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Fine dust in focus: effects on molecular mechanisms during respiratory infections

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Air pollution poses a severe global health problem, contributing to over seven million deaths annually. Fine particulate matter (PM), primarily from fossil fuels, industry, and traffic, is associated with respiratory diseases such as asthma, chronic obstructive pulmonary disease (COPD), and lung cancer, while also impairing innate immunity and increasing susceptibility to infections.

Influenza A viruses (IAV) cause severe respiratory infections, often accompanied by bacterial or fungal coinfections. Airborne spores of *Aspergillus* spp. can lead to invasive pulmonary aspergillosis (IPA) or influenza virus-associated aspergillosis (IAPA) in immunocompromised individuals. Although PM exposure has been linked to aggravated respiratory infections, the molecular mechanisms remain poorly understood.

This study expands *in vitro* cell culture models and an *ex vivo* mouse-lung system to investigate PM's direct effects on pathogen-host interactions. Viral load will be assessed via plaque assays, while hyphal growth will be analyzed using immunofluorescence microscopy. To elucidate PM-induced molecular effects, planned techniques include Western blot, flow cytometry, immunofluorescence microscopy, qRT-PCR, and transcriptomics.

Preliminary experiments suggest that PM modulates the IAV-induced innate immune response in THP-1 macrophages. We will provide initial insights into PM-mediated effects on pathogen burden, cellular homeostasis, and innate immunity.

Keywords

fine dust, particulate matter, influenza A virus, *Aspergillus fumigatus*, influenza, aspergillosis

Registration ID

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Professional Status of the Speaker

Postdoc

Junior Scientist Status

Yes, I am a Junior Scientist.

Authors: Prof. EHRHARDT, Christina (Section of Experimental Virology, Institute of Medical Microbiology, Jena University Hospital); Dr KÖNIG, Sarah (Section of Experimental Virology, Institute of Medical Microbiology, Jena University Hospital)

Presenter: Dr KÖNIG, Sarah (Section of Experimental Virology, Institute of Medical Microbiology, Jena University Hospital)

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