Analysis of the incidence of fungal pathogens in air of the Department of Dermatology, Venereology and Allergology of Medical University in Wrocław

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Abstract

Purpose: Analysis of incidence of fungal pathogens in air of Department of Dermatology, Venereology and Allergology of Medical University in Wrocław.

Material and methods: Materials for the tests were: the air samples in front of the building, corridors, library, lecture hall, and mycological laboratory. The air pollution was determined using SAS SUPER 100. Humidity and temperature were evaluated by a termohigrometr. Classification of the isolated fungi was made with an accordance to the current procedures

Results: From the air was isolated: in library 69 colonies (mean CFU 138±41.5), from the bookstands – 25 colonies (mean CFU–125±63.6), lecture hall – 119 colonies (mean CFU–380±98.8), mason room – 52 colonies (mean CFU–104±21.9), mycological laboratory – 154 colonies (mean CFU–513±155.3). Temperature in the tested rooms ranged from 24.5ºC (mason room) to 26.1ºC (library), humidity ranged from 40.1%-53.1%. Temperature outside of the building was 23.6ºC, and humidity 51.6%. Moulds *Peniciullium citricum* and *Aspergillus niger* and the yeasts *Candida albicans* were isolated more frequently

Conclusions: The highest number of fungi colonies were isolated from the air sampled at the lecture hall and mycological laboratory. Moulds were the most common airborne fungi. Temperature and huimidity in the tested rooms are good conditions for the development of fungi.

Key words: air, fungi, dermatology department.

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Introduction

Fungi are ubiquitous in the natural environment, appearing in air, water and soil. Some people may spend as much as 90% of their time within one building, or perhaps the same room, and as a result may be subject to lengthy exposure to fungal bioaerosols [1]. In the air of the buildings with ineffective ventilation or with damage and poor air conditioning systems, there may be an increase in the concentration of mycotoxinogenic moulds *Penicillium* and *Aspergillus species* [2]. Airborne microflora in hospital rooms was the subject of numerous studies as a potential cause of hospital infections [3,4]. Most of the studies were performed in intensive care units, surgical units, haematological wards, maternity wards and other department where the risk of infections is greatest [5,6]. The object of the present research was the determination of airborne fungi in selected rooms of the Department of Dermatology, Venereology and Allergology of Medical University in Wrocław.

Material and methods

Air sampling was carried out in selected rooms of the Department of Dermatology, Venereology and Allergology in Wrocław. Air was sampled in library, bookstands, mason room, lecture hall, and mycology laboratory. SAS SUPER 100 sampler (pbi international) in of impactor sampler have a flow rate of 100 l air/min.

At each site, a 100 l sample was taken with the sampler placed at a height of 150 cm above floor level in the middle of the room, with all windows and doors closed. The single 9 cm Petri dish collection plates onto which particles impacted contained Sabouraud agar amended with chloramphenicol to prevent bacterial growth. After incubation at 27ºC for three days quantitative analysis and morphological evaluation of fungal colonies were carried out, and depending on the nature of the fungi cultures the plates were incubated for up to 14 days to

***Table 1*. Number of culturable fungi in air samples taken in the rooms of the Department of Dermatology, Venereology and Allergology of Medical University in Wrocław**

	Library	Bookstands	Lecture hall	Mason room	Mycology laboratory	Total
Candida albicans	17	4	5	22	3	51
Acremonium strictum	1		13	3	7	24
Penicillium citricum	20	9	50	10	62	151
Penicillium commune	9	2	6	3	10	30
Fusarium solani	3	2	10	1	4	20
Aspergillus ochraceus	8		11		30	49
Aspergillus niger	10	7	20	10	35	82
Mucor racemosus	1	1	2			4
Rhodotorula mulcilaginosa			2	3	3	8
Sum	69	25	119	52	154	419

allow identification. The raw counts of colonies on the agar plates were adjusted by reference to statistical scaling table applying to the sampler. Yeast-like fungi were identified by means of original Candida ID (bioMerieux) medium, API 20C AUX (bioMerieux) identification sequence as well as CandiSelect (Bio-Rad) medium. For moulds, microscopical evaluation of morphological elements in preparations stained with lactophenol/methylene blue (Merck).

