

# Assessment of fungal aerosol in different type of residential buildings located in the city free of flood

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Keywords: fungi, dwellings, air contamination

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In the indoor air of residential buildings even located in areas free of flood can find many species of fungi mainly of the genera: *Aspergillus*, *Cladosporium*, *Penicillium*, *Fusarium*. Their sources are: outdoor air, spores and fragments of mycelium present in the settled dust, in flowerpots, carpets but also fungi growing on various types of building and finishing materials. Structural elements, the type of used material and the age of the building can effect on the colonization and growth of fungi. Conditions conducive to the occurrence of fungi in buildings can appear both during build and later during their exploitation (bad ventilation, new tight windows, lack of rooms airing, activities in home like cooking, etc.). Fungi can be both an infectious and allergic agents, and longer exposure to this kind of microorganisms can cause serious respiratory diseases.

**Aim:** The aim of this study was to assess the contamination of dwellings indoor air by fungi in different type of residential buildings.

**Materials and Methods:** In a large city (over a half million inhabitants) which was free of flood in the last century 700 dwellings located in different types of buildings were randomly selected. Among dwellings residents questionnaire study was conducted and information describing building and dwelling were collected. Air samples for assessment of the levels of fungi were collected from 60 dwellings in three type of buildings (block of flats n=36, old tenement house n=17 and detached house n=7) during summer and winter. The air was sampled for 24 hours using pump and a measuring head filled with a filter. After the sampling the filters were transported to the laboratory where the biological material was eluted and series of 10-fold dilutions was made. To determine the total number of fungi plates with Malt Extract Agar containing chloramphenicol and streptomycin were used. The plates were incubated at 25°C for 7 to 10 days. Identification of fungi was carried out according to standard diagnostic techniques and procedures. The presence of five allergenic to human genera (*Penicillium*, *Aspergillus*, *Cladosporium*, *Alternaria*, *Stachybotrys*) were studied. Among the *Aspergillus* genus the fungi of *Aspergillus fumigatus* species were determined. Geometric means of fungi concentrations in the dwellings location in different type of buildings were analyzed.

**Results:** Concentrations GM, (ranges) of airborne fungi in blocks of flats, tenement houses and detached houses in summer were  $6.96 \times 10^1$  cfu/m<sup>3</sup> ( $1.04 \times 10^1 - 1.17 \times 10^3$ ),  $1.03 \times 10^2$  cfu/m<sup>3</sup> ( $2.39 \times 10^1 - 4.93 \times 10^2$ ),  $1.62 \times 10^2$  cfu/m<sup>3</sup> ( $1.8 \times 10^1 - 5.83 \times 10^2$ ) and in winter  $3.62 \times 10^1$  cfu/m<sup>3</sup> ( $3.23 - 1.7 \times 10^3$ ),  $2.29 \times 10^2$  cfu/m<sup>3</sup> ( $2.18 \times 10^1 - 6.73 \times 10^3$ ),  $3.34 \times 10^1$  cfu/m<sup>3</sup> ( $2.5 - 2.33 \times 10^3$ ),

respectively. In summer significantly higher concentrations of fungi were found in blocks of flats and detached houses than in tenement houses ( $p < 0.05$ ). The highest mean concentration of fungi in winter was in tenement houses and the lowest in the blocks of flats ( $p < 0.001$ ). In two cases only (in tenement houses) the concentrations of fungi exceeded the Polish reference limit value for the home environment ( $5.0 \times 10^3$  cfu/m<sup>3</sup>, Górny, 2004). In collected samples isolated fungi of the genus *Stachybotrys* were not found. The allergenic genera of fungi in blocks, tenement houses and detached houses in summer constituted 59.0%, 67.8% and 78.1% and in winter 86.5%, 94.7% and 88.5% of all isolated fungi respectively. Qualitative analysis showed that in summer the largest percentage of fungi of the *Penicillium* genus were found in dwellings located in the blocks of flats and detached houses, in winter in those types of buildings the fungi of the *Aspergillus* genus were the most numerous. In tenements the reversed trend was observed. In all types of buildings, both in summer and in winter the fungi of the species *Aspergillus fumigatus* which were qualified to the second biosafety categories according to the classification BSL (biosafety levels) were isolated (de Hoog, 1996).

**Conclusions:** 1. The type of building significantly modified the concentration of airborne fungi in dwellings but only in winter season The highest mean concentration of fungi was found in old tenement houses. 2. Only in a few cases the level of fungi exceeded the reference limit values. 3. Among identified microorganisms, fungi of *Aspergillus fumigatus* which are in BSL-2 according to the classification BSL were found. 4. Share of allergenic fungi was much higher in winter than in summer.

The project was carried out under grant 1754/B/P01/2010/39

## References:

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