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## Summary of Recent Research on Air Pollution and the Brain

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This systematic review and meta-analysis compiled studies that compared exposure to air pollutants to incidence of various forms of neurodegenerative diseases including all-cause dementia, Alzheimer's disease, Parkinson's disease, and vascular dementia. The findings showed that certain types of airborne pollution - PM<sub>2.5</sub>, PM<sub>10</sub>, and NO<sub>2</sub> are associated with increased risk of neurodegenerative disease.

*Zhang Z, Xu C. Airborne pollutants and risk of neurodegenerative diseases: a global systematic review and meta-analysis. Alzheimers Res Ther. 2026 Apr 18. doi: 10.1186/s13195-026-02050-3. Epub ahead of print. PMID: 41998752.*

This cross-sectional study used the CARTaGENE cohort from Quebec, Canada to examine associations between long-term exposure to fine particulate matter (PM<sub>2.5</sub>) and nitrogen dioxide (NO<sub>2</sub>) and cognitive function in adults aged 40–69. Even at low exposure levels, long-term PM<sub>2.5</sub> exposure was associated with slower processing speed, and NO<sub>2</sub> exposure was associated with poorer visual working memory.

*Fliaguine O, et. al. Association between long-term exposure to ambient PM<sub>2.5</sub> and NO<sub>2</sub> and cognitive function in the CARTaGENE cohort. Environ Res. 2026 Apr 21;301:124560. doi: 10.1016/j.envres.2026.124560. Epub ahead of print. PMID: 42025832.*

This longitudinal cohort study examined associations between residential and school-based air pollution exposure and standardized test performance among children ages 8–13 in the Fresno, California metropolitan area, using data collected between 2015 and 2022. Math test scores were negatively associated with both PM<sub>2.5</sub> and ozone

exposure, while associations with English Language Arts were in the same direction but did not reach statistical significance.

*Loomis S, et al. Characterizing the Relationship Between Air Pollution and Childhood Cognition in the Children's Health and Air Pollution Study. \*Environ Res.\* 2026 Apr 30;124590. doi: 10.1016/j.envres.2026.124590.*

This case-crossover study used hourly air pollution monitoring data linked to 106,623 acute ischemic stroke (AIS) events to assess the relationship between short-term pollutant exposure and stroke severity. Of the different types of pollutants, PM2.5, PM10, and SO2 showed the strongest associations with increased stroke severity.

*Cao N, et al. Short-term exposure to outdoor air pollution significantly associated with severity of acute ischaemic stroke: evidence from the 4S registry. Stroke Vasc Neurol. 2026 Apr 30;svn-2025-004525. doi: 10.1136/svn-2025-004525.*

This retrospective study examined the relationship between short-term PM2.5 exposure and stroke severity and type of stroke. Patients who presented on high PM2.5 days had greater stroke severity and more functional decline at discharge, and both hemorrhagic stroke and ischemic stroke were more common on high PM2.5 days. Effects persisted up to 48 hours after PM2.5 exposure.

*Garfinkel LP, et al. Air pollution and stroke: A two-year analysis linking short-term particulate matter 2.5 exposure to stroke severity and etiology. \*J Stroke Cerebrovasc Dis.\* 2026 Apr 27;35(6):108648. doi: 10.1016/j.jstrokecerebrovasdis.2026.108648.*

This cross-sectional study examined associations between city-level air pollution exposure and suicidal ideation (SI) among university students in China. Significant dose-response relationships were identified for all three pollution measures (SO2, PM2.5, and number of air pollution days), with PM2.5 showing the largest effect.

*Yang T, et al. The influence of environmental air pollution on suicidal ideation among university students: A nationwide representative study in China. \*iScience.\* 2026 Mar 11;29(5):115338. doi: 10.1016/j.isci.2026.115338.*

In this randomized, double-blind, crossover trial, researchers tested whether using air purifiers in classrooms and bedrooms could improve cognitive outcomes in primary school children aged 10–12 in a high-pollution region of China. Children in the intervention group had their PM2.5 exposure nearly cut in half compared to the control group, which used sham purifiers. Those breathing cleaner air showed meaningful improvements in academic test scores and rankings in Chinese and math, as well as better performance on measures of executive function, providing evidence that reducing indoor air pollution can benefit children's school performance.

*Wang Y et al. Innovation (Camb). 2026 Feb 5;7(5):101304. doi: 10.1016/j.xinn.2026.101304.*