

Participation of yeast-like fungi in respiratory system diseases tuberculosis and neoplasms

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Dynowska M., Biedunkiewicz A., Sucharzewska E.: *Participation of yeast-like fungi in respiratory system diseases tuberculosis and neoplasms*. Acta Mycol. 37 (1/2): 117-122, 2002.

The following paper contains the research results (1997-1999), concerning the presence of yeast-like fungi in the human respiratory system (sputum, bronchoscopy material) of 1315 patients of the Specialistic Public Hospital of Lung Diseases and Oncology in Olsztyn with the neoplasm development process and suspicion of tuberculosis. In the studied group the majority of patients with neoplasms (452 people: 311 female and 141 male) were infected with fungi. They were isolated from 280 women (90%) and 130 men (92%). Among 78 people suspicion of tuberculosis and treated with series of antibiotics only in two cases mycobacterium was obtained. All the 76 patients the presence of mycobacterium was not found, although, the clinical symptoms and radiological researches indicated tuberculosis. In total 9 species fungi were isolated: *Candida*, *Saccharomycopsis* and *Trichosporon*. The *Candida albicans* dominated. The results obtained confirm negative influence of the modern antibiotics and neoplastic diseases therapy, which succession is the drastic decrease in cellular resistance and activity of pathogenic fungi often imitating symptoms other diseases (e.g. tuberculosis).

Key words: yeast-like fungi, respiratory system, neoplasms, tuberculosis

INTRODUCTION

Among many diseases related to the development of civilization, not dismissing the state of the art therapy, mycoses of organs dominating in ontocenoses of those organs that have direct contact with the external environment pose an increasingly important problem. The respiratory system, which is penetrated by fungi *per os* or as a result of inhalation, is one of such systems. A continuous increase in the numbers of respiratory system mycoses (Dynowska 1995) results not only from the abundance and biological diversification of pathogens but also by the expanding spectrum of their pathogenicity (Dynowska 1993) as well as a decrease in human body resistance to fungal infections. This applies to people in different age groups. Continuous underestimation of fungi as a potential source of numerous very serious diseases is a

concern, the more so as the range of factors predestining their appearance expands continuously.

Besides the iatrogenic factors (the major ones are hypertension, unsuitable and uncontrolled antibiotic therapy), a very important role is played by pathological factors: tuberculosis and neoplastic diseases (Batura-Gabryel et al. 1994; Verthallitis and Meunier 1995; Krajewska-Kulak et al. 1999).

It was decided then to check what is the participation of increasingly expansive yeast-like fungi in those diseases.

MATERIAL AND METHODS

The research material consisted of yeast-like fungi isolated from the respiratory system (sputum, bronchoscopy material) of 1783 patients of the Specialist Public Hospital of Lung Diseases and Oncology in Olsztyn during the years 1997-1999.

The research was conducted at the Bacteriology Laboratory according to the generally accepted method and guidelines for bacteriological and mycological diagnostics (Richardson and Warnock 1995; Verthallitis and Meunier 1995).

Cultures of fungi were grown on solid and liquid Sabouraud medium at 37°C for 48-72 hours. The fungi were identified taking into consideration their macroscopic features on Sabouraud agar, microscopic ones on Nickerson agar and biochemical ones obtained from bio-Merieux tests (Kurnatowska 1995). Works by Kregger-van Rij (1984), Barnett et al. (1990) Kurnatowska (1995) and were used for identification purposes.

In analysis of the results, the qualitative composition of mycoflora of patients with neoplasms and tuberculosis was considered, including also the patients with symptoms of tuberculosis but BK (-), and the sex of the patients.

RESULTS

In total 1315 patients were analyzed, i.e. those cases in which the fungal growth was abundant: 892 cases - 50%, and very abundant: 423 cases - 23.7% (Table 1). In the studied group, the majority of patients with the neoplasm development process in progress (452 people, including 311 female and 141 male) were also infected with fungi. The fungi were isolated from 280 women - 90% of cases, and 130 of men - 92% of cases (Figure 1). Instead among 78 people suspicion of tuberculosis only in two cases mycobacterium brought up. All the 76 patients presence of mycobacterium was not found although the clinical symptoms and radiological results indicated tuberculosis. Those results represented 18% of the cases with the most abundant fungal growth.

