




Abstract

Fine Aerosol Toxicity in Urban Environments of the Eastern Mediterranean [†]

Despina Paraskevopoulou ^{1,2,*}, Kalliopi Tavernaraki ¹, Irene Maria Vrettou ², Maria Tsagkaraki ¹, Aikaterini Bougiatioti ² and Nikolaos Mihalopoulos ^{1,2}

¹ Environmental Chemical Processes Laboratory, Department of Chemistry, University of Crete, P.O. Box 2208, 71003 Heraklion, Greece; popi_tavernaraki@yahoo.gr (K.T.); tsagaraki-maria@hotmail.com (M.T.); nmihalo@noa.gr (N.M.)

² Institute for Environmental Research and Sustainable Development, National Observatory of Athens, I. Metaxa and Vas. Pavlou, P. Penteli, 15236 Athens, Greece; e.vrettou@noa.gr (I.M.V.); abougiat@noa.gr (A.B.)

* Correspondence: dparask@noa.gr

[†] Presented at the 1st International Electronic Conference on Toxics, 20–22 March 2024; Available online: <https://sciforum.net/event/IECTO2024>.

Keywords: OP; aerosol toxicity; DTT; oxidative potential; ROS; biomass burning

In October 2022, the European Commission published a proposal for a revision of the Ambient Air Quality Directive, introducing stricter thresholds for pollution, more closely aligned with new limits set by the WHO, and strengthening rules for air quality monitoring to support preventive action and targeted measures. One of the latter is the monitoring of the Reactive Oxygen Species (ROS) contained in ambient aerosol. Although a direct mechanism linking PM exposure to health outcomes has not yet been well established, it is believed that ROS (redox-active components, like metals and several organic species), present in polluted air or generated from photochemical reactions, can induce oxidative stress in the human organism. During an intensive measurement campaign, daytime and nighttime PM_{2.5} samples were collected at the urban environment of Ioannina, a rural mountainous moderately inhabited city (~0.15 M inhabitants), impacted by intense residential wood burning (RWB) for heating purposes especially during winter nighttime, that in combination with its topography, results in a magnified accumulation of atmospheric pollutants. The oxidative potential of the collected samples was determined using a semi-automated system, applying the dithiothreitol (DTT) assay. It is worth noting that nighttime DTT values were three times higher than the daytime ones, highlighting the critical role of RWB in population exposure. Furthermore, the measured OP levels were compared with carcinogenic markers such as polycyclic aromatic hydrocarbons (PAHs) and their oxygenated derivatives (OPAHs). All the aforementioned levels were also compared to the respective values from Athens, the capital of Greece with almost 4 million inhabitants, and from Heraklion, an urban center in Crete, with 0.2 M inhabitants. The results elucidate the importance of regional aerosol transportation during the warmest period of the year, and the dominant impact of local sources in wintertime.



Citation: Paraskevopoulou, D.; Tavernaraki, K.; Vrettou, I.M.; Tsagkaraki, M.; Bougiatioti, A.; Mihalopoulos, N. Fine Aerosol Toxicity in Urban Environments of the Eastern Mediterranean. *Proceedings* **2024**, *102*, 39. <https://doi.org/10.3390/proceedings2024102039>

Academic Editor: Yankai Xia

Published: 3 April 2024



Copyright: © 2024 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

Author Contributions: Methodology, D.P.; Validation, D.P. and N.M.; formal analysis, K.T., I.M.V. and M.T.; investigation, D.P. and K.T.; data curation, D.P. and K.T.; writing—original draft preparation, D.P. and A.B.; writing—review and editing, D.P., A.B. and N.M.; supervision, D.P. and N.M.; project administration, D.P.; funding acquisition, D.P. All authors have read and agreed to the published version of the manuscript.

Funding: The research project was funded and supported by the Hellenic Foundation for Research and Innovation (H.F.R.I.) under the “3rd Call for H.F.R.I. Research Projects to support Post-Doctoral Researchers” (Project Number: 7738).

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Data are available upon request.

Conflicts of Interest: The authors declare no conflict of interest.

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.