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Aerosols and Human Health: A Brief Report

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Introduction

Air pollution is the most serious environmental threat to human health in developed countries. Since the early studies on the health effects of the London smog episode in 1952, an enormous amount of epidemiological, toxicological, medical, chemical, physical, and technological research has been conducted in order to understand and prevent the effects of air pollution on human health, particularly fine particulate matter.

Many industrialised countries have seen significant improvements in air quality as a result of laws and abatement measures based on this research. Despite all of the efforts taken, air pollution remains the most serious environmental health issue in the developed world. A scientific session at the Analytica Conference 2014 in Munich, as well as a workshop at the Helmholtz Zentrum on the theme Aerosols and Health: A Challenge for Chemical and Biological Analysis, were organised and conducted based on this paradigm. The current topical issue includes a feature article, a critical review, and seven research papers, four of which are from the Helmholtz Virtual Institute of Complex Molecular Systems in Environmental Health – Aerosols and Health consortium, which aims to combine a comprehensive analysis of aerosol properties and composition with a multi-omics comprehensive analysis of the biological effects of the aerosol on human lung cells to improve our understanding [1-5].

Description

Chemical analysis

The US Environmental Protection Agency's feature article by Gilmour, Kim, and Hays discusses the importance of the organic composition of particulate matter from diesel engines and wildfires for health impacts, particularly (allergic) lung inflammation. They come to the conclusion that a better understanding of the organic PM composition, as well as the introduction of new, more efficient toxicity assessment methodologies, such as cell-based methods, are required. In the future, it is advised that various difficulties be addressed in order to improve knowledge of the health effects of combustion emissions.

Biological analysis

The state-of-the-art in analytical methodology for characterisation of organic compounds in atmospheric aerosol particles is summarised in a critical review featured in this subject issue by Parshintsev and Hyötyläinen from Helsinki University and Steno Inc. They distinguish between off-line and on-line methods and discuss the benefits and drawbacks of each technique, concluding that more method development and the combination of different on-line and off-line techniques are required for a better understanding of the composition and dynamics of organic compounds in the atmosphere. The five papers that follow describe novel uses and methods for analysing organic molecules in aerosols. The on-line real-time mass spectrometric study of particle composition is particularly significant for understanding atmospheric alteration processes. Despite the fact that Aerosol Mass Spectrometry (AMS, Aerodyne Inc., USA) has had a significant impact on atmospheric chemistry research in recent years, a revival of the classic laser-based single particle aerosol time of flight mass spectrometry (ATOFMS) is possible. Similarly to the AMS technique, the recently developed possibility of obtaining quantitative ATOFMS data is fueling this development. The ATOFMS method may also identify total quantities of elemental and organic carbon (EC/OC) [6,7] as well as particular organic molecules.

Conclusion

The cells are ALI-exposed to exhaust from a diesel engine with and without a diesel particulate filter for various periods of time. Different additives are used in diesel fuels. The cells are exposed to the diluted emission aerosol for various amounts of time, and the cytotoxicity (LDH release), oxidative potential, as well as interleukin 8 and TNF gene expression and secretion are all assessed. As a result, depending on the additives, the particulate filter does not eliminate all hazardous effects of the exhaust stream, as reactive gases (or extremely small nanoparticles) are still emitted. To further understand the reported biological impacts in the future, Steiner et al. believe that a more complete aerosol characterization is required.

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Conflict of Interest

There is no conflict of interest of author towards this manuscript.

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