PM1 particle matter and nanoplastics differentially alters primary immune response and cell viability of porcine primary alveolar macrophages compared to Pseudorabies virus

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ABSTRACT

Plastic waste is significantly increasing in the aquatic environment and in the atmosphere during the last years. Microplastics are plastic fragments which originate from multiple sources such as textile industry and households. Further fragmentation of microplastics results in nanoplastics (NPs, <1000 nm) formation and in their respective distribution in the environment. In addition, atmospheric pollution has been significantly increased in urban environments due to particulate matter (PM). Acute and chronic exposure to PM is linked to increased risk of cardiovascular and metabolic diseases. Up to now, the synergistic and antagonistic effects of mixtures of NPs, PM and airborne pathogens on the environment and in human health have been poorly investigated, remaining a source of concern. In this work, the synergistic effect of NPs, PM and airborne viruses has been evaluated in the context of cytotoxicity, primary immune responses and cell viability. Briefly, primary porcine alveolar lung macrophages were treated and exposed for 24, 48 and 72 h with different concentrations of NPs, PM and pseudorabies virus, under the same conditions. Culture supernatants were collected and cells were subjected in pcr and different assays to measure changes in cell viability, cytopathic effect, virus replication and transcriptional expression of cytokines. Results showed significantly reduced cell viability and increased cytopathic effect in alveolar macrophages at the synergistic exposure groups of virus/PM and virus/NPs compared to control group. Moreover, at the same synergistic exposure groups it was observed increased expression of TNFα, IL6 and IL4 but decreased expression of IFNγ and GM-CSF, suggesting different mechanisms by which NPs, PM and airborne respiratory viruses regulate inflammatory responses in mammalian cells. Our results confirmed the increased health risk concerning the simultaneous exposure to human pathogens and environmental pollutants, showing a differential immunological response after synergistic treatment of cells to mixtures of viruses, NPs and PM.

KEYWORDS: PM1, Nanoplastics, Pseudorabies Virus, alveolar macrophages, porcine

ACKNOWLEDGEMENTS

This work has been funded by the State Scholarship Foundation (IKY), Greece and the European Union for the Support of Postdoctoral Research - 2nd Round of Funding (MIS 5033021).