

Study reveals how air pollution may increase the risk of cardiovascular disease

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Tiny particles of air pollution—called fine particulate matter—can have a range of effects on health, and exposure to high levels is a known risk factor for cardiovascular disease. New research led by investigators at Massachusetts General Hospital (MGH) reveals that fine particulate matter has a detrimental impact on cardiovascular health by activating the production of inflammatory cells in the bone marrow, ultimately leading to inflammation of the arteries. The findings are published in the *European Heart Journal*.

The retrospective study included 503 patients without [cardiovascular disease](#) or cancer who had undergone imaging tests at MGH for various medical reasons. The scientists estimated participants' annual average fine particulate matter levels using data obtained from the U.S. Environment Protection Agency's air quality monitors located closest to each participant's residential address.

Over a median follow-up of 4.1 years, 40 individuals experienced major cardiovascular events, such as heart attacks and strokes, with the

highest risk seen in participants with higher levels of fine particulate matter at their home address. Their risk was elevated even after accounting for cardiovascular risk factors, socioeconomic factors, and other key confounders. Imaging tests assessing the state of internal organs and tissues showed that these participants also had higher [bone marrow](#) activity, indicating a heightened production of inflammatory cells (a process called leukopoiesis), and elevated inflammation of the arteries. Additional analyses revealed that leukopoiesis in response to [air pollution exposure](#) is a trigger that causes arterial inflammation.

"The pathway linking air pollution exposure to cardiovascular events through higher bone marrow activity and arterial inflammation accounted for 29% of the relationship between air pollution and cardiovascular disease events," says co-first author Shady Abohashem, MD, a cardiovascular imaging fellow at MGH. "These findings implicate air pollution exposure as an underrecognized risk factor for cardiovascular disease and suggest therapeutic targets beyond pollution mitigation to lessen the cardiovascular impact of air pollution exposure."

Co-first author Michael Osborne, MD, a cardiologist at MGH, explains that therapies targeting increased inflammation following exposure to [fine particulate matter](#) may benefit patients who cannot avoid air pollution. "Importantly, most of the population studied had air pollution exposures well below the unhealthy thresholds established by the World Health Organization, suggesting that no level of air pollution can truly be considered safe," he says.

More information: Ahmed Tawakol et al, A leucopoietic-arterial axis underlying the link between ambient air pollution and cardiovascular disease in humans, *European Heart Journal*, 2021; ehaa982, doi.org/10.1093/eurheartj/ehaa982

Provided by Massachusetts General Hospital

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