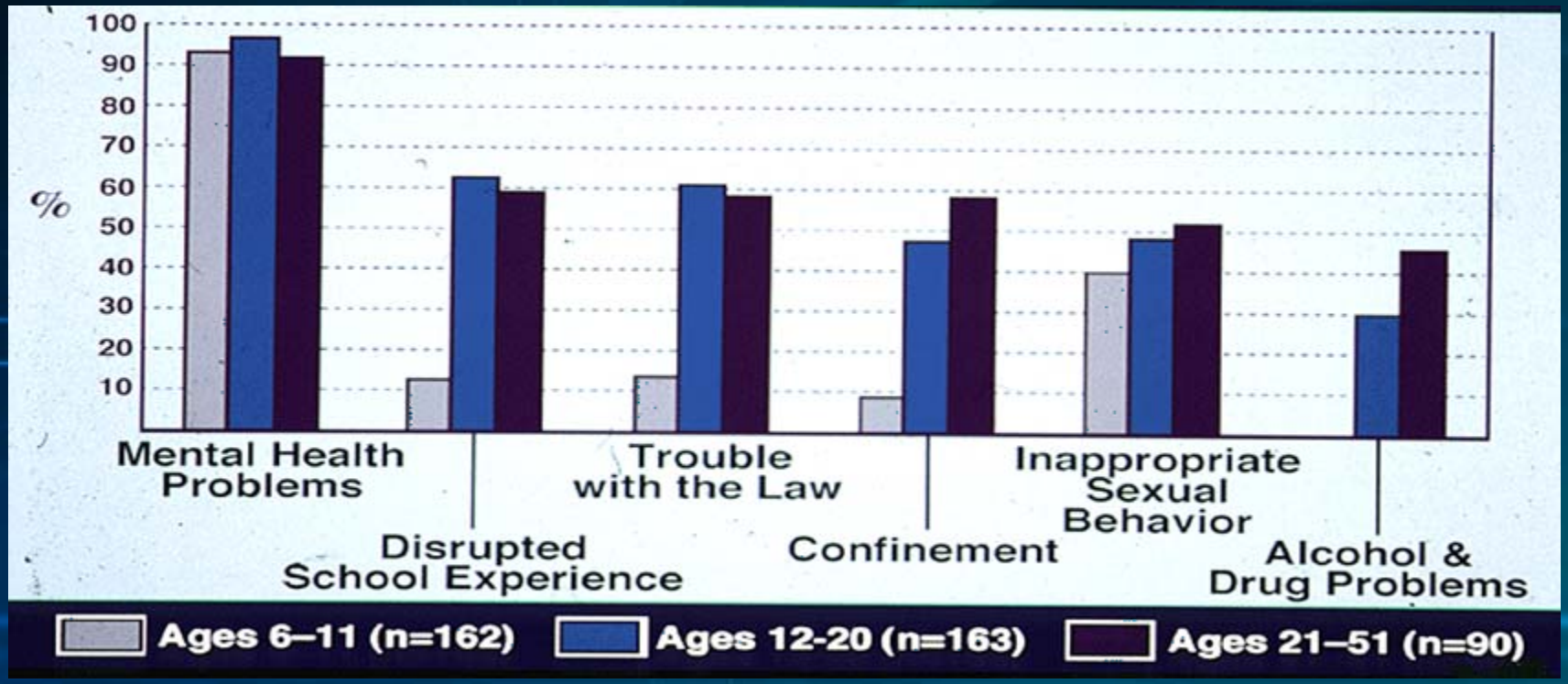
Pictures courtesy of James West

Suspected Mechanisms Implicated in CNS Damage

- Cell death modes(necrosis and apoptosis)
- Free radical damage
- Interference with growth factor functions
- Adverse effects on astrocyte formation
- Abnormal development of neurotransmitter system
- Altered glucose transport and uptake
- Abnormal cell adhesion molecules
- Altered regulation of gene expression

Individuals with FASD have a range of secondary disabilities that the individual is not born with- and which could be ameliorated with appropriate interventions.

