

Even a little air pollution may have long-term health effects on developing fetus

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Even small amounts of air pollution appear to raise the risk of a condition in pregnant women linked to premature births and lifelong neurological and respiratory disorders in their children, new Johns Hopkins Bloomberg School of Public Health research suggests.

Fine particles from car exhaust, power plants and other industrial sources are breathed into the lungs, but the scientists have now found evidence of the effects of that pollution in the [pregnant women's](#) placentas, the organ that connects her to her fetus and provides blood, oxygen and nutrition. They found that the greater the maternal exposure to air pollution, the more likely the pregnant women suffered from a condition called intrauterine inflammation, which can increase the risk

of a number of health problems for her child from the fetal stage well into childhood.

The researchers, reporting online April 27 in *Environmental Health Perspectives*, say the findings add to the growing evidence that the air a pregnant woman breathes could have long-term health consequences for her child and that current U.S. Environmental Protection Agency air pollution standards may not be stringent enough to protect her developing fetus.

"Twenty years ago, we showed that high levels of air pollution led to poor pregnancy outcomes, including premature births. Now we are showing that even small amounts of air pollution appear to have biological effects at the cellular level in pregnant women," says the study's senior author, Xiaobin Wang, MD, ScD, MPH, the Zanvyl Krieger Professor and Director of the Center on the Early Life Origins of Disease at Bloomberg School.

Says the study's lead author Rebecca Massa Nachman, PhD, a postdoctoral fellow in Department of Environmental Health Sciences at the Bloomberg School: "This study raises the concern that even current standards for air pollution may not be strict enough to protect the fetus, which may be particularly sensitive to environmental factors. We found biological effects in women exposed to [air pollution levels](#) below the EPA standard."

For the study, researchers analyzed data from 5,059 mother-child pairs in the Boston Birth Cohort, a predominantly low-income minority population. They assessed the presence of intrauterine inflammation based on whether the mother had a fever during labor and by looking under a microscope at the placenta, which was collected and preserved after birth. They assessed maternal exposure to fine particulate matter (PM2.5) air pollution using data from EPA air quality stations located

near the mothers' homes. Boston, where the women lived, is known as a relatively clean city when it comes to air pollution. The majority of the women in the study were exposed to air pollution below the level that EPA deems acceptable, fewer than 12 micrograms per cubic meter. A subset of 1,588 women (or 31 percent) were exposed to air pollution at or above the EPA standard.

The researchers found that pregnant women who were exposed to the highest levels of air pollution were nearly twice as likely as those exposed to the lowest levels to have intrauterine inflammation and it appeared that the first trimester might be a time of highest risk. These results held up even when researchers accounted for factors including smoking, age, obesity and education levels.

Intrauterine inflammation is one of the leading causes of premature birth, which occurs in one of every nine births in the United States and one in six African-American births, the researchers say. Babies born prematurely can have lifelong developmental problems. Researchers have linked preterm birth to both autism and asthma.

While [maternal exposure](#) to [air pollution](#) during pregnancy is associated with adverse birth outcomes, the biological mechanism has not been well understood. There are few outward signs of intrauterine inflammation in most women. But the researchers say that the placenta - which is typically discarded after birth - offered vital clues to the condition and could be the source of other important health information.

"The placenta may be a window into what is going on in terms of early life exposure and what it means for future health problems," Wang says. "This organ is discarded, but testing it is non-invasive and could be a valuable source of all kinds of environmental information."

More information: "Intrauterine Inflammation and Maternal Exposure

to Ambient PM_{2.5} during Preconception and Specific Periods of Pregnancy: The Boston Birth Cohort" *Environmental Health Perspectives*, 2016.

Provided by Johns Hopkins University Bloomberg School of Public Health

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