ACTA MYCOLOGICA
Vol. 35 (1): 47–52
2000

Fungi isolated from the oral cavity, nose and throat of healthy children

MARIA DYNOWSKA[1] and ELŻBIETA EJDYS[2]

[1] Departament of Mycology, University of Warmia and Mazury in Olsztyn
Żołnierska 14, PL-10-561 Olsztyn, Poland
[2] Department of Biology Didactics, University of Warmia and Mazury in Olsztyn
Żołnierska 14, PL-10-561 Olsztyn, Poland

Dynowska M., Ejdys E.: *Fungi isolated from the oral cavity, nose and throat of healthy children.* Acta Mycol. 35 (1): 47–52, 2000.

The paper presents the analysis of fungi found in the oral cavity, nose and throat in 70 healthy children, at the age of 0 to 15 years old. Fungi were found in 27 children (45 isolates) – what makes 39% of the examined. They were mainly isolated from the oral cavity, seldom from the throat. In the nose they were observed sporadically. The species of *Cryptococcaceae* dominated, mainly *Candida albicans* (28 isolates) and *Candida guilliermondii* (7 isolates).

Key words: yeast-like fungi, respiratory system, children.

INTRODUCTION

The most attention in mycological pediatric literature is paid mainly to children from so called risk groups. They include children with diabetes (Małecka-Panas 1994) and cancers, who have undergone chemotherapy (Bogusławska-Jaworska and Gołębiowski 1992; Bogusławska-Jaworska et al. 1992), immunosupression and antibiotic therapy (Brózik et al. 1980; Alkiewicz and Nowak 1992; Małecka-Panas 1994; Sysa-Jędrzejowska et al. 1997) or have been treated orthodontically (Białasiewicz, Kurnatowska and Śmiech-Słomkowska 1993; Śmiech-Słomkowska, Białasiewicz and Kurnatowska 1996; Pietrzak-Bilińska 1998). The works on the mycoflora in "healthy" children (Kowalczyk 1975; Kobayashi et al. 1980) and youngsters (Kurnatowska, Żabińska and Wara-Wąsowska 1969; Żurowski et al. 1994) are very scanty. Therefore the analysis of a group of school children 7 to 15 years old from the Warmińsko-Mazurski

voivodeship was undertaken. The research on the species content and physiology of mycoflora of the respiratory system in adults has been carried out since 1986 (D y n o w s k a 1995). It is not unlikely that the comparison of different age groups will help to point out the fungi connected temporarily and (or) permanently with the human body.

MATERIALS AND METHODS

The material for examination was taken from the oral cavity, throat and nose from 70 healthy children inhabiting the Warmińsko-Mazurski voivodeship, representing two age groups: 0–9 and 10–15 years old. The material was taken twice: in May and in November 1997.

The culture was set on Sabouraud agar at 37°C for 48 hours. After the fungi growth, the material was sieved twice or three times onto a fresh base in order to eliminate bacteria. The bases with antibiotics were not used because they could modify the growth of fungi. After obtaining clean bacteria-free strains microcultures on Nickerson agar were established. They were incubated at 37°C for 48 up to 72 hours. Macroscopic features (the size, colour, shape, smell of colonies) and microscopic ones (shape, size of gammating cells, blastospores and chlamydospores, diameter of pseudohyphae and hyphae) and biochemical features obtained on API-tests bio-Mérieux firm were taken into consideration during verification. The fungi were determined according to L o d d e r and K r e g e r-v a n R i j (1967), B a r n e t t, P a y n e and Y a r r o w (1990) and K u r n a t o w s k a (1995).

RESULTS AND DISCUSSION

The fungi were found in 27 children (45 isolates) – what makes 39% of the examined. They were most often isolated from the oral cavity, seldom from the throat. They were found in nose sporadically (Table 1). Only one species of fungus was isolated from the majority of children of the same ontocoenosis, two species-from five children, in one case 3 species of fungi were obtained from the mouth cavity. In one child three different fungi occurred in the throat, mouth cavity and nose. In eight children fungi were found in the mouth and throat and in the mouth and the nose (Table 2).

