

Exposure to ultrafine particles influences cardiac function

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A. Peters (left), A. Schneider (right), Credit: Helmholtz Zentrum München

The adverse health effects caused by fine particles have been known for some time. In addition, ultrafine particles appear to play a significant role in cardiac function – even if an individual is exposed to these for only a few minutes, as scientists of Helmholtz Zentrum München have now been able to show. The results of the study have been published in the journal *Particle & Fibre Toxicology*.

Inhalable particles include all particulate matter with a diameter smaller than 10 micrometers (PM₁₀). In this group a distinction is made between even finer particles smaller than 2.5 micrometers (PM_{2.5}) in diameter, which can deeply enter the lung, and ultrafine particles with

diameters less than 0.1 micrometers (100 nanometers), which can also enter the blood stream.

The research team at Helmholtz Zentrum München led by Prof. Dr. Annette Peters, head of the research program Epidemiology at the German Center for Diabetes Research (DZD), and Dr. Alexandra Schneider together with colleagues of the University of Rochester (USA), studied how ultrafine particles specifically affect the heart. They provided 64 study participants with measuring devices which recorded particle number concentrations as well as the heart activity (ECG, electrocardiogram) during daily activities. Furthermore, data from an urban background station for particulate matter were considered. The recruited participants had a confirmed diagnosis of impaired glucose tolerance (IGT) or type 2 diabetes.

Change in heart rate variability after only short-term exposure

"Elevated concentrations of ultrafine particles, e.g. in dense road traffic, led to a change in heart rate variability of the participants after only five minutes," said Peters. "Moreover, we were able to confirm effects that are already known, for example that fine particles over the course of an hour and noise are associated with impaired [cardiac function](#)."

The adverse [health effects](#) of inhalable and/or [fine particles](#) have already been established in other studies. In the present study they occur below the EU threshold limit value, which has existed for the last ten years. The role of ultrafine [particles](#), however, is unclear: Scientists expect additional [adverse health effects](#) – but to date no threshold limit values have been established.

Health risks – demand for threshold limit values

"The results are alarming because [ultrafine particles](#) occur generally in the environment and pose health risks for all of us – but especially for people who already have an elevated risk for cardiovascular disease, such as the individuals with diabetes in this study," said Peters. "We hope that with our data, we can substantiate the demands for threshold limit values and environmental standards in the future."

More information: "Elevated particle number concentrations induce immediate changes in heart rate variability: a panel study in individuals with impaired glucose metabolism or diabetes," *Particle & Fibre Toxicology*, [DOI: 10.1186/s12989-015-0083-7](#)

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