

Science for Environment Policy

PM_{2.5} and ozone pollution exposure increases risk of cardiac arrest

People exposed to fine particle (PM_{2.5}) and ozone pollution are at increased risk of suffering out-of-hospital cardiac arrests, according to a recent Finnish study. Cardiac arrest is more likely within 24 hours after exposure to PM_{2.5} and up to several days after exposure to ozone.

Previous studies have already linked [air pollution](#) with sudden events causing cardiac (heart) arrest, when the heart stops pumping blood through the body. One common event of this kind is an acute myocardial infarction (AMI, also known as a heart attack) which happens when a blood clot forms in an artery of the heart, starving the heart muscle of oxygen and leading to damage of the heart or to cardiac arrest. Other events, such as arrhythmia (irregular heartbeat), which have previously been linked to air pollution, may also lead to cardiac arrests.

In this study, the researchers reviewed cases of out-of-hospital cardiac arrest (OHCA) in Helsinki, Finland, for the period 1998 to 2006. Only cases where heart problems were the primary cause of cardiac arrest were included in the study. Cases triggered by other causes, for example, by respiratory diseases or strokes, were excluded. The researchers then divided the cardiac-caused OHCA cases into those triggered by AMIs or other causes (e.g. irregular heartbeat).

They then investigated whether the OHCAs were related to ambient air pollution in the form of carbon monoxide, nitrogen oxides, sulphur dioxide, fine particles (PM_{2.5}), coarser particles (PM₁₀) and ozone concentrations, as monitored at four sites in Helsinki. The researchers also looked at when the patients would have been exposed to the pollution, prior to the OHCA.

Of 2134 cardiac-related OHCA cases, 629 were associated with AMIs and 1505 with heart rhythm problems. Most significantly, exposure to high levels of PM_{2.5} and ozone pollutants was found to be linked with a large increase in the risk of an OHCA occurring. In particular, there was an increased risk of cardiac arrest caused by an AMI within the same day of exposure to PM_{2.5}, and an increased risk of cardiac arrest due to arrhythmia, 2-3 days after exposure to ozone.

It was clear from the study that PM_{2.5} and ozone were the main pollutants that led to OHCAs. Exposure to a combination of two pollutants (either PM_{2.5} or ozone with other pollutants) did not appear to pose a greater risk of cardiac arrest than exposure to a single pollutant.

The difference in the timing of the OHCA after exposure to PM_{2.5} and ozone suggests these pollutants cause cardiac arrest in different ways. Since exposure to PM_{2.5} increases the risk of an AMI triggering a cardiac arrest, the PM_{2.5} is thought likely to cause inflammation of the heart arteries. Inflammation increases the risk of blood clots forming, which increases the risk of an AMI. Ozone exposure may interfere with the nerve supply to the heart, which may lead to an increased likelihood of arrhythmias.

Other results from the study suggest that colder weather may increase the risk of cardiac arrest following exposure to PM_{2.5}. However, there is some debate about how low temperatures have to drop before cold weather will influence the effects of PM_{2.5}.



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Contact:
frank@purdue.edu

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