Totally 8 species belonging to 4 genera were detected in the examined material: *Candida*, *Saccharomyces*, *Saccharomycopsis* and *Trichosporon*. Yeast-like fungi dominated (Table 1). *Candida albicans* (Robin) Berkhout and *Candida guilliermondii* Langeron et Guerra = *Pichia guilliermondii* Wickerham were most often isolated. *Candida parapsilosis* Langeron et Talice, *Candida tropicalis* (Castelani) Barkhout, *Trichosporon beigelii* Vuillemin and *Trichosporon capitatum* Diddens et Lodder = *Dipodascus capitatus* de Hoog et al. and *Saccharomycopsis capsularis* Schiönning were observed very seldom. Proper yeast were represented by *Saccharomyces cerevisiae* Hansen.

Table 1

Fungi isolated from the oral cavity, nose and throat from 70 children in spring and autumn

Species of fungi	Number of isolates	Period of sampling						Child's age	
		May			November			0–9	10–15
		mouth	nose	throat	mouth	nose	throat		
C. albicans	28	8	2	6	4		8	14	14
C. guilliermondii	7	5		2				6	1
C. parapsilosis	2	1					1		2
C. tropicalis	2	1		1				1	1
S. cerevisiae	2	1	1					2	
S. capsularis	1		1					1	
T. beigelii	2		1	1				1	1
T. capitatum	1		1						1
Sum	45	17	5	10	4		9	26	19
Total		**32**			**13**				

Table 2

Occurrence of fungi in the examined ontocoenoses and their symbiotic relations

Species of fungi	One species in one onto-coenosis	Two species in one onto-coenosis	Three species in one onto-coenosis	Species occurring in two ontocoenoses of the some child				Species occurring in three ontocoeno-ses of the same child		
				mouth	throat	mouth	nose	mouth	nose	throat
C. albicans	X	X	X	X	X	X				X
C. guilliermondii	X	X	X	X	X	X	X			
C. parapsilosis	X	X	X	X						
C. tropicalis	X					–				
S. cerevisiae	X	X							X	
S. capsularis	X						X			
T. beigelii	X	X					X			
T. capitatum	X							X		

Among examined ontocoenosa yeast and yeast-like fungi are isolated most often from mouth (K a ł o w s k i 1964; D m o c h o w s k a and B u l u k 1971; Ż u r o w s k i et al. 1994) which is a reservoir of numerous saprotrophs getting into it together with food or by inhalation. D m o c h o w s k a and B u l u k (1971) found fungi in the mouth of healthy,

school children in 63.6% of the examined whereas Żurowski et al. (1994) in 59.5%. The dependence of the occurrence of fungi and hygiene of the mouth was not observed even at so high percentage of positive results. There were only found insignificant changes in parodontium (Żurowski et al. 1994). However, many authors (Białasiewicz et al. 1993; Śmiech-Słomkowska et al. 1996; Pietrzak-Bilińska 1998) pay attention to a close correlation between the presence of an orthodontic apparatus and the variety and number of yeast-like fungi in the mouth. Białasiewicz et al. (1993) in the washings taken from the mouth of 80% children treated orthodontically found 16 species of fungi among which *Candida albicans*, *Candida parapsilosis* and *Geotrichum candidum* dominated. More fungi were isolated in the age group 9–18 years old than in the children 6–8 years old. Author's own investigations show that fungi occur often in younger children up to 9 years old (Table 1). These observations correspond to the suggestions presented by Zaremba and Nowacki (1990) who state that children 0 to 9 years old constitute a group being predisposed to fungal infections. They also claim that fungi occur particularly often in the youth and the period of puberty.

Some data concerning the presence of fungi in the mouth and throat of healthy children are quite different, from a few (Pietrzak-Bilińska 1998) up to several dozen percent of the examined (Dmochowska and Buluk 1971). Significant discrepancies appear when *Candida albicans* is concerned – the species which dominates in most analysed children populations (Wawrzkiewicz 1972; Majewski 1973; Kowalczyk 1975).

The composition of ontocoenosis mycoflora of the mouth, throat and nose of a healthy child depends on individual features: age, topography, way of nutrition and breathing, functioning of an immunological system.