Secondary Disabilities



Streissguth, et al., 1996

Diagnosis of FASD

- Individuals with FAS and ARND will of course appear different
- But these individuals may be equally cognitively and behaviorally disabled
- Because individuals with ARND are usually not identified early they have endured more environmental distress and may have more secondary symptoms

Disorders that Resemble FASD

- Noonan's Syndrome
- Williams Syndrome
- Dubowitz Syndrome
- Aarskog Syndrome
- Fetal anticonvulsant syndrome
- Other chromosome deletion and duplication syndromes

What are Problems Interfering with Health Professionals Providing "good enough services"

1. The disorder is not housed in the DSM
2. There is are few places to obtain a consultation
3. There is no text where this information is easily obtained in rapid style
4. These patients can often look happy and healthy thereby misleading the practitioner who has to make a rapid decision about treatment that the patient is stable

Caretakers

- Be ready to support the caretakers
- Require much time to absorb the reality of the situation of having a special needs child (may take years)
- Need understanding from helping professionals (therapist may need support from colleagues to avoid “burn-out”)
- Blame and or provoking guilt should be avoided in all interactions (most parents just don’t know that their behavior towards the child is unjustified)
- They have to be taught to understand and be more accepting
- Be ready to believe the fantastic stories they report
- These stories are generally true
- Need to evaluate the neurotic issues and stress behavior of caretakers

Caretaker-Child Problems

- “Goodness of Fit”
- Seriousness of the disability
- Intensity of the wish for a typical child
- Difficulties in obtaining adequate medical services
- Treatment planning

Patients Can Achieve Stability

- Despite the complexity of some of our patients with FASD many can achieve a certain level of stability over time when specific areas of their functioning are prioritized

- In the more impaired individuals their problems are multifactorial and therefore a complex interplay between
  - **Cognitive factors**
  - **Environmental conditions**
  - **Susceptibility to behavioral and emotional reactivity**
  - **Genetic predisposition for psychiatric disorder or developmental disorders**
  - **Somatic disorders**

- Tackling these problems requires an integrated context oriented approach

Sample Diagnostic Work Up

- Dysmorphology evaluation
- Possible genetic testing
- Lead level
- MRI
- EEG
- Neurological evaluation
- Neuropsychology Evaluation
- Speech and Language Evaluation
- Occupational Therapy Evaluation
- Behavioral Psychology Evaluation

Assessment instruments

- BRIEF
- SIB-R
- Connor's
- CBCL
- Sensory Processing
- Developmental history
- Parent Stress index
- BASC
- SNAP

FAS Facial Photographic Analysis Report

IDENTIFICATION

	First	Middle	Last
Name	Kinya		Marangu

Subject I.D. 10-41-16
Source of Photo Clinic
Gender Female
Race African American/
Birth Date 11/7/1999

PHOTO ASSESSMENT

* Normal PFL Charts: Iosub Lip-Philtrum Guide: African American

	Frontal	¾ View	Lateral
File Name	KM front 2.JPG	KM .75 a.jpg	KM side a.JPG
Date of Photo	7/25/2006	7/25/2006	7/25/2006
Age (yrs) in photo	6.71	6.71	6.71
Date of Photo Assessment	7/25/2006	7/25/2006	7/25/2006
Photo Assessor	Boyle	Boyle	Boyle

Length of Real Internal Measure of Scale(sticker) placed on forehead (mm) 25.4
Length of Internal Measure of Scale in Frontal Photo (pixels) 226.7

Left Palpebral Fissure Length:	In photo (pixels) 193.0	True Length (mm) 23.8	* Z-score	-3.40
Right Palpebral Fissure Length:	In photo (pixels) 204.0	True Length (mm) 25.1	Z-score	-2.97
Mean Palpebral Fissure Length*:	In photo (pixels) 198.5	True Length (mm) 24.5	Z-score	-3.19
Inner Canthal Distance:	In photo (pixels) 237.0	True Distance (mm) 26.6	Z-score	

