POTENTIALLY PATHOGENIC YEASTS FROM SOIL OF CHILDREN’S RECREATIONAL AREAS IN THE CITY OF ŁÓDŻ (POLAND)

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Abstract

Objectives: Yeasts may become potential human and animal pathogens, particularly for individuals with a depressed immune system. Their presence in the environment, especially in soil, may favour their spread into human ontocenoses.

Materials and Methods: Eighty-four soil samples obtained from 21 children’s recreational sites in Łódź in autumn 2010 and spring 2011 were evaluated. The yeasts were isolated by classical microbiological methods and identified on the basis of morphological and biochemical features.

Results: The fungi were found in 73.8% and in 69.0% of the examined samples collected in autumn and spring, respectively. Among 97 isolates of yeasts, the species potentially pathogenic to humans and animals were Candida colliculosa, C. guilliermondii, C. humicola, C. inconspicua, C. lamia, C. lusitaniae, C. pelliculosa, C. tropicalis, Cryptococcus albidos, C. laurentii, C. neoformans, C. terreus, Kloeckera japonica, Geotrichum candidum, G. penicillatum, Rhodotorula mucilaginosa, R. glutinis, Saccharomyces cerevisiae, Sporobolomyces salmonicolor and Trichosporon cutaneum. The most frequently isolated fungi included the genus Cryptococcus (38 isolates) and two species: Rhodotorula glutinis (15), Trichosporon cutaneum (14). C. neoformans, an etiological factor of cryptococcal meningitis, was present in the sandpits of 3 kindergartens. The Candida species were identified from park playgrounds and school sports fields mainly in autumn 2010 (14 isolates), in spring 2011 – only 1 isolate. The concentration of fungal species in particular samples varied considerably, but in the majority of samples, fungi were present at concentration of up to 1×10^2 CFU/1 g of soil.

Conclusions: Yeasts were present in the soil of parks, schools and kindergarten recreational areas; the fact may pose a health risk to humans, especially to children, and this type of biological pollution should be regarded as a potential public health concern.

Key words:
Pathogenic fungi, Yeasts, Soil, Children’s recreational areas

INTRODUCTION

Soil, being a very heterogeneous habitat, contains a great diversity of microorganisms. The fungi found in the soil play an important role in the ecosystem by forming and maintaining soil structure [1]. Yeasts classified as Ascomycota or Basidiomycota may be still present in soil or may be introduced into it from the organisms living inside or over the soil. The species composition of different soil-localities is highly heterogeneous and the quantities of fungi range from hundreds to millions of cells per gram of soil. Up to 130 species of yeast fungi have been found in soils worldwide [2,3]. The diversity patterns and abundance of yeast fungi depend on abiotic and biotic factors present in the soil, such as organic and inorganic chemical compounds and moisture, as well as other organisms living above and in the soil. Nevertheless, the relationship

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between fungi development and the presence and concentration of the various environmental factors quoted above still requires investigation [2,4–6].

Fungi may become potential human and animal pathogens, especially for immunocompromised individuals. Their presence in soil may favour their spread into human ontocenosis; however, transmission of the pathogens from soil to the human organism has not been directly demonstrated. Populations of children, common users of sandpits, school sports fields and park playgrounds, are particularly at risk of being infected. In the available literature, a paucity of information exists regarding soil yeasts from recreational areas intensely used by humans, especially children [7,8]. The aim of the present study was to evaluate the quantitative and qualitative profiles of yeast fungi in the soil of recreational areas for children in selected districts of Łódź, Poland.

MATERIALS AND METHODS

Study area

Łódź is the third-largest city in Poland, located in the central part of the country, with about 737,100 inhabitants (in 2010). Poland belongs to the temperate climatic zone with four distinct seasons. Łódź (51°77'N, 19°46'E) is characterized by a mean annual air temperature and relative air humidity of 7.5°C and 80%, respectively. The surveys were carried out in selected locations of the city, in two seasons: October–November 2010 and April–May 2011. The soil and sand samples were collected from 21 localities in 2 districts of Łódź (Widzew and Śródmieście): 7 children’s playgrounds from public parks or recreational places open for general use, 6 sandpits situated in school or kindergarten areas and 8 sites around various school sports fields. The playgrounds were situated both in large (Poniatowski and Piłsudski) parks, over 40 ha each, and smaller public recreational areas (Sienkiewicz and Staromiejski, Stawy Jana and Arturówka parks), covering an area of 5–40 ha each. All parks were unfenced, with free access. All examined children’s playgrounds were located close to developed (built-up) areas, such as housing estates, residential districts and family houses. Four of the seven playgrounds were not protected from the approach of domestic and stray animals, but the remaining three were enclosed by low fences not exceeding 1 m in height with a 1 m-wide gate. All examined sandpits were situated within school or kindergarten areas which were securely fenced; there was no access for either domestic or stray animals. Five of the nine examined school sports fields were partially fenced, usually by only one fence located at the side facing the street; while the remaining four fields were unfenced. According to our observations, domestic dogs had ample access to all examined sports field areas, as those sites were favoured by dog walkers. Of note, also birds, especially pigeons, were also present on all examined sites.

Collection of soil samples

A total of 84 samples were collected during autumn 2010 (October–November) and spring 2011 (April–May) from the same 21 localities. All of the thirty-two soil samples taken from areas around school sports fields were obtained from a 10 m² territory at 9 various points (9 subsamples), while for the sandpits and playgrounds, each of the 52 sand samples were collected from an area of about 5 m² at 6 various points (6 subsamples). The subsamples were combined into one composite sample of about 300 g. Samples of soil or sand were collected both from the 0–3 cm superficial layer at the surface and at a depth of about 15 cm from each examined site. Each soil and sand sample was placed separately into a sterile plastic bag, labelled by number and description and stored at 4°C.

Isolation and identification of the fungi

From each soil or sand sample, two subsamples of 1 g and 0.5 g were suspended, each in 10 cm³ of sterile water,