According to Majewski (1973) "normal" flora of a mouth changes at the age of 5 years. Above 5 years of age it becomes stabilized and is the same as in adults. The author thinks that bacteria and fungi remain in a state of a continuous dynamic equilibrium, its disturbance means illness. These remarks are in accordance with own observations. The species composition of fungi in the examined children is very similar to adults, but a little poorer (Dynowska 1990). The species of *Candida* are considered to dominate.

Larger differentiation of fungi was observed in spring than in autumn. The number of positive results was similar – twice more were in May than in November (Table 1). It may have been caused by a spring immunity decrease in children, hypovitaminosis after the winter period and increased susceptibility to infections, cured with antibiotics. Antibiotics are can favour homing and development of fungi in different ontocoenoses.

Early detection of fungi at the early age and their monitoring may enable to follow the trends of changes in the composition of the examined mycoflora

and the estimation of a degree of fungi development. That it the condition for prophylaxis and therapy. Fungi isolated from oral mucosa may testify to different chronic illnesses of respiratory (Kurnatowska 1995; Baran 1998), digestive, nervous system or hormonal disturbances (Żabińska, Kurnatowska and Jędrzejewska 1974). Intensive development of fungi in the oral cavity may lead to chronic inflammation of mucosa and their permanent damage (Kobayashi et al. 1980).

The analysis of mycoflora connected with different ontocoenoses of healthy children seem to be very important because of the constant increase of the interest in pathogenicity of different systematic of fungi groups and continuous extension of the list of species being pathogenic (Dynowska 1993a, b; 1995). Further research may show individuals or groups of children being predisposed to fungal infections. Also the observations suggest symbiotic connections between some species of fungi (Table 2). The phenomenon needs a special investigation in the future.

REFERENCES

Alkiewicz J., Nowak T. 1992. Inhalacje z *Allium sativum* w zapobieganiu i leczeniu drożdżyc u dzieci intensywnie leczonych z powodu rozrostowych chorób krwi. Przeg. Pediat. 1: 46–53.

Baran E. 1998. Zarys mikologii lekarskiej. VOLUMED, Wrocław.

Barnett J. A., Payne R., Yarrow D. 1990. Yeasts: Characteristic and identification. Cambridge Univ. Press.

Białasiewicz D., Kurnatowska A., Śmiech-Słomkowska G. 1993. Charakterystyka grzybów i próba ich wyeliminowania z jamy ustnej dzieci leczonych aparatami ortodontycznymi. Medyc. Dośw. i Mikrobiol. 3: 389–392.

Bogusławska-Jaworska J., Gołębiowski W. 1992. Zakażenia grzybicze u dzieci chorych na nowotwory. Przeg. Pediat. 1: 32–41.

Bogusławska-Jaworska J., Balcar-Boroń A., Celińska W., Kowalczyk J., Makowska K., Moryl-Bujakowska A., Nowaczyk-Michalak A., Rokicka-Milewska R., Sońta-Jakimczyk D. 1992. Ocena preparatu grzybiczego „Pimafucin – krople" w leczeniu kandidiazy jamy ustnej i gardła u dzieci poddanych intensywnej chemioterapii nowotworów złośliwych krwii. Przeg. Pediat. 1: 42–45.

Brózik H., Brzezińska H., Konopka T., Miller T., Rózga A. 1980. Wpływ przewlekłej profilaktyki penicylinowej na występowanie grzybów u dzieci. Reumatologia 18 (5): 4–14.

Dmochowska H., Buluk H. 1971. Występowanie drożdżaków z rodzaju *Candida* w jamie ustnej u dzieci szkolnych miast i wsi. Czas. Stomat. 24: 859–864.

Dynowska M. 1990. Występowanie grzybów z rodzaju *Candida* w układzie oddechowym mieszkańców województwa olsztyńskiego. Acta Mycol. 26 (1): 99–107.

Dynowska M. 1993a. Observations concerning appearance of yeast in human's respiratory system. Ibid. 28 (2): 147–150.

Dynowska M. 1993b. Changes in mycoflora of mens respiratory system-observed during last some years-yeasts. Ibid. 28 (2): 151–155.