Flat Philtrum (5-point rank): In Frontal Photo 5 In ¾ Photo 5
Thin Upper Lip: Circularity (perimeter²/area) 72.3 5-Point rank (Circ)* 5 5-Point rank (Scale) 4

clown eyebrows ☐ ptosis ☐ strabismus ☐ epicanthal folds ☐
flat midface ☐ protruding ears ☐ flat nasal bridge ☐ hypertelorism ☐

Other anomalies present: Ears (NOS)

Comments: slight head tilt toward patients right shoulder secondary to posture as right shoulder is a bit lower too. Attempts to correct posture
Other syndromes present: None reported

PHOTO QUALITY

	Frontal	¾ View	Lateral
Side showing		Right	Right
Head rotation (5-point rank/degrees) to subject's Right (+) or Left (-)	0°	0	0
Head tilt (5-point rank) toward subject's Right (+) or Left (-) shoulder			0
Head tip (degrees) Up (+) or Down (-) from Frankfort Horizontal Plane	0°		
Exposure (3-point rank)	1 (good)	1 (good)	1 (good)
Focus (3-point rank)	1 (good)	1 (good)	1 (good)
Facial Expression (3-point rank)	1 (Relaxed)	1 (Relaxed)	1 (Relaxed)
Reliability of ABC-Score for palpebral fissure length (5-point rank)	2 (good)		
Reliability of ABC-Score for philtrum (5-point rank)	1 (very good)	2 (good)	
Reliability of ABC-Score for upper lip (5-point rank)	1 (very good)		


KM front 2.JPG


KM .75 a.jpg


KM side a.JPG

OUTCOME

	C PFL	C Philtrum	C Lip
ABC-Score			
Data Used			

4-Digit Diagnostic Code for Face 4: FAS features severe

Diagnosis of FASD

- Diagnosis of Exclusion
- Can have major Axis I diagnosis/es but features of FASD may also appear like bipolar disorder, autism, conduct disorder, etc.
- Important to look at the quality of the symptoms and how close they are to DSM IV criteria
- Facial dysmorphic features are suggestive of FASD but also rule out presence of a genetic disorder
- Growth retardation needs to be ruled out (chart growth-are there any reasons for non-alcohol associated growth problems)
- Contribution of psychosocial problems to the symptoms
- What are the protective factors

Treatment of the Central Nervous System Effects of Prenatal Alcohol Exposure

Hope derives from new concepts of treatment:

- Psychopharmacology (improving cognition, reduction of anxiety and mood problems)
- Psychotherapy (family support, repetitive messages)
- Environmental manipulation (structure, mentoring, etc.)
- Parenting therapy
- Speech and Language (social skills practice)
- Occupational Therapy (motor and sensory system treatment)
- Behavioral Therapy (reward systems)

Spectrum of Disability

Speech and Language
Motor Skills
Adaptive functioning
Executive functioning
Somatic problems
Environment
Axis I diagnoses

All of these areas of disability can negatively impact on the treatment of these patients if not factored in in a dynamic manner

Treatment

- Most treatment protocols are not rigorously researched
- Medication treatment of Axis I diagnoses teasing out the cognitive from the major diagnoses decreases pain and suffering
- Structure, support, limits and close direction are a must
- Rewards built in are more helpful than punitive consequences
- Sexuality, drugs, victimization and boundaries must be carefully taught
- Talk therapy can be helpful to improve communication and decrease outbursts.
- Cognitive disability needs to be factored into the types of therapy used

The Psychiatrist in Partnership with other Health Professionals

- Internists and Neurologists
- Social Workers and care coordinators
- Occupational Therapists
- Speech and Language Pathology
- Behavioral Psychologist
- Dysmorphologist
- Respite agencies
- Behavioral Aide agencies