Results

From the air was isolated: in library 69 colonies (mean CFU 138±41.5), from the bookstands – 25 colonies (mean CFU–125±63.6), lecture hall – 119 colonies (mean CFU–380±98.8), mason room – 52 colonies (mean CFU–104±21.9), mycological laboratory – 154 colonies (mean CFU–513±155.3) (*Tab. 1*). Temperature in the tested rooms ranged from 24.5ºC (mason room) to 26.1ºC (library), humidity ranged from 40.1% to 53.1%. Temperature outside of the building was 23.6ºC, and humidity 51.6%. Sampling air in the rooms of the Department of Dermatology, Venereology and Allerology in Wrocław (*Tab. 1*) revealed that numbers of airborne culturable fungi were the highest at mycological laboratory and lecture hall. In contrast the lowest numbers of airborne fungi at bookstands and mason room were found. Moulds *Peniciullium citricum* and *Aspergillus niger* and the yeasts *Candida albicans* were isolated more frequently (*Tab. 1*). In contrast *Mucor racemosus and Rhodotorula mulcilaginosa* were detected more rarely. The highest number of *Candida albicans* was isolated at mason room and library. In lecture hall *Penicillium citricum* and *Aspergillus niger* were detected more frequently. *Penicllium citricum, Aspergillus niger, Aspergillus ochraceus* were more often isolates detected at mycological laboratory.

Discussion

In the present study, we found that moulds *Peniciullium citricum* and *Aspergillus niger* and the yeasts *Candida albicans* were isolated more frequently in air of the Department of Dermatology, Venereology and Allerology in Wrocław. We also found the highest number of airborne culturable fungi at mycological laboratory and lecture hall. Our findings are in accordance with previous reports on airborne contamination [2-4]. Indoor air quality exert effect on health of workers [7]. Indoor-air-related symptoms were studied among hospital workers (N=5598) in a questionnaire survey in which employees from 10 central hospitals participated. The survey was based on the Indoor Air Questionnaire (MM-40) by the Finnish Institute of Occupational Health. The authors found the environmental problems most frequently reported were dry air (reported by 46% of the respondents), stuffy air (40%), noise (30%), draft (27%), and unpleasant odor (26%). The most common symptoms were nasal irritation (reported by 25% of the participants), hand irritation (24%), eye irritation (23%), and fatigue (21%). They concluded that dry and stuffy air, noise, draft, and unpleasant odors were more common in hospitals than in office environments. Irritation of the nose, hands, and eyes, as well as fatigue, were also experienced more often in hospitals than in office environments. In our study we did not assess indoor-air-related symptoms by hospital workers. In Greek study [8] air, surface, and tap water sampling was performed in four departments with high-risk patients. As sampling sites, the solid-organ transplantation department and the hematology department and the pediatric oncology department and the pediatric intensive care unit were selected. They found from culture of air specimens were *Aspergillus niger* (25.9%), *Aspergillus flavus* (17.7%), and *Aspergillus fumigatus* (12.4%). The pediatric intensive care unit had the lowest mean CFU (7.7/m^3) compared with the pediatric oncology department 8.7 CFU/m^3, and the hematology department 22.6 CFU/m^3. Environmental surfaces were swabbed, and 62.7% of the swab samples cultured yielded fungi similar to the fungi recovered from air but with low numbers of colony-forming units.

The present data are partially in agreement with our report [9]. In a comparative study of the occurrence of culturable airborne fungi carried out during the four seasons of the year in four social welfare homes. Air of randomly chosen rooms and bathrooms, corridors, ward kitchens, soiled-linen closets, din-

ing-rooms, day-rooms and nurses' stations was sampled using single-stage impactor samplers and isolated moulds and yeasts were identified by macroscopic, microscopic and biochemical characteristics. Generally the greatest numbers of fungi were observed in the autumn. *Penicillium* and *Cladosporium* were isolated from the air in social welfare homes during all seasons of the year.

Conclusions

Concluding, we did not analyze allergic symptoms among workers of the Department of Dermatology, Venereology and Allerology, for the well-being of workers the cleanliness of their indoor environment should be monitored.

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