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**Effects of Fine and Ultrafine Particles on the Heart**

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Associations have been observed between ambient concentrations of particulate matter and morbidity and mortality consistently and coherently in epidemiological studies. These effects seemed to be attributable to fine particles (diameter below 2.5 $\mu$ m) when measurement techniques were employed. The effects were attributable to respiratory disease exacerbation as well as cardiovascular disease exacerbation. Recent studies investigating the biological mechanisms which might be responsible for linking deposition of particles in the lung to cardiovascular disease outcomes have suggested several pathways for particle action. These include an acute phase response leading to increases in systemic marker of inflammation in the blood, modification of the autonomic control of the heart and induction of endothelial dysfunction. These changes might predispose individuals to acute ischemia or to sudden cardiac death as indicated by the time-series analyses and case-crossover studies. Unclear is so far, which role the different components of the complex particle mixture play. Ultrafine particles with a diameter below 100 nm have been implicated as being a class of particles with independent health effects. They have higher variation in daily averages than fine particles in urban areas. The correlation between the ultrafine number concentrations and the fine particle mass concentrations varies between different regions, but rarely exceeds a correlation coefficient of 0.5. Health effects of ultrafine particles were studied so far only for short-term health effects. Independent effects of ultrafine particles were documented for daily variations in all cause mortality. Furthermore, evidence was found that ultrafine particle may induce ischemia during sub-maximal exercise in patients with coronary artery disease. A European multi-centre study indicated that hospital admissions for cardiovascular diseases in myocardial infarction survivors may be associated with ultrafine particle number concentrations. The limited body of studies including ultrafine measurements suggest that there might be health effects of ultrafine and fine particles independently of each other and potentially through different mechanisms. Further epidemiological studies characterising the aerosol with respect to its physico-chemical characteristics are needed to evaluate the role of freshly and locally produced ambient particles in the ultrafine mode.

[back to index](#)