Presenting Complaints

Aggression, Hearing Voices, History of trauma

Cognitive Problems

- Sensory Integration dysfunction
- Fine and Gross Motor skills
- Expressive and Receptive Language Problems
- IQ-Mild MR

Emotional/Behavioral symptoms

- Nightmares
- Flashbacks
- Attention problems
- Auditory and Visual Hallucinations
- Injuring sibling
- Attachment issues

Environmental Factors

- Multiple foster placements
- Early and recurrent sexual abuse
- Physical abuse
- Lost for 3 days
- Early neglect

Multigenerational

- Drug and alcohol abuse in parents
- Psychiatric problems in mother

Somatic

- Traumatic brain injury
- History of Seizures

Case Examples

- 15 year old that does not copy homework off the board, and has multiple tobacco violations
- 16 year old girl who can't say "no" to boys
- 25 year old who has been homeless since his family put him out
- 37 year old who has "melt downs" and needs to live with someone to help organize her life
- 51 year old who needs to live with his significant other who no longer is interested in him

Personal Challenges of the Professional

- Patiently letting all the information unfold
- Being non-judgmental
- Avoiding demoralization
- Being a friendly supporter and objective at the same time
- Being able to step back from the situation
- Allowing the parent and patient to teach us
- Maintaining energy level in the face of disaster
- Knowing how to ask for help from colleagues
- Being consistent
- Being kind when under stress

Improving the Outcome of Individuals with FASD

- The non-medication therapies should be appropriate to the cognitive abilities of the individual
- The environment of the affected individual should be considered an extension of the therapy

Infant Screening

- Failure to thrive
- Small for gestational age
- Obvious dysmorphic features
- Developmental delays
- Unexplained medical complications
- History of substance or frank alcohol exposure

Early childhood

- Extreme hyperactivity and impulsivity
- Overwhelmed easily by sensory stimulation
- High pain threshold
- Does not learn from mistakes
- Intrusive
- Irritable; many meltdowns
- Not meeting developmental milestones
- Motor or language delays
- Mental retardation
- Prenatal substance exposure

Preadolescence

- Immaturity
- Poor social skills
- Inappropriate
- Tells “tall” tales
- Takes things
- Language and motor skills delays
- Melt downs
- ADHD
- LD (especially math)
- Poor peer relatedness
- Poor boundaries
- No friends
- Everyone is their friend
- Parents angry

Adolescence

- Immaturity
- ADHD
- Moody, temper tantrums
- Can’t take responsibility
- Few or no friends
- Substance exposure
- Using substances
- Poor generalization
- Poor cause and effect reasoning
- Doesn’t learn from mistakes
- Inappropriate
- Steals, tells “tall” tales
- Lack of independence for age

Adult

- Lack of independence
- Poor adaptive functioning
- Psychiatric disability
- Poor executive functioning
- ADHD
- LD
- Immature
- Does not learn from mistakes
- Cannot hold a job
- Still living at home
- Easy victim
- May have been arrested

Psychiatric Care

- All medications that are commonly used in psychiatric care should be considered
- Making certain that we safely prescribe is the important issue
- Getting proper medical work up may include EKG or EEG
- Monitoring vital signs, height and weight are very important when meds are prescribed

FASD ABC Checklist

- Appearance-Small eyes
  Flattened philtrum
  Thin upper lip
- Behavior- Does not understand consequences of behavior
  Attention problems/Impulsivity
- Cognition- Mental retardation
  IQ not commensurate with abilities

Any patient with known prenatal alcohol exposure should be screened for disability as early as possible

Research demonstrates that there is no safe amount of alcohol to consume during pregnancy

Prevention is the Key to Complete Elimination of this Very Serious Public Health Problem

Practice prevention in your own lives and that of family, friends and social contacts

Thank you!!!