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Bacterial strains from moldy buildings are highly potent inducers of inflammatory and cytotoxic effects

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Abstract

We aimed to identify inflammatory and cytotoxic potential of individual indoor air bacterial and fungal strains, as well as extracts of indoor air filter samples containing bacteria and fungi. Mouse RAW264.7 macrophages were exposed in vitro to four bacterial strains; Streptomyces californicus, Mycobacterium terrae, Bacillus cereus and Pseudomonas fluorescens, and three fungal strains; Penicillium spinulosum, Aspergillus versicolor and Stachybotrys chartarum. Furthermore, RAW264.7 macrophages were exposed to indoor air filter sample extracts representing 'low' (n = 21) and 'high' (n = 20) exposure to viable fungi or bacteria. Production of nitric oxide (NO), tumor necrosis factor-alpha (TNF-alpha) and interleukin-6 (IL-6) as well as cell viability were measured after 24 h exposure. The results show that the bacterial strains induce more profound production of NO, TNF-alpha and IL-6 than the studied fungal strains. They also decrease the viability of mouse macrophages. Similarly, the indoor air filter samples with high concentration of bacteria induced a statistically significant increase in TNF-alpha and IL-6 production as well as a decrease in cell viability. Altogether, these results suggest that indoor air bacterial strains are potent inducers of inflammatory responses and thus possibly related to adverse health effects of the inhabitants.

PRACTICAL IMPLICATIONS:

There is abundant documentation of the association between building dampness and mold and adverse health effects on occupants, but the causal agents of the effects are still unclear. In order to reveal these causal links, experimental studies with in vitro and in vivo methods are needed. The present findings shed new light on studies of the microbial constituents of indoor air in moldy buildings responsible for adverse health effects. These results imply that bacteria should also be monitored in cases of suspected microbial contamination of indoor air.

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