Particle toxicity and air quality standards. A focus on the Po Valley, Italy

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Particle toxicity and air quality standards. A focus on the Po Valley, Italy.

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Introduction: Northern Italy still has difficulties complying with EU air quality standards, despite strong emission reductions. In the colder seasons, wind speed, PBL height, and atmospheric pressure occurring in the Po basin are three to five times less efficient in dispersing pollutants if compared to other European regions [1]. Different regions also show different aerosols composition, resulting in a changing toxic impact on human health. The characterization of aerosols toxicity is gaining importance, as it could act as a key point for the development of air quality planning policies. To this end, toxicity ranking methods have been recently proposed by researchers.
Methodology: In this study, the toxicity of PM_{10} in different sites worldwide was calculated and compared. The PM_{10} source apportionment and concentration trend were analysed based on data reported in the literature. The results of the LIFE PREPAIR project (https://www.lifeprepair.eu/) were also considered in this study. To evaluate particle toxicity, the methodology proposed by Park et al. [2] was applied. This method is based on the analysis of multiple biological and chemical endpoints, that were integrated for various source-specific aerosols to derive toxicity scores for particles originating from different sources. Average PM_{10} toxicity of rural and urban sites was thus calculated based on the average chemical composition.
Results: the results showed that, on average, toxicity ranking of rural sites was lower than that of urban areas. In addition, the average contribution of secondary inorganic aerosols to the overall PM toxicity was analysed. A significant variability was observed among different sites. In the second phase of the study, the temporal variability of PM composition and toxicity of a rural and a urban area in the Po Valley was analysed and compared. Time series of toxicity-weighted concentration were defined.
Conclusion: The results reported show that, despite toxicity ranking methods are still not consolidated, if coupled with advanced PM source apportionment, reliable toxicity and epidemiological analyses, they could represent important tools to build a new consistent health metric for ambient PM.
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References

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