Dynowska M. 1995. Drożdże i grzyby drożdżopodobne jako czynniki patogenne oraz bioindykatory ekosystemów wodnych. Rozpr. hab. Studia i Materiały WSP-77. Olsztyn: 1–83.

Kałowski M. 1964. Występowanie drożdżaków w jamie ustnej człowieka. Czas. Stomat. 17: 427–432.

Kobayashi R. H., Rosenblatt M. H., Carney J. M., Byrne W. J., Ament M. E., Mendoza G. R., Dudley J. P., Stiehm E. R. 1980. *Candida esophagitis* and *laryngitis* in chronic mucocutaneous candidiasis. Pediatrics 66 (3): 380–384.

Kowalczyk J. 1975. *Candidiasis* u dzieci. Przeg. Pediat. 5 (3): 291–297.

Kurnatowska A. 1995. Wybrane zagadnienia mikologii medycznej. Promedi, Łódź.

Kurnatowska A., Żabińska O., Wara-Wąsowska K. 1969. Gatunki grzybów występujące w biocenozie jamy ustnej człowieka. Czas. Stomat. 22: 1141–1145.

Lodder J., Kreger-van Rij N. W. 1967. The yeasts a taxonomical study. North Holl. Publ. Comp., Amsterdam.

Majewski S. 1973. Biocenoza jamy ustnej – zagadnienia wybrane. Normalna flora bakteryjna i grzybicza jamy ustnej. Czas. Stomat. 26: 1369–1375.

Małecka-Panas E. 1994. Próba oceny zbieżności wieloogniskowych inwazji grzybami z przebiegiem klinicznym choroby wrzodowej i cukrzycy u dzieci. Przeg. Pediat. 2: 191–198.

Milewska-Bobula B. 1993. Przebieg kliniczny i wyniki leczenia zakażeń *Candida albicans* u noworodków i najmłodszych niemowląt. Pediat. Pol. 68 (6): 17–21.

Pietrzak-Bilińska B. 1998. Grzybice jamy ustnej u dzieci leczonych ortodontycznie. Czas. Stomat. 51: 125–132.

Sysa-Jędrzejowska A., Woźniacka A., Dziankowska-Bartkowiak B., Kwaśniewska J., Loga G., Łaski E. 1997. Yeast-like fungus infection in patients treated with low doses of immunosupressive drugs. Med. Sci. Monit. 3 (3): 369–372.

Śmiech-Słomkowska G., Białasiewicz D., Kurnatowska A. 1996. Zakażenia grzybami jamy ustnej u dzieci leczonych ortodontycznie. Czas. Stomat. 49: 189–193.

Wawrzkiewicz K. 1972. *Candida albicans* u dzieci leczonych w szpitalu i u dzieci zdrowych. Pol. Tyg. Lek. 27: 593–595.

Zaremba M., Nowacki M. 1990. Zarażenia grzybicze u ludzi. In: Z. Kowszyk-Gindifer, W. Sobiczewski. Antybiotyki. Warszawa: 49–58.

Żabińska O., Kurnatowska A., Jędrzejewska T. 1974. Zmiany zanikowe błony śluzowej a występowanie grzybów w jamie ustnej. Czas. Stomat. 27: 487–491.

Żurowski M., Szponar-Żurowska A., Jarzębowska M., Masiota J., Palicka M., Szukalska D., Snieć M. 1994. Występowanie grzybów drożdżopodobnych z rodzaju *Candida* w jamie ustnej u młodzieży licealnej. Czas. Stomat. 47: 259–262.

Grzyby wyizolowane z jamy ustnej, nosa i gardła dzieci zdrowych

Streszczenie

Praca obejmuje analizę grzybów występujących w jamie ustnej, nosie i gardle 70 dzieci zdrowych, w wieku 0–15 lat. Grzyby stwierdzono u 27 dzieci (45 izolatów) – 39% badanych. Najczęściej izolowano je z jamy ustnej, rzadziej z gardła. W nosie występowały sporadycznie. Dominowały grzyby drożdżopodobne, głównie *Candida albicans* (28 izolatów) i *Candida guilliermondii* (7 izolatów).