

Particulate air pollution affects heart health

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Breathing polluted air increases stress on the heart's regulation capacity, up to six hours after inhalation of combustion-related small particles called PM2.5, according to Penn State College of Medicine researchers.

Stress on the [heart](#) from exposure to high levels of PM2.5 may contribute to cardiovascular disease, said Duanping Liao, professor of public health sciences.

The body's ability to properly regulate heartbeat so the heart can pump the appropriate amounts of blood into the [circulation system](#) relies on the stability of the heart's [electrical activity](#), called electrophysiology.

"[Air pollution](#) is associated with cardiopulmonary mortality and morbidity, and it is generally accepted that impaired heart electrophysiology is one of the underlying mechanisms," said Fan He, master's program graduate, Department of Public Health Sciences, Penn State College of Medicine. "This impairment is exhibited through fluctuations in the heart rate from beat to beat over an established period of time, known as heart rate variability. It is also exhibited through a longer period for the electric activity to return to the baseline, known as ventricular repolarization.

"The time course, how long it would take from exposure to cardiac response, has not been systematically investigated," said He. "We conducted this study to investigate the relationship between particle matter and heart electrophysiology impairment, especially the time course."

The researchers published their results in recent issues of the *Journal of Exposure Science and Environmental Epidemiology* and in *Environmental Health Prospective*.

Liao's team of researchers studied 106 people from central Pennsylvania, mostly in the Harrisburg metropolitan area. Nonsmokers over the age of 45 without severe [cardiac problems](#) wore air-quality and heart-rate monitors for 24 hours. The devices recorded data in one-minute intervals.

Results indicate that heart electrophysiology was affected up to six hours after elevated PM2.5 exposure. These adverse effects may trigger the onset of acute cardiac events and over time may result in increased risk of chronic heart disease.

PM2.5 refers to particles up to 2.5 micrometers in size. Their primary sources are diesel engine and coal combustion outdoors; and oil, gas or wood combustion for cooking and heating indoors. PM2.5 levels are regulated by the U.S. Environmental Protection Agency.

"Our findings may contribute to further understanding of the pathophysiology of air pollution-related cardiac events, specifically our results indicating elevated PM2.5 exposure is associated with immediate disturbance of cardiac electrical activities within six hours after exposure," said Liao.

Provided by Pennsylvania State University

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