Ultrafine particles in the air – what has been studied epidemiologically to date?

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Methods

Since 1985 the documentation database of ‘LUDOK: Dokumentationsstelle Luft und Gesundheit’ selects, categorizes and summarizes relevant international research papers on the topic of air pollution and health outcomes on behalf of the Swiss Federal Office of the Environment (BAFU: Bundesamt für Umwelt). The number of population based studies published on the effects of ultrafine particles on human health is increasing. We aim to give an overview on the current state of knowledge.

From a monthly systematic search query in PubMed and alerts from important journals the research team selects continuously relevant papers for the LUDOK database. This database has been searched for papers that studied (up to May 2015) health effects of ultrafine particles, measured as number of particles usually of less than 100 nm in diameter. Publications which have studied combined effects of ultrafine particles and other air pollutants have been examined more closely.

Results

To date, the database contains over 4000 articles on particles, around 400 of them deal with ultrafine particles (UFP) and their impact on health. After excluding cell and animal studies, overviews and discussions and concentrating only on studies which have applied as indicator for UFP the number of particles (PNC), about 170 publications remain. Since 2007 these studies have been included more systematically and are presented in detail (Tab 1). Almost all of them studied short-term effects (hours to days) of ultrafine particles on health. Twelve short-term, but none of the long-term studies, analyzed associations of health effects with PNC while simultaneously adjusting for other pollutants from similar sources or with similar spatial resolution (Tab 2).

Conclusion

There is a gap in the current research on effects of ultrafine particles and their long-term effects on human health. Short-term effects have been studied more often. However, the independence of their effects from effects of other air pollutants still has to be evaluated. Whether the number of particles, a non-specific indicator for ultrafine particles, shows independent effects of other air pollution metrics still has to be shown in future research.