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Autism Tied to Air Pollution, Brain-Wiring Disconnection

By Elizabeth Lopatto and Nicole Ostrow - Jun 18, 2013

Researchers seeking the roots of autism have linked the disorder to chemicals in air pollution and, in a separate study, found that language difficulties of the disorder may be due to a disconnect in brain wiring.

Researchers from Harvard University's School of [Public Health](#) found that pregnant women exposed to high levels of diesel particulates or mercury were twice as likely to have an autistic child compared with peers in low-pollution areas. The findings, published today in [Environmental Health Perspectives](#), are from the largest U.S. study to examine the ties between air pollution and autism.

One in 50 U.S. children are diagnosed with autism or a related disorder, according to the Centers for Disease Control and Prevention. Children with autism may be unresponsive to people, become indifferent to social activity and have communication difficulties. A separate study from Stanford University and published in [Proceedings of the National Academy of Sciences](#) is the first to suggest that weak connections between brain regions for speaking and reward may be why.

“There isn't a lot of data to strongly point at what are the root causes of the social deficits in children with autism,” [Daniel Abrams](#), a postdoctoral research fellow at [Stanford University](#) in [California](#), said in a telephone interview. “We think it has this important motivation and reward component to it.”

The cause of autism isn't known, though genetic factors are thought to be important, according to the [National Institutes of Health](#).

Previous Findings

The link to air pollution was [initially made in 2006](#) by a group led by Gayle Windham at the California Department of Health Services. Another study, published in November 2012, also found links between air pollution and autism.

“People were skeptical” of the initial report from Windham's group, said [Marc Weisskopf](#), an author of today's study and an associate professor of environmental health and epidemiology at Harvard University's School of Public Health in [Boston](#). “I went to do this in a larger setting, not at all

convinced we would see anything.”

The Harvard researchers used data from the [Nurse’s Health Study 2](#), a long-term study involving more than 116,000 nurses, begun in 1989. Within that group, the scientists looked at 325 women who had a child with autism and 22,000 women who had children without the disorder.

EPA Data

Using data from the Environmental Protection Agency, researchers estimated the women’s exposure to toxins, a method Weisskopf said is imperfect. Many of the compounds travel together in the air, so separating their contributions was difficult. What’s more, the EPA data is taken once every four years, so it’s an imprecise way of estimating exposure, and doesn’t take into account women’s contact from traveling to places other than their homes.

“There’s a lot of error in estimating what the mother’s exposed to,” he said. His study is large enough to suggest follow-up studies with more precise methods of detecting chemicals in the air, he said.

The study also found that including lead exposure was also associated with increased risks of autism.

About 2 percent of American school children were diagnosed with autism disorders in 2011 and 2012, according to the Centers for Disease Control and Prevention.

Language Study

In the language study, brain imaging determined that the connections between brain regions for language and reward were stronger in children who don’t have the disorder than in those diagnosed with it, said Abrams. That’s important because communication problems are key diagnostic criteria for autism.

Insensitivity to human speech can affect a child’s early development, the authors said. Typical infants will listen to human speech and engage with sounds as a way to develop early language skills and emotional understanding, as well as to bond with their parents, the authors wrote.

The researchers looked at how the speech part of the brain was connected to other regions. Those with autism had weaker connections between the temporal lobe, where speech is controlled, and the dopamine reward pathway that elicits pleasurable feelings, the study found.

They also found weak links between voice regions and parts of the brain that process emotional information, Abrams said. In the future, the researchers plan to look at whether there are certain parts or types of speech that activate an autistic child’s brain, he said.

The study included 20 children with autism who were considered high functioning, with language skills and issues with communication. Their [magnetic resonance imaging](#) scans were compared with 19 children without the disorder who had similar intelligence.

To contact the reporters on this story: Elizabeth Lopatto in [San Francisco](#) at elopatto@bloomberg.net; Nicole Ostrow in [New York](#) at nostrow1@bloomberg.net

To contact the editor responsible for this story: Reg Gale at rgale5@bloomberg.net

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