

Exposure to air pollution during pregnancy could change structure of children's brains

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New European research has found that exposure to air pollution while pregnant could affect the cognitive function of children, by changing the structure of the brain.

Carried out by researchers from the Barcelona Institute for Global Health (ISGlobal) in Spain and Erasmus University Medical Center in the Netherlands, the research looked at a cohort of pregnant women in the Netherlands and followed the 783 children from fetal life until school age.

The team measured air pollution levels at home during the fetal life of the children and collected data on levels of exposure to nitrogen dioxide, an air pollutant caused by traffic and cigarette smoking, and coarse particles and fine particles of pollution.

When the children were between 6 and 10 years old, the researchers performed brain imaging tests to look at the structure of the brain.

The results showed that exposure to fine particles during fetal life was associated with a thinner outer layer of the brain, called the cortex, in several regions.

The researchers explained that this structural change could contribute to impaired inhibitory control, which is the ability to regulate self-control over temptations and impulsive behavior, and is related to mental health problems such as addictive behavior and attention-deficit/hyperactivity disorder.

Worryingly, the team also found that the relationship between these brain structure alterations and fine particle exposure occurred when the average residential levels of fine particles in the study

were well below the current acceptable limit set by the European Union, with only 0.5 percent of the pregnant women in the study exposed to levels considered unsafe.

As the fetal brain hasn't yet developed the mechanisms needed to protect against or remove environmental toxins, it is particularly vulnerable during pregnancy, with the study suggesting that exposure to levels even well below those considered safe could still cause permanent brain damage.

“This finding adds to previous studies that have linked acceptable air pollution levels with other complications including cognitive decline and fetal growth development. Therefore, we cannot warrant the safety of the current levels of air pollution in our cities,” said lead author Dr. Mònica Guxens of Barcelona Institute for Global Health (ISGlobal).

Dr. John Krystal, editor of *Biological Psychiatry*, the journal in which the study is published, also commented, “Air pollution is so obviously bad for lungs, heart, and other organs that most of us have never considered its effects on the developing brain. But perhaps we should have learned from studies of maternal smoking that inhaling toxins may have lasting effects on cognitive development.” ***JB***

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