Team investigates links to traffic-related air pollution and symptoms of childhood anxiety, through neuroimaging

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Exposure to air pollution is a well-established global health problem associated with complications for people with asthma and respiratory

disease, as well as heart conditions and an increased risk of stroke, and according to the World Health Organization, is responsible for millions of deaths annually. Emerging evidence now suggests that air pollution may also impact the metabolic and neurological development of children.

A new study from researchers at the University of Cincinnati and Cincinnati Children's Hospital Medical Center looks at the correlation between exposure to traffic-related air pollution (TRAP) and childhood anxiety, by looking at the altered neurochemistry in pre-adolescents.

"Recent evidence suggests the central nervous system is particularly vulnerable to air pollution, suggesting a role in the etiology of mental disorders, like anxiety or depression," says Kelly Brunst, Ph.D., assistant professor in the Department of Environmental Health at the College of Medicine, and lead author on the study.

"This is the first study to use neuroimaging to evaluate TRAP exposure, metabolite dysregulation in the brain and generalized anxiety symptoms among otherwise healthy children," says Brunst.

The study was published by the journal *Environmental Research* and is available online.

The researchers evaluated imaging of 145 children at an average age of 12 years, looking specifically at the levels of myo-inositol found in the brain through a specialized MRI technique, magnetic resonance spectroscopy. Myo-inositol is a naturally-occurring metabolite mainly found in specialized brain cells known as glial cells, that assists with maintaining cell volume and fluid balance in the brain, and serves as a regulator for hormones and insulin in the body. Increases in myo-inositol levels correlate with an increased population of glial cells, which often occurs in states of inflammation.

They found that, among those exposed to higher levels of recent TRAP, there were significant increases of myo-inositol in the brain, compared to those with lower TRAP exposure. They also observed increases in myo-inositol to be associated with more generalized anxiety symptoms. "In the higher, recent exposure group, we saw a 12% increase in anxiety symptoms," says Brunst.

Brunst noted however, that the observed increase in reported generalized anxiety symptoms in this cohort of typically developing children was relatively small and are not likely to result in a clinical diagnosis of an anxiety disorder. "However, I think it can speak to a bigger impact on population health ... that increased exposure to air pollution can trigger the brain's inflammatory response, as evident by the increases we saw in myo-inositol," says Brunst. "This may indicate that certain populations are at an increased risk for poorer anxiety outcomes."

More information: Kelly J. Brunst et al, Myo-inositol mediates the effects of traffic-related air pollution on generalized anxiety symptoms at age 12 years, *Environmental Research* (2019). DOI: 10.1016/j.envres.2019.05.009

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