

Early-life traffic-related air pollution exposure linked to hyperactivity

By Keith Harrell

Early-life exposure to traffic-related air pollution was significantly associated with higher hyperactivity scores at age 7, according to new research from the University of Cincinnati (UC) and Cincinnati Children's Hospital Medical Center. The findings appear in an NIEHS-funded [study](http://ehp.niehs.nih.gov/1205555/) (<http://ehp.niehs.nih.gov/1205555/>) published in the June issue of Environmental Health Perspectives.

The research was conducted by faculty members from the UC College of Medicine Department of Environmental Health in collaboration with Cincinnati Children's. [Nicholas Newman, D.O.](http://www.cincinnatichildrens.org/bio/N/nicholas-newman/), (<http://www.cincinnatichildrens.org/bio/N/nicholas-newman/>) director of the Pediatric Environmental Health and Lead Clinic at Cincinnati Children's and an assistant professor of pediatrics at UC, was the study's first author.

"There is increasing concern about the potential effects of traffic-related air pollution on the developing brain," Newman said. "This impact is not fully understood, due to limited epidemiological studies.

"To our knowledge, this is the largest prospective cohort with the longest follow-up investigating early life exposure to traffic-related air pollution and neurobehavioral outcomes at school age." Scientists believe that early life exposures to a variety of toxic substances are important in the development of problems later in life.

Implications of exposure in the first year of life

Newman and his colleagues collected data on traffic-related air pollution (TRAP) from the Cincinnati Childhood Allergy and Air Pollution Study (CCAAPS), a long-term epidemiological study examining the effects of traffic particulates on childhood respiratory health and allergy development. Funded by NIEHS, CCAAPS is led by [Grace LeMasters, Ph.D.](http://healthnews.uc.edu/experts/?/2286/), (<http://healthnews.uc.edu/experts/?/2286/>) of the UC environmental health department. Study participants — newborns in the Cincinnati metropolitan area from 2001 through 2003 — were chosen based on family history and their residence being either near or far from a major highway or bus route.

Children were followed from infancy to age 7, when parents completed the Behavioral Assessment System for Children, 2nd Edition, assessing attention deficit hyperactivity disorder and related symptoms, including attention problems, aggression, conduct problems, and atypical behavior. Of the 762 children initially enrolled in the study, 576 were included in the final analysis at 7 years of age.

Results showed that children who were exposed to the highest third amount of TRAP, during the first year of life, were more likely to have hyperactivity scores in the at risk range when they were 7 years old. The at risk range for hyperactivity in children means that they need to be monitored carefully because they are at risk for developing clinically important symptoms.

"Several biological mechanisms could explain the association between hyperactive behaviors and traffic-related air pollution," Newman says, including narrowed blood vessels in the body and toxicity in the brain's frontal cortex.

Newman notes that the higher air pollution exposure was associated with a significant increase in hyperactivity only among those children whose mothers had greater than a high school education. Mothers with higher education may expect higher achievement, he said, affecting the parental report of behavioral concerns.

Potential for primary prevention

"The observed association between traffic-related air pollution and hyperactivity may have far-reaching implications for public health," Newman said, noting that studies have shown that approximately 11 percent of the U.S. population lives within 100 meters of a four-lane highway and that 40 percent of children attend school within 400 meters of a major highway.

"Traffic-related air pollution is one of many factors associated with changes in neurodevelopment, but it is one that is



Newman was also the corresponding author on the study. (Photo courtesy of UC)



LeMasters has served as lead researcher on other NIEHS-funded grants. She was also a member of the NIEHS National Advisory Environmental Health Sciences Council. (Photo courtesy of Steve McCaw)

potentially preventable.”

In addition to support by NIEHS, funding was also provided by the National Institute for Occupational Safety and Health.

Citation: Newman NC, Ryan P, Lemasters G, Levin L, Bernstein D, Hershey GK, Lockey JE, Villareal M, Reponen T, Grinshpun S, Sucharew H, Dietrich KN. (<http://www.ncbi.nlm.nih.gov/pubmed/23694812>) 2013. Traffic-related air pollution exposure in the first year of life and behavioral scores at 7 years of age. *Environ Health Perspect* 121(6):731-736.

([Keith Harrell](http://healthnews.uc.edu/mediacontacts/) (<http://healthnews.uc.edu/mediacontacts/>) is a public information officer with the UC Academic Health Center Public Relations and Communications publication [healthNEWS](http://healthnews.uc.edu/news/?/22617/), (<http://healthnews.uc.edu/news/?/22617/>) where this story originally appeared to coincide with online publication May 21.)

The Environmental Factor is produced monthly by the [National Institute of Environmental Health Sciences \(NIEHS\)](http://www.niehs.nih.gov/) (<http://www.niehs.nih.gov/>), Office of Communications and Public Liaison. The content is not copyrighted, and it can be reprinted without permission. If you use parts of Environmental Factor in your publication, we ask that you provide us with a copy for our records. We welcome your [comments and suggestions](#). (bruskec@niehs.nih.gov)

This page URL: NIEHS website: <http://www.niehs.nih.gov/>
Email the Web Manager at webmanager@niehs.nih.gov