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Prenatal exposure to combustion-related pollutants leads to anxiety, attention problems in young children

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Mothers' exposure during pregnancy to a class of air pollutants called polycyclic aromatic hydrocarbons (PAH) can lead to behavioral problems in their children. PAH are released to air during incomplete combustion of fossil fuel such as diesel, gasoline, coal, and other organic material.

The study is the first report of associations between child attentional and behavioral problems among school-age children and two complementary measures of prenatal PAH exposure: monitored air concentrations of PAH and a PAH-specific biomarker of exposure measured in maternal and umbilical cord blood. The paper, "Prenatal Polycyclic Aromatic Hydrocarbon (PAH) Exposure and Child Behavior at age 6-7," published online today in *Environmental Health Perspectives*, adds to rising concerns about the risks associated with exposures to air pollution during pregnancy.

The study followed the children of 253 non-smoking inner-city women who gave birth between 1999 and 2006. Researchers led by Frederica Perera, DrPH, director of the Columbia Center for Children's Environmental Health at the Mailman School of Public Health, measured two complementary indicators of PAH exposure. One indicator was the PAH concentration in air from personal air sampling which took place during the third trimester of pregnancy. The other was a specific biological marker of exposure-- PAH–DNA adducts measured

in maternal blood and newborn umbilical cord blood. When inhaled by the mother during pregnancy, PAH can be transferred across the placenta and bind to the DNA of the fetus, forming "adducts" in blood and other tissues and providing a biologic measure of pollutant exposure.

Mothers completed a detailed assessment of their child's behavior (including whether the children experienced symptoms of anxiety, depression, or attention problems. High prenatal PAH exposure, whether characterized by personal air monitoring or maternal and newborn cord adducts, was significantly associated with symptoms of Anxious/Depressed and Attention Problems.

In urban air, traffic emissions are a dominant source of the pollutants measured in the study. Illustrating widespread exposure to these pollutants, 100% of the mothers in the Columbia Center for Children's Environmental Health NYC cohort had detectable levels of PAH in prenatal personal air samples, although levels varied widely. The authors accounted for other sources of PAH such as environmental tobacco smoke and diet in their analyses. None of the mothers in the study were smokers.

"This study provides evidence that environmental levels of PAH encountered in NYC air can adversely affect child behavior. The results are of concern because attention problems and anxiety and depression have been shown to affect peer relationships and academic performance," said Dr. Perera, the study's lead author.

Provided by Columbia University

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