

BIOTIC FACTORS – MICROSCOPIC FUNGI IN PHD PROGRAMME

Elena PIECKOVÁ

*Institute of Microbiology, Faculty of Medicine, Slovak Medical University, Bratislava,
Slovakia*

Keywords: Moulds, Indoors, Bioaerosol, Mycotoxins, Disinfectants.

Abstract

Various indoor factors can contribute to ill health in occupants, incl. building-related-illnesses and sick building syndrome. The indoor microclimatic conditions, mainly humidity (at 20 °C and relative humidity 50 %, the dew point on the indoor walls is 12,6 °C), are crucial for undesired excessive fungal colonization. That leads to concentrated fungal bioaerosol, containing mycotoxins and releasing volatile organic compounds with highly irritative, inflammatory, cytotoxic and immunosuppressive potential that may result in the most severe scenario of pre- and canceroses. The main indoor fungal colonizer in dwellings in Slovakia – *Aspergillus versicolor* (related PhD-theses: Mycological Indoor Air Quality in Dwellings in Slovakia; Modelling of Indoor Fungal Colonizer *Aspergillus versicolor* Growth Conditions) – produces carcinogenic sterigmatocystin. The mycotoxin breaks down mucociliary self-cleaning of upper airways in 24-hrs-activity *in vitro*, causes statistically significant inflammation in lungs, cytotoxic damage and overproduction of reactive oxygen radicals in lung tissue in animal models *in vivo*. The adverse effects are more pronounced when co-cultured with cellulolytic *Stachybotrys chartarum* synthesizing cyclic trichothecenes, and acting together with cigarette smoke (related PhD-thesis: Fungal Sinusitis in Patients in Slovakia).

At workplaces with mouldy materials, the air might comprise 10^9 fungal propagules in m^3 – „particle burst“, and mixture of mycotoxins. The aerosolized fungi, once settle down, might damage historically valuable exponents remarkably; some indoor fungi (zygomycota) are early indicators of microclimatic conditions favorable to indoor mould development with serious public health consequences. Anyway, hygienic limits of fungal composition of bioaerosol based on serious scientific data, incl. possible breathable fungal load to the individuals present, are missing yet. Inhalatory exposition to fungal bioaerosol in the places rich in organic material (historical artefacts) was estimated by calculating total number of inhaled propagules over a period given, 1 or 8 hours, at a normal ventilation rate of 5 – 8 liters of the air per 1 min. The highest inhaled fungal load was estimated in a mausoleum and an archive, both for visitors and researchers, in thousands of propagules per m^3 of the air. Special caution should be paid to remarkable amounts of fungal propagules inhaled by the staff working on site for 8 hrs. (PhD-related: Indoor Fungal Bioaerosol as A Public Health Risk Factor).

High concentrations of fungi may lead to mycoses as an infectious dose of (opportunistic) pathogenic

moulds is unknown yet. Over time, fungi have become one the most common agents of nosocomial infections, esp. in immunocompromised patients. The fungal spectrum varies in different hospital departments remarkably. Thus, the efficacy of different disinfectants, incl. the polymer-based chemicals, on the particular hospital-environment-borne moulds aerosolized and forming biofilms as well – pathogens (*Aspergillus fumigatus*), opportunistic pathogens (hyalo- and phaeohyphomycetes) and toxic (*Aspergillus versicolor*, *Fusarium* spp., *Penicillium* spp.) and hygienic indicators (zygomycetes) was tested. The fungicide based on peracetate proved to be the most effective biocide while polymer preparations cannot be considered antifungals (PhD-related: Efficacy of Disinfectants Against Hospital Related Fungi).

Received: July 04, 2023

Address for correspondence:

Assoc. Prof. Elena Piecková, MPH, PhD.

E-mail: elena.pieckova@szu.sk