Study shows exposure to bad air raises blood pressure

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The air people breathe while walking in the park, working in the garden or shopping downtown may be unhealthy enough to seriously spike their blood pressure, a new study suggests.

Cardiovascular researchers at The Ohio State University Medical Center are the first to report a direct link between air pollution and its impact on high blood pressure, or hypertension. If the results from these animal studies hold up, this could be important for human health.

"We now have even more compelling evidence of the strong relationship between air pollution and cardiovascular disease," said Sanjay Rajagopalan, section director of vascular medicine at Ohio State's Medical Center and co-author of the study. This builds upon previous research from Rajagopalan's team published in the journals *JAMA*, *Circulation* and *Inhalation Toxology*.

Researchers exposed rats to levels of airborne pollutants that humans breathe everyday, noting the levels were still considerably below levels found in developing countries such as China and India, and in some parts of the U.S.

Researchers found that short-term exposure to air pollution, over a 10-week period, elevates blood pressure in those already predisposed to the condition. The results appear online and are scheduled for publication in an upcoming issue of *Arteriosclerosis, Thrombosis, and Vascular Biology*, a journal published by the American Heart

Association.

"Recent observational studies in humans suggest that within hours to days following exposure, blood pressure increases," Rajagopalan says.

In a highly-controlled experiment, hypertensive rats were placed in chambers and exposed to either particulate matter or filtered air for six hours a day, five days a week, over a period of 10 weeks. At week nine, researchers infused angiotensin II, another pollutant, into mini-pumps within the chambers and monitored responses in blood pressure over one week.

The air pollution level inside the chamber containing particulate matter was comparable to levels a commuter may be exposed to in urban areas with heavy traffic such as downtown Manhattan. "Pre-exposure to air pollution markedly increased blood pressure responses following infusion of angiotensin II," added Rajagopalan.

According to the U.S. Environmental Protection Agency (EPA), the four most common pollutants emitted into the air are particulate matter, ozone, nitrogen dioxide and sulfur dioxide. Air pollution is commonly the result of industrial emissions, coal burning, power plants and automobile exhaust.

"This study provides guidance for the EPA to change pre-existing stringent standards in the effort to reduce air pollution," says Rajagopalan. "Our study also confirmed a need for a broader based approach, from the entire world, to influence policy development."

Qinghua Sun, first author of the study, will analyze vascular function in humans before and after the upcoming summer Olympics in Beijing, China. With stringent laws to ensure good quality during the games, it is anticipated that the air quality will improve significantly in and around

Beijing. "We expect to find a tangible impact on vascular function and blood pressure because ultimately the only thing that will have changed is levels of air pollution," says Sun.

Researchers at the University of Michigan, the U.S. Environmental Protection Agency, the Institute of Statistical Science and the New York University School of Medicine participated in the study.

Along with Rajagopalan and Sun, other Ohio State researchers involved in the study were Peibin Yue, Zhekang Ying and Arturo J. Cardounel. Funding from the National Institutes of Health supported this research.

According to the World Health Organization (WHO), more than three million premature deaths each year can be attributed to air pollution, with more than half of the population residing in developing low- and middle-income countries where air pollution levels are at their highest. For example, severe air pollution in Beijing, China, where the average concentration is well above five times that of levels typically found in the U.S., is the result of rapid industrial development, urbanization and increased traffic into the capital. WHO relies on scientific evidence and considers its implications when determining air quality guidelines.

Source: Ohio State University