

FAS and the Brain

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Alcohol is a "teratogen" (substance that is toxic to the baby's developing brain). Damage can occur in various regions of the brain. The areas that might be affected depend on which areas are developing at the time the alcohol is consumed. Since the brain and the central nervous system are developing throughout the entire pregnancy, the baby's brain is always vulnerable to damage from alcohol exposure.

The regions of the brain that might be affected by prenatal alcohol exposure in terms of ability to function include:

Corpus Callosum - passes information from the left brain (rules, logic) to the right brain (impulse, feelings) and vice versa. The Corpus Callosum in an individual with Fetal Alcohol Syndrome (FAS) might be smaller than normal, and in some cases it is almost nonexistent.

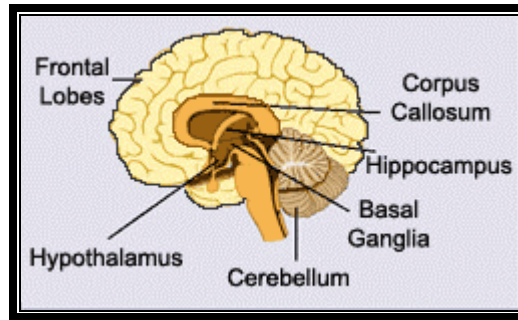
Hippocampus - plays a role in memory function.

Cerebellum - controls coordination and movement, behavior and memory.

Basal Ganglia - affects spatial memory and behaviors like perseveration and the inability to switch modes, work toward goals, and predict behavioral outcomes, and the perception of time.

Frontal Lobes - controls impulses and judgment. The most noteworthy damage to the brain probably occurs in the prefrontal cortex, which controls what are called the **Executive Functions**.

Alcohol causes more damage to the developing fetus than any other substance, including marijuana, heroin, and cocaine. (Institute of Medicine, 1996)



Executive Functions of the Prefrontal Cortex

Effects of alcohol exposure on behaviors related to executive functions of the prefrontal cortex:

- inhibitions: socially inappropriate behavior
- problem solving: inability to figure out solutions spontaneously
- sexual urges: inability to control sexual impulses, especially in social situations
- planning: inability to apply consequences from past actions
- time perception: difficulty with abstract concepts of time and money
- internal ordering: like files out of order, difficulty processing information
- working memory: storing and/or retrieving information
- self-monitoring: needs frequent cues, requires "policing" by others
- verbal self-regulation: needs to talk to self out loud, needs feedback
- motor control: fine motor skills more affected than gross motor
- regulation of emotion: moody "roller coaster" emotions, may withdraw or lash out
- motivation: apparent lack of remorse, need external motivators

Alcohol Exposure During the Three Stages of Pregnancy:

1. During the first trimester, as shown by the research of Drs. Clarren and Streissguth, alcohol interferes with the migration and organization of brain cells. [Journal of Pediatrics, 92(1):64-67]
2. Heavy drinking during the second trimester, particularly from the 10th to 20th week after conception, seems to cause more clinical features of FAS than at other times during pregnancy, according to a study in England. [Early-Human-Development; 1983 Jul Vol. 8(2) 99-111]
3. During the third trimester, according to Dr. Claire D. Coles, the hippocampus is greatly affected, which leads to problems with encoding visual and auditory information (reading and math). [Neurotoxicology And Teratology, 13:357-367, 1991]

Not all damage from alcohol exposure is seen on brain scans, as lesions might be too small to be detected, yet large enough to cause significant disabilities.

Children do not need to have full FAS to have significant difficulties due to prenatal exposure to alcohol. According to research done by Drs. Joanne L. Gusella and P.A. Fried, even light drinking (average one-quarter ounce of absolute alcohol daily) can have adverse effects on the child's verbal language and comprehension skills. [Neurobehavioral Toxicology and Teratology, Vol. 6:13-17, 1984] Drs. Mattson and Riley in San Diego have conducted research on the neurology of prenatal exposure to alcohol. Their studies show that children of mothers who drank but who do not have a diagnosis of FAS have many of the same neurological abnormalities as children who have been diagnosed with full FAS. [Neurotoxicology and Teratology, Vol. 16(3):283-289, 1994]

Damage to the brain from alcohol exposure can have an adverse affect on behavior. Alcohol exposure appears to damage some parts of the brain, while leaving other parts unaffected. Some children exposed to alcohol will have neurological problems in just a few brain areas. Other exposed children may have problems in several brain areas. The brain dysfunction is expressed in the form of inappropriate behaviors. Their behavior problems should be viewed with respect to neurological dysfunction. Although psychological factors such as abuse and neglect can exacerbate behavior problems in FAS, we are looking primarily at behavior that is organic in origin. When it comes to maintaining good behavior, it is not a matter of the child "won't" but "can't."(Diane Malbin, MSW, Trying Differently Rather Than Harder,)

Sometimes the person's behavior is misinterpreted as willful misconduct (Debra Evensen, www.fasalaska.com), but for the most part, maintaining good behavior is outside of the child's control, especially in stressful or stimulating situations. Behavior problems in children with FAS are often blamed on poor parenting skills. While good parenting skills are required, even alcohol exposed children raised in stable, healthy homes can exhibit unruly behavior. The most difficult behaviors are seen in children who were prenatally exposed to alcohol and who also suffer from Reactive Attachment Disorder.

Most children with FAS disorders have some attachment issues, may display inappropriate sexual behaviors, show poor judgment, have difficulty controlling their impulses, are emotionally immature, and need frequent reminders of rules. As a result, many will require the protection of close supervision for the rest of their lives.

“Impulsivity is when the space between the thought and the action is missing, where the frontal lobes monitor the intentions of the rest of the brain. There is a gap in the thought process and the person goes directly from thought to action.” FAS expert Dr. Susan Doctor, University of Nevada, Reno.

“Soft Signs”

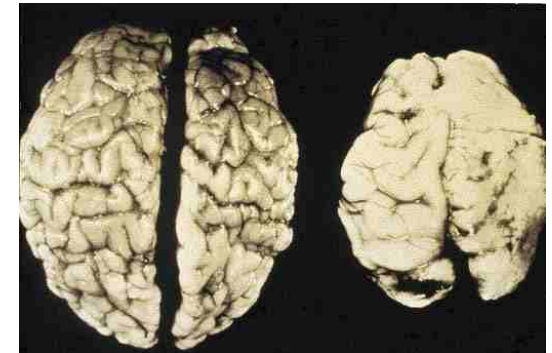
(Psychological signs of brain damage)

- Immature social development: overly friendly to strangers
- Emotional lability:
- Poorly developed conscience:
- Lack of consistent impulse control:
- Inability to learn from consequences
- Good expressive language skills
- Talented in art, music or mechanics.
- Attention deficits: not always hyperactive, but easily distracted by external stimuli
- Short-term memory deficits
- Inappropriate social interactions
- Difficulty managing money:
- Poor concept of time
- Grandiose ideas and unrealistic life goals, distorted perceptions
- Poor judgment
- Vulnerability and naiveté

“The greatest obstacle our children with FAS disorders must overcome is chronic frustration from not being able to meet the unrealistic expectations of others.” – Dr. Calvin Sumner, nationally recognized expert on FAS.

Fetal Alcohol Syndrome
Fasstar Information Series Brochure 0201B1

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(Photo courtesy of Sterling Clarren, MD)
Brain of normal baby Brain of baby with FAS

How Prenatal Alcohol Exposure Affects Development of the Brain

By Teresa Kellerman

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