

Study shows autism risk for developing children exposed to air pollution

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Research conducted by University of Southern California (USC) and Children's Hospital Los Angeles scientists demonstrates that polluted air – whether regional pollution or coming from local traffic sources – is associated with autism.

The study titled "Traffic Related Air Pollution, [Particulate Matter](#), and [Autism](#)," shows that exposure to traffic-related air pollution during pregnancy and the first year of life is associated with a more than two-fold risk of autism. In addition, exposure to regional pollution consisting of nitrogen dioxide (NO₂) and small particles – particulate matter less than 2.5 and 10 microns in diameter (PM_{2.5} and PM₁₀) – is also associated with autism even if the mother did not live near a busy road. The study is published in the [Archives of General Psychiatry](#), a sister publication of the [Journal of the American Medical Association](#).

"This work has broad potential public health implications," said the study's principal investigator, Heather Volk, Ph.D., assistant professor of [preventive medicine](#) at the Keck School of Medicine of USC and investigator in the Division of Research on Children, Youth and Families at Keck School-affiliated Children's Hospital Los Angeles. "We've known for a long time that air pollution is bad for our lungs, and especially for children. We're now beginning to understand how air pollution may affect the brain."

The research is the first to look at the amount of near-roadway [traffic pollution](#) individuals were exposed to and combine that with measures of regional air quality. The study builds on previous research by Volk and colleagues that examined how close subjects lived to a freeway, said Volk, who also has appointments at the Keck School's Zilkha Neurogenetic Institute and Department of Pediatrics.

"We took into account how far away people lived from roads, meteorology such as which way the

wind was blowing, how busy the road was, and other factors to study traffic-related pollution," she said. "We also examined data from air quality monitors, which measure pollution over a larger region that could come from traffic, industry, rail yards, or many other sources."

In the 2012 study, Volk and colleagues from USC and the University of California, Davis examined data on 279 autism cases and 245 control subjects enrolled in the California-based Childhood Autism Risks from Genetics and the Environment (CHARGE) study. Mothers' addresses from birth certificates and addresses reported from a residential history were used to estimate exposure during each trimester of pregnancy and the first year of life. The researchers used [air pollution](#) levels derived from the Environmental Protection Agency's [Air Quality](#) System to determine exposure to NO₂, PM_{2.5}, and PM₁₀. They also applied dispersion models to estimate the amount of traffic the mothers and children were exposed to.

Particularly interesting was the effect of mothers' and children's exposure to particles, both PM₁₀ and PM_{2.5}. PM₁₀ includes both coarse and fine particles, while PM_{2.5} includes only the smaller (fine) particles, which are most likely to have deleterious effects on the human body.

"From studies conducted in the lab, we know that we can breathe in tiny particles and they can produce inflammation," said Volk. "Particles have varied composition, and there are many chemicals that can bind to them. The components of these particles could be hazardous to the brain."

Other researchers who participated in the study include Irva Hertz-Picciotto, University of California, Davis; Rob McConnell from USC; and Fred Lurmann and Bryan Penfold from Sonoma Technology, Inc.

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of Environmental Health Sciences (grant 1 R21 ES019002-01).

Volk and colleagues are now at work on a study of how genes related to autism may be affected by environmental exposures to try to identify if there are factors that make people are genetically more vulnerable to particular pollutants.

More information: Volk, H.E., Lurmann, F., Penfold, B., Hertz-Picciotto, I., McConnell, R. (2012) "Traffic Related Air Pollution, Particulate Matter, and Autism." *Archives of General Psychiatry*. Published online November 26, 2012. doi:10.1001/jamapsychiatry.2013.266

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