Table 1
Proportional participation of yeast-like fungi in analysing of material with regard to intenseness of growth

Number of patients	abundant	very abundant	weak and moderate
1783	892 (50.0%)	423 (23.7%)	468 (26.3%)
100%	1315 (73.7%)		468 (26.3%)

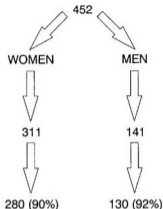


Fig. 1. Number of analysing patients with the neoplasms were infected with fungi

Neoplastic and tuberculosis changes were accompanied by growth of *Candida*, *Trichosporon* and *Saccharomycopsis* types fungi.

In total, 9 species of fungi, which were present individually, in twos and in case of one patient three together (Table 2) were isolated.

The most frequently isolated fungi were *C. albicans* and *C. guilliermondii*, less frequently *Trichosporon beigelii* and *Saccharomycopsis capsularis* (Fig. 2). *C. albicans* was the fungus that most frequently accompanied other species (Table 2).

Table 2
Yeast-like fungi isolated in the respiratory system of patients
with neoplasms and suspicion of tuberculosis

L.p.	Species of fungi	Occurrence		
		individually	in two	in three
1.	<i>Candida albicans</i> Berkhout	X	X	X
2.	<i>Candida guilliermondii</i> Langeron et Guerra	X	X	
3.	<i>Candida parapsilosis</i> Langeron et Talice	X	X	
4.	<i>Candida tropicalis</i> Berkhout	X	X	
5.	<i>Saccharomycopsis capsularis</i> Schiønning	X	X	
6.	<i>Saccharomycopsis</i> sp.	X	X	X
7.	<i>Trichosporon beigelii</i> Villemin	X	X	
8.	<i>Trichosporon capitatum</i> Diddens et Lodder	X	X	
9.	<i>Trichosporon</i> sp.	X	X	X

Two fungi were not traced to a specific species but it should be pointed out that the *Saccharomycopsis* sp. had the largest number of *S. capsularis* features while the *Trichosporon* sp. was most similar to *T. beigelii*.

DISCUSSION

In view of the increasing frequency of infections with opportunistic microorganisms, among which the yeast-like fungi are included, particular attention should be focused on comprehensive clinical examinations and diagnostics oriented at effective control of fungal infections threatening to life. This applies in particular to the patients belonging to the increased risk group in case of whom fungal infections are the major cause of morbidity and mortality among the hospital treated patients (Senet and Robert 1995; Verthalis and Meunier 1995). The percentage share fungal infections in the total number of hospital infections increased from 6% in 1980 to 10.4% in 1990 while the number of fungemia increased from 5.4% to 9.9% (Krajewska-Kuřak et al. 1999). The above data corresponds to the progress that made in antibiotic therapy in case of tuberculosis or even suspicion of tuberculosis and therapy of neoplastic diseases. It frequently happens that presence of fungi is confirmed in almost every biological material collected from the disease lesion. However, fungi are much more frequently isolated in case of patients with neoplasms than those with tuberculosis. In both cases we deal with a drastic decrease in cellular resistance, which is furthered by aggressive therapy: series of antibiotics with a wide spectrum of influence, cytostatic medicines, corticosteroids and irradiation. All of that facilitates direct or indirect fungal infestation of the system.

Antibiotics lead, first of all, to dysbacteriosis of the alimentary tract and change the permeability of the epithelium and as a result facilitate fungal penetration of the lymphatic and circulatory systems. Cytostatic and corticosteroid medicines have immunosuppressive effects, they inhibit development of antibodies, distort the activity of macrophages, disable regeneration of mucous membrane in intestines and lead to severe and long-term neutropenia which favors development of mycoses (Verthalis and Meunier 1995). The above mentioned represent just a small sample of therapeutic activities that cause a risk of mycosis development.

