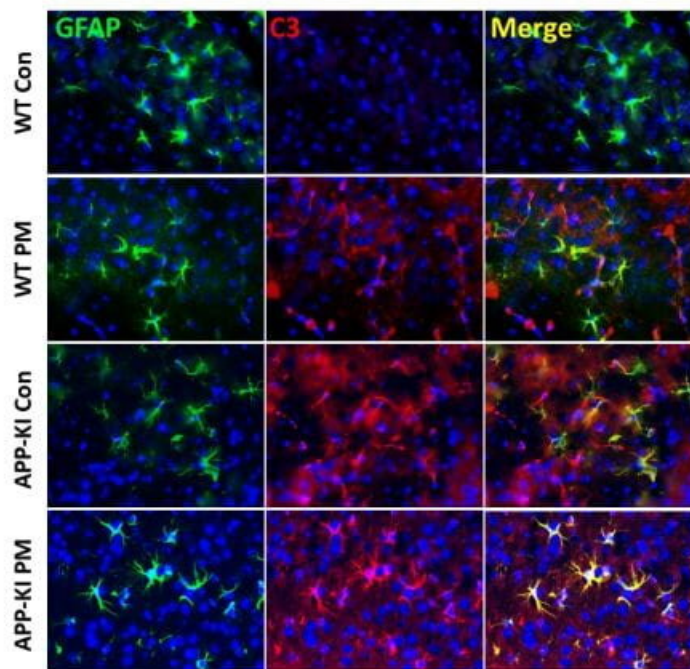


Study shows traffic-related air pollution in Irvine weakens brain function

May 11 2023, by Brianna Aldrich



The brains of wild type (WT) and Alzheimer’s (APP) mouse models were analyzed after exposure to purified air (Con) and ultrafine particulate matter (PM) for the presence of astrocyte cells. These were visualized by staining them green (left column), with potentially harmful and activated astrocytes appearing in red (middle column). Merged images (right column) indicate in yellow the prevalence of deleterious astrocytes in the brain, suggesting that exposure to ultrafine particulate matter significantly promotes activation of astrocytes in the brains of Alzheimer’s mouse models. Credit: UCI Program in Public Health

Researchers from the University of California, Irvine have found that exposure to traffic-related air pollution in Irvine led to memory loss and cognitive decline and triggered neurological pathways associated with the onset of Alzheimer's disease.

"The link between air pollution and Alzheimer's disease is concerning, as the prevalence of toxicants in ambient air is not just on the rise globally, but also hitting close to home here in Irvine," said corresponding and senior author Masashi Kitazawa, Ph.D., associate professor of environmental and occupational health in UCI's Program in Public Health. "Our findings are just one example of what particulate matter can do to brain function."

The study's results are published in the journal *Toxicological Sciences*.

Alzheimer's disease is the most common cause of dementia among the elderly and is a growing public health crisis in the U.S. as well as several other countries. Despite extensive research on all aspects of Alzheimer's disease, its exact origins remain elusive. Although genetic predispositions are known to play a prominent role in [disease progression](#), growing bodies of evidence suggest that environmental toxicants, specifically [air pollution](#), may cause the onset of Alzheimer's disease.

Kitazawa and his team compared mouse models at two ages. Researchers exposed a group of 3- and 9-month-old mouse models to ultrafine particulate matter for 12 weeks via ambient air collected in Irvine. A second group was exposed to purified air. The differing ages were used to determine the potential impact of particulate matter exposure during highly vulnerable life stages: developing youth and the elderly.

Researchers conducted testing related to memory tasks and cognitive function and found that both benchmarks were impaired by exposure to

particulate matter. Notably, they also discovered that their older models (12 months at the time of analysis) showed brain plaque build-up and glial cell activation, which are both known to increase inflammation associated with the onset of Alzheimer's disease.

"Air pollution is one of the very few prominent, modifiable environmental risk factors in Alzheimer's disease," said co-author Michael Kleinman, Ph.D., adjunct professor of environmental and [occupational health](#) in UCI's Program in Public Health. "Public and environmental regulatory agencies need to accelerate efforts to reduce [particulate matter](#) levels in order to reduce the risk of Alzheimer's disease and other serious health conditions."

Kitazawa added, "This evidence is alarming, and it's imperative that we take action to adopt effective and evidence-based regulations, spread awareness on lifestyle changes and work together to improve our air quality."

More information: Jason G Kilian et al, Exposure to quasi-ultrafine particulate matter accelerates memory impairment and Alzheimer's disease-like neuropathology in the AppNL-G-F knock-in mouse model, *Toxicological Sciences* (2023). [DOI: 10.1093/toxsci/kfad036](https://doi.org/10.1093/toxsci/kfad036)

Provided by University of California, Irvine

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