Heavy prenatal alcohol consumption linked to childhood brain development problems

November 1 2012

(Medical Xpress)—Heavy drinking during pregnancy disrupts proper brain development in children and adolescents years after they were exposed to alcohol in the womb, according to a study supported by the National Institutes of Health. The study is the first to track children over several years to examine how heavy exposure to alcohol in utero affects brain growth over time.

Using magnetic resonance imaging (MRI) scans, researchers found that brain growth patterns in children whose mothers drank heavily while pregnant differed from normal patterns of development seen in children who were not exposed to alcohol before birth.

The findings suggest that children with heavy alcohol exposure have decreased brain plasticity – the brain's ability to grow and remodel itself based on experience with the outside world. Such adaptation continues throughout one's life and is crucial to learning new skills and adapting to the environment.

"This study documents the long-term impact of heavy prenatal alcohol exposure on brain development," said Ken R. Warren, Ph.D., acting director of the National Institute on Alcohol Abuse and Alcoholism (NIAAA), which provided most of the funding for the study.

"It underscores that heavy drinking during pregnancy often has lasting consequences for the child's growth and development, and reminds us that women who are, who may be, or who are trying to become pregnant,

should not drink alcohol."

The study currently appears online in the Oct. 31, 2012 issue of *The Journal of Neuroscience*.

During normal development, brain volume increases rapidly at a young age as new neural connections are formed, and then decreases in certain regions during adolescence as underused brain connections are cleared away to increase efficiency. While unexposed children showed this pattern of robust growth and reduction in the brain's outmost layer, known as the cerebral cortex, those heavily exposed to alcohol typically only lost cortical volume.

Among the 70 children in the study who had been heavily exposed to alcohol in utero (13 drinks per week throughout the pregnancy, on average), the pattern of static growth was most evident in the rear portions of the brain—particularly the parietal cortex, which is thought to be involved in selective attention and producing planned movement.

In addition, heavier alcohol exposure was linked to lower intelligence, greater facial abnormalities, and little change in brain volume between scans. Most children received two scans approximately two years apart. Participants ranged in age from 5 to 15 years of age, with an average age of 12.

About half of the alcohol-exposed children were given full physical examinations to determine whether they met the criteria for fetal alcohol spectrum disorder, or FASD. Of the 37 children examined, 23 were classified as having the disorder, which may be marked by a pattern of distinct facial features, intellectual disability, speech and language delays, and poor social skills.

The researchers note that environment after birth is also likely to play a

role in the abnormal development seen in the children exposed to alcohol before birth.

"The differences in brain maturation may also be related to prolonged dysfunctional experiences throughout childhood and adolescence," said senior author Elizabeth Sowell, Ph.D., professor of pediatrics at the University of Southern California, and director of the Developmental Cognitive Neuroimaging Laboratory at Children's Hospital, Los Angeles.

The study findings may have implications for developing early treatments that could correct or improve these patterns of abnormal brain development.

"These findings further illustrate the need for early intervention, as they demonstrate that effective treatments may not only address current difficulties, but may also impact developmental trajectories during later childhood and adolescence in a positive way," said first author Catherine Lebel, Ph.D., a postdoctoral fellow at the Department of Neurology, University of California, Los Angeles.

The study authors write that this work may also help to understand and treat other disorders with abnormal brain growth in childhood and adolescence, such as autism.

Provided by National Institutes of Health