

Association between air toxics and childhood autism

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Quinn, an autistic boy, and the line of toys he made before falling asleep. Repeatedly stacking or lining up objects is a behavior commonly associated with autism. Credit: Wikipedia.

Children with autism spectrum disorder (ASD) were more likely to have been exposed to higher levels of certain air toxics during their mothers' pregnancies and the first two years of life compared to children without the condition, according to the preliminary findings of a University of

Pittsburgh Graduate School of Public Health investigation of children in southwestern Pennsylvania.

This research, funded by The Heinz Endowments, will be presented today at the American Association for Aerosol Research annual meeting in Orlando, Fla.

"Autism spectrum disorders are a major [public health](#) problem, and their prevalence has increased dramatically," said Evelyn Talbott, Dr.P.H., principal investigator of the analysis and professor of epidemiology at Pitt Public Health. "Despite its serious social impact, the causes of autism are poorly understood. Very few studies of autism have included environmental exposures while taking into account other personal and behavioral risk factors. Our analysis is an addition to the small but growing body of research that considers [air](#) toxics as one of the risk factors for ASD."

Dr. Talbott and her colleagues performed a population-based study of families with and without ASD living in six southwestern Pennsylvania counties. The researchers found links between increased levels of chromium and styrene and childhood autism spectrum disorder, a condition that affects one in 68 children.

"This study brings us a step closer toward understanding why autism affects so many families in the Pittsburgh region and nationwide – and reinforces in sobering detail that air quality matters," said Grant Oliphant, president of The Heinz Endowments. "Our aspirations for truly becoming the most livable city cannot be realized if our children's health is threatened by dangerous levels of air toxics. Addressing this issue must remain one of our region's top priorities."

Autism spectrum disorders are a range of conditions characterized by social deficits and communication difficulties that typically become

apparent early in childhood. Reported cases of ASD have risen nearly eight-fold in the last two decades. While previous studies have shown the increase to be partially due to changes in diagnostic practices and greater public awareness of autism, this does not fully explain the increased prevalence. Both genetic and environmental factors are believed to be partially responsible.

Dr. Talbott and her team interviewed 217 families of children with ASD and compared these findings with information from two separate sets of comparison families of children without ASD born during the same time period within the six-county area. The families lived in Allegheny, Armstrong, Beaver, Butler, Washington and Westmoreland counties, and the children were born between 2005 and 2009.

One of the strengths of the study was the ability to have "two types of controls, which provided a comparison of representative air toxics in neighborhoods of those children with and without ASD," said Dr. Talbott.

For each family, the team used the National Air Toxics Assessment (NATA) to estimate the exposure to 30 pollutants known to cause endocrine disruption or neurodevelopmental issues. NATA is the Environmental Protection Agency's (EPA) ongoing comprehensive evaluation of air toxics in the U.S., most recently conducted in 2005.

Based on the child's exposure to concentrations of air toxics during the mother's pregnancy and the first two years of life, the researchers noted that children who fell into higher exposure groups to styrene and chromium were at a 1.4- to two-fold greater risk of ASD, after accounting for the age of the mother, maternal cigarette smoking, race and education. Other NATA compounds associated with increased risk included cyanide, methylene chloride, methanol and arsenic. As these compounds often are found in combination with each other, further

study is needed.

Styrene is used in the production of plastics and paints, but also is one of the products of combustion when burning gasoline in vehicles.

Chromium is a heavy metal, and air pollution containing it typically is the result of industrial processes and the hardening of steel, but it also can come from power plants. Cyanide, methylene chloride, methanol and arsenic are all used in a number of industries or can be found in vehicle exhaust.

"Our results add to the growing body of evidence linking environmental exposures, such as air pollution, to ASD," said Dr. Talbott. "The next step will be confirming our findings with studies that measure the specific exposure to air pollutants at an individual level to verify these EPA-modeled estimates."

Additional investigators on this study were Vincent Arena, Ph.D., Judith Rager, M.P.H., Ravi Sharma, Ph.D., and Lynne Marshall, M.S., all of Pitt.

Provided by University of Pittsburgh Schools of the Health Sciences

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