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Health Effects of Ultrafine Particles – Systematic Literature Research of Epidemiologic Studies and its Transferability to the German Context.

Environmental risk factors are major determinants of health. Even though the increases in risk are relatively small, these ubiquitous exposures affect a large proportion of the population and can thus lead to a high burden of disease. Air pollution exposure is estimated to account for almost 400,000 premature deaths in the WHO European Region and to reduce individual life expectancy by about one year (WHO data and statistics, 2015). In order to protect the population against negative health effects, regulations on air pollution concentrations have been established in most regions of the world.

Up to now, regulations on the concentration of ultrafine particles (UFP; particles with a diameter of less than 100 nm) have been lacking. In contrast to larger particles, UFPs originate from different sources and vary with regard to their chemical composition and physical reactivity. Due to their small size, inhaled UFPs may enter into alveoli and are even capable to penetrate cell membranes. Consequently, UFPs may pass into the blood system, overcome the placental barrier, and finally diffuse into all organ systems, including the brain and nervous system. Toxicological studies suggest that UFPs contribute to the development and progression of various diseases (HEI 2013).

Epidemiological evidence for health effects of UFPs, in comparison to that for larger particles, is scarce. Nevertheless, numerous studies have been published in the last decade. Several expert committees have reviewed and interpreted the epidemiological evidence base concerning UFPs (HEI 2013 (Health Effects Institute, Boston), WHO 2013), and the expert commission of the HEI and of the WHO concluded that scientific studies suggest harmful effects of UFPs on health. However, particularly in terms of epidemiologic studies, the evidence base was not sufficient to recommend regulations on UFP exposure concentrations. Recently published epidemiologic studies now make it necessary to reevaluate the evidence base on the health effects of UFPs. Within this project, we conduct a systematic literature search and review of articles addressing adverse health effects of UFPs.

Funding Umweltbundesamt FKZ 00377 7205

Duration 31.1.2017 – 31.01.2018

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Publications