

ADHD Cognitive and Behavioral Problems Linked To Genetic and Environmental Interactions by Study

Article Date: 05 May 2006 - 16:00 PST

Article adapted by Medical News Today from original press release.

A new study indicates that cognitive and behavioral problems that underlie attention deficit hyperactivity disorder, or ADHD, are due to a complex interplay of genes and the environment. The Cincinnati Children's Hospital Medical Center study is the first to examine how genes, toxins and gender interact to shape ADHD.

"This study shows that certain groups of children have an increased sensitivity to environmental exposures," says Tanya Froehlich, M.D., a physician at Cincinnati Children's and the study's lead author. "More studies like this one are needed to help set exposure standards that adequately protect the most susceptible members of society."

The Cincinnati Children's researchers examined the impact of lead exposure on executive function – the ability to plan and organize activities and behaviors. Executive function is impaired in individuals with ADHD. They particularly wanted to determine whether lead's effects are influenced by an individual's underlying genetic and biological make-up, including the impact of gender and variations in the DRD4 dopamine receptor gene. The DRD4 receptor helps regulate brain levels of dopamine, a chemical in the brain that is essential for attention and cognition, and variations in DRD4's composition have been linked to ADHD.

The study findings indicate that increasing lead exposure is linked to impairment on a number of executive functions, including planning, memory span and attentional flexibility (the ability to revise one's plan or strategy in the face of obstacles or new information). However, certain genetic and biological factors seemed to predispose an individual to the negative effects of lead exposure. For instance, only children with certain variations of the DRD4 gene seemed vulnerable to lead's adverse effects on attentional flexibility.

"In addition, increasing lead exposure impaired performance in both planning and attentional flexibility in boys more than in girls. This suggests that, for these executive functions, boys are more vulnerable to the adverse affects of lead exposure," says Dr. Froehlich. "This is also consistent with the established fact that boys have higher rates of ADHD than girls."

The researchers studied 172 children who were enrolled in a community-based study of low levels of lead exposure. Blood lead levels were assessed during infancy and early childhood. At age 5, children took standardized, ADHD-related executive function tests.

"This study offers a model for examining how genes and environmental toxins interact to shape ADHD, and demonstrates that important effects may be obscured or over-generalized if the joint contributions of these factors are not considered," says Dr. Froehlich. "Such studies can help us understand the underlying causes of neuropsychological disorders, and why certain groups may be more prone to ADHD than others."

Cincinnati Children's Hospital Medical Center is a 475-bed institution devoted to bringing the world the joy of healthier kids. Cincinnati Children's is dedicated to transforming the way health care is delivered by providing care that is timely, efficient, effective, family-centered, equitable and safe. Cincinnati Children's ranks third nationally among all pediatric centers in research grants from the National Institutes of Health. It is a teaching affiliate of the University of Cincinnati College of Medicine.