# Pollution levels linked to stroke-related narrowing of arteries

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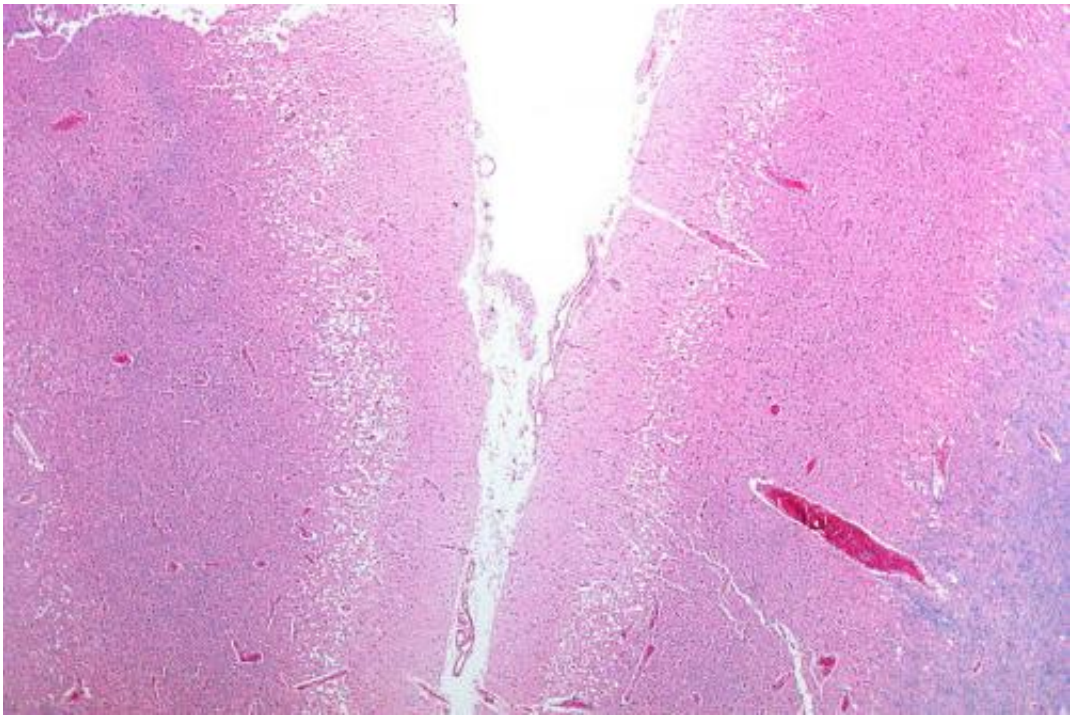

Micrograph showing cortical pseudolaminar necrosis, a finding seen in strokes on medical imaging and at autopsy. H&E-LFB stain. Credit: Nephron/Wikipedia

Air pollution has been linked to a dangerous narrowing of neck arteries that occurs prior to strokes, according to researchers at NYU Langone Medical Center.

The scientists analyzed medical test records for more than 300,000

people living in New York, New Jersey or Connecticut. They found that people living in zip codes with the highest average levels of fine-particulate-matter pollution were significantly more likely to show signs of narrowing (stenosis) in their internal carotid arteries, compared to those living in zip codes with the lowest pollution levels.

The study will be presented at the American College of Cardiology's 64th Annual Scientific Session as a poster presentation and published online in the *Journal of the American College of Cardiology* (*JACC*).

Fine particulate matter pollutants, also called "PM 2.5 pollutants," are particulates with diameters less than 2.5 millionths of a meter. They are mostly by-products of combustion engines and burning wood.

"We spend a lot of time thinking about traditional risk factors for stroke such as high blood pressure, cholesterol, diabetes and smoking—but our data underscore the possibility that everyday air pollution may also pose a significant stroke risk," said senior investigator Jeffrey S. Berger, MD, an assistant professor in NYU Langone Medical Center in the Department of Medicine, Leon H. Charney Division of Cardiology.

Medical researchers have noticed since the 1950s that episodes of high air pollution can bring temporary jumps in local heart attack and stroke cases. More recent studies have linked heart attack and stroke risks to long-term pollution exposures as well, including PM 2.5 exposures.

"Most of the studies in this area have focused on the heart and the coronary arteries; no one has really looked at other parts of the vascular system, in particular the carotid arteries," says Jonathan D. Newman, MD, MPH a cardiologist at NYU Langone Medical Center in the Department of Medicine, Leon H. Charney Division of Cardiology and the study's lead author.

The two internal carotid arteries are situated on either side of the neck and provide most of the brain's blood supply. Strokes often result when accumulated plaque breaks off from a narrowed section of an internal carotid artery and blocks smaller vessels in the brain.

In the study, the carotid narrowing data came from vascular ultrasound tests performed on 307,444 tri-state area residents during 2003-2008 by Life Line Screening, a leading community-based health screening company focused on evaluating risk factors for vascular disease. People with known carotid artery disease at the time of their ultrasound test were excluded from the dataset. The pollution data for the period came from the Environmental Protection Agency.

The researchers' analysis showed that subjects in the top fourth of tri-state zip codes, ranked by average PM 2.5 levels, were about 24 percent more likely than those in the bottom quarter to have shown signs of stenosis—defined as a narrowing by at least half—in either internal carotid artery.

"Our study was a population study, so it can't establish cause and effect, but it certainly suggests the hypothesis that lowering pollution levels would reduce the incidence of carotid artery stenosis and stroke," says Dr. Newman.

Scientists aren't yet sure how air pollution contributes to vascular disease. Studies have indicated that it may do so in part by causing adverse chemical changes to cholesterol in the blood, by promoting inflammation, and by making blood platelets more likely to form clots.

The study was a collaboration between researchers and clinicians in Leon H. Charney Division of Cardiology and the Departments of Environmental Medicine and Population Health at NYU Langone Medical Center. Dr. Newman notes "This study represents an important

partnership between leading experts across specialty areas in Environmental Medicine and Cardiology and has led to innovative and new thinking with great potential for future research collaborations."

The team is planning further studies. "Does the relationship between pollution levels and carotid artery stenosis hold up on a national level? Are certain groups disproportionately affected by air pollution? Is pollution also linked to other types of vascular disease, such as in your leg?" Dr. Berger says. "There are a lot of questions we have yet to answer."

**More information:** Dr. Newman will present the poster "Particulate Air Pollution and Carotid Artery Stenosis," on Monday, March 16 in at 9:45 a.m. PT/12:45 p.m. ET/4:45 p.m. UTC in Prevention Moderated Poster Theater, Hall B1.

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