A large number of mycoses was described in case of patients with neoplastic diseases, tuberculosis and other diseases of lungs (Zagórecka 1971; Warnock and Richardson 1991; Batura-Gabryel et al. 1994; Senet and Robert 1995; Batura-Gabryel 1999) however, the most frequent ones are candidoses, in case of which *C. albicans* and *C. tropicalis*, and in case of patients on extra-intestinal feeding also *C. parapsilosis* are the major etiological factors (Verthalis and Meunier 1995). The results obtained confirm the domination of the same *Candida* type fungi, but at the same time draw attention to a very important phenomenon. This phenomenon is an increasingly frequent appearance and growth of fungi that so far have rarely been recorded in the respiratory system. Those fungi include, first of all, *Trichosporon* type fungi, which used to be isolated most frequently from the skin as a permanent component of its microflora. At the time of collapse of resistance those fungi become aggressive and start colonizing all systems, with a preference for the respiratory system. This is important as during the recent years a significant blurring of differences between ecological groups of pathogenic fungi and an increase in the pathogenicity of species rarely mentioned as significant etiological factors has been observed (Dynowska 1993). Currently, it is believed, that all fungi which may develop in the human body temperature and are able to survive in the environment of a de-

creased oxidation-reduction potential (conditions in the damaged and sick tissue, should be considered as potential pathogens (Richardson and Warnock 1995). Presence of fungi in the respiratory system does not have to indicate a situation of direct threat, however, isolation of fungi from bronchoscopic material (ca. 70% of the entire studied material) may not be dismissed and it suggests development of a disease process. That is why it is a very important task for the diagnosticians and doctors taking care of the patients with neoplastic diseases or tuberculosis to differentiate between colonization by fungi and invasive infestation with them (Verthallitis and Meunier 1995). It should be added that presence of symptoms of tuberculosis, without confirmation of mycobacterium presence in a culture, does not have to indicate the developing disease, however, in spite of that, all patients suspected of tuberculosis are treated with series of antibiotics destructive for the body. As yeast-like fungi often imitate the symptoms of tuberculosis, it is possible that many severe life threatening diseases of the respiratory systems are unidentified mycoses. This is indicated by examinations of post mortem material (Verthallitis and Meunier 1995).

That is why it is very important to conduct careful mycological examinations of people from the physiological risk group (Warnock and Richardson 1991; Sene and Robert 1995), in particular those who return for hospital treatment on many occasions. At the same time, compulsory mycosis prevention should be applied before initiating and during antibiotic therapy or chemical therapy. It is very important as in patients with lung cancer dependence was found within increase in fungal infestation and the progress or remission of the disease and the number of fatalities (Batura-Gabryel et al. 1994). Much of the data indicates that long-term untreated mycosis may lead to neoplastic changes as the substances produced by fungi (mycotioxins and enzymes) have a cytotoxic and carcinogenic effect (Batura-Gabryel et al. 1994).

All the time to little attention is taken of the problem of mycoses, which in the majority of cases are secondary, i.e. dependent on therapist and awareness of the patient.

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Udział grzybów drożdżopodobnych w schorzeniach układu oddechowego – gruźlica i nowotwory

Streszczenie

Praca obejmuje wyniki badań (1997-1999) dotyczących występowania grzybów drożdżopodobnych w układzie oddechowym (plwocina, materiał bronchoskopowy) 1315 pacjentów Samodzielnego Publicznego Zespołu Pulmonologii i Onkologii w Olsztynie, u których rozwijał się proces nowotworowy i podejrzanych o gruźlicę.

W analizowanej grupie osób większość pacjentów nowotworowych (452 osoby: 311 kobiet i 141 mężczyzn) była zakażona grzybami. Wyizolowano je od 280 kobiet – 90% i 130 mężczyzn – 92%. Spośród 78 osób podejrzanych o gruźlicę i leczonych w tym kierunku seriami antybiotyków, tylko w dwóch przypadkach wyhodowano prątki. U 76 osób prątków nie stwierdzono, mimo, że objawy kliniczne oraz badania radiologiczne wykazywały zmiany gruźlicze. Ogółem wyizolowano 9 gatunków grzybów z rodzaju: *Candida*, *Saccharomycopsis* i *Trichosporon*. Dominowała *Candida albicans*. Uzyskane wyniki potwierdzają negatywny wpływ nowoczesnej terapii antybiotykowej i przeciwnowotworowej, której następstwem jest drastyczny spadek odporności organizmu i uaktywnienie się grzybów potencjalnie chorobotwórczych często imitujących objawy innych chorób (m.in. gruźlicy).