

New evidence links ozone exposure to potential heart attacks

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Young, healthy adult volunteers exposed for two hours to ozone developed physiological changes associated with cardiovascular ailments, according to a small study reported in *Circulation*, an American Heart Association journal.

Study participants showed evidence of vascular inflammation, a potential reduced ability to dissolve artery-blocking [blood clots](#), and changes in the autonomic nervous system that controls the heart's rhythm. The changes were temporary and reversible in these young, healthy participants.

Ground level [ozone](#) is created when pollutants from vehicles, power plants, industry, [chemical solvents](#) and consumer products react in the presence of sunlight. Recent epidemiology studies have reported associations between acute exposure to ozone and death but little is known about the underlying pathophysiological pathways responsible.

"This study provides a plausible explanation for the link between acute [ozone exposure](#) and death," said Robert B. Devlin, Ph.D., the study's lead author and senior scientist at the U.S. Environmental Protection Agency's (EPA) National Health and Environmental Effects Research Laboratory in Research Triangle Park, N.C.

Devlin and colleagues focused on a single, short-term exposure and not the effects of years of exposure to ozone.

Researchers exposed 23 volunteers, ages 19 to 33, to 0.3 parts per million (ppm) of ozone. The dose was higher than the EPA's eight hour ozone standard of 0.076 ppm. However, a person breathing 0.3 ppm for two hours receives roughly the same amount of ozone as does a person breathing the lower 0.076 ppm for eight hours, Devlin noted.

Study participants underwent two controlled exposures — one to clean air and one to ozone-polluted air — at least two weeks apart. During each exposure, participants alternated 15-minute periods of stationary cycling and rest.

None of the participants reported complaints or physical symptoms after inhaling clean air or ozone. However, immediately following and the morning after ozone inhalation, tests showed significant ozone-induced vascular changes compared to clear-air exposure. These changes included:

- Increase in blood levels of interleukin 1beta, a signature marker of inflammation that appears to play a key role in heart disease.
- Decrease in plasminogen activator inhibitor 1 and plasminogen, components that play an important role in dissolving blood clots that may form along arterial walls.
- A change in heart rhythm, indicating altered [autonomic nervous system](#) control of heart rate.

Epidemiology studies have also associated acute exposure to another ubiquitous air pollutant, particulate matter (PM), with death in elderly people with cardiovascular disease. Particulate matter is tiny airborne particles that can be inhaled into the lungs. Controlled exposure studies of both humans and animals have described PM-induced changes that are very similar to those described in this ozone study, suggesting that both pollutants may be causing death by affecting similar pathways, the researchers said.

The World Health Organization estimates 2 million people worldwide, mostly elderly people with cardiovascular disease, die because of acute exposure to air pollution. The EPA puts the yearly U.S. toll at 40,000-50,000 deaths.

"People can take steps to reduce their ozone exposure, but a lot of physicians don't realize this," Devlin said.

More information: [Abstract](#)
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Provided by American Heart Association

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