

Mycoflora of human external auditory canal in Shiraz, southern Iran

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Abstract

Background: Otomycosis is a superficial mycotic infection of the outer ear canal caused by many saprophytic fungi that could be considered as causative agents. Detection of the fungal agents in the external auditory canal could be valuable to determine the potential risk of otomycosis. The aim of this study was to identify the mycoflora of the human auditory canal in healthy individuals in Shiraz, southern Iran.

Methods: During three months, a total of 486 ear samples of 243 healthy individuals (100 females and 143 males) were randomly collected by sterile swabs and cultivated on Mycosel and Sabouraud dextrose agar supplemented with antibiotics. Fungal isolates were identified using conventional methods and chromogenic media.

Results: Ten point twenty eight percent of the individuals were positive for ear fungal infections. Fungal species belonged to eight genera including *Penicillium*, *Cladosporium*, *Candida*, *Aspergillus*, *Alternaria*, *Rodotorula*, *Exophiala* and *Dematiaceous* fungi. In this study, *Aspergillus niger*, the major cause of otomycosis, was not isolated.

Conclusion: Our findings suggest that the normal fungal otic infections in the presence of predisposing factors could be a potential cause for otomycosis.

Keywords: Otomycosis; Mycoflora; Auditory canal; *Aspergillus*

Introduction

Otomycosis is a superficial mycotic infection of the outer ear canal. The infection may be either acute or subacute and is characterized by inflammation, pruritis, scaling, feeling of fullness and severe discomfort.¹⁻⁵ Occasionally a fungus is considered as the primary pathogen in otitis externa,¹ and otomycosis accounts for about 10% of otitis external cases.²⁻⁴ Otomycosis occurs world-wide but is more common in tropical and subtropical zones.⁵ The prevalence of the disease is influenced by a number of predisposing factors such as climate (extremely moist and hot environments), chronic bacterial otitis externa, swimming, dermatomycoses, insertion of foreign

subjects and wearing head clothes.^{1,5-9} Nearly 61 fungal species are involved in external otitis,⁶ but the most common fungal agents causing otomycosis are *Aspergillus niger* (80% of case), *Candida albicans* (second most common), *Actinomyces*, *Trichophyton*, *Aspergillus fumigatus* and *Candida tropicalis*.^{1,6,8,10-12} The ear is constantly exposed to biotic elements of the biosphere and is thus accessible to various micro-organisms including fungi. Therefore, identification of fungal agents in the external auditory canal can be valuable for determining the potential risk for otomycosis. Most of previous investigations aimed at determining the bacterial normal flora of the external auditory canal. There is a lack of information about specific fungal normal residents of external auditory canal and also on the correlation between normal otic mycoflora and major pathogens for otomycosis. The objectives of this study were to identify the mycoflora of the healthy human ear canal, and to show the correlation between normal otic mycoflora and true pathogens for otomycosis.

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Materials and Methods

During three months (Spring 2005), a total of 486 samples of external auditory canal of 243 healthy individuals (100 females and 143 males) were randomly collected using sterile swabs. Healthy individuals were randomly selected after clinical examination for itching, otalgia, hearing impairment and tinnitus. For each case, a specific questionnaire was prepared containing personal information, history of otalgia, history of residual water in the ear canal after bathing or swimming and a mycological report. The study was carried out at the School of Medicine in Shiraz University of Medical Sciences. The samples from each ear canal were cultivated on Mycosel and Sabouraud dextrose agar supplemented with penicillin (200000 IU/L) and streptomycin (300 mg/L). The cultures were incubated at 25°C for 10 days. After the incubation period, mycological examination of the fungal isolates was conducted based on the colony morphology, microscopic characterization of conidiogenous structure, chromogenic method, Germ Tube and Chlamidoconidia tests using CHROMagar *Candida* media (Rambach, France). The investigation was undertaken in safety conditions to minimize contamination with airborne micro-organisms. The Statistical Package for Social Sciences (11.5 software SPSS Inc, Chicago, IL) was used for statistical analysis and a p value of less than 0.05 was considered significant.

Results

Ten point twenty eight percent of the participants were positive for ear fungal residents. The mean age of 243 individuals participating in the study was 30.97±11.62. The isolated fungal species from ear canal comprised eight genera including *Penicillium* (8 cases, 32%), *Cladosporium* (5 cases, 20%), *Candida* (3 cases, 12%), *Aspergillus* (2 cases, 8%), *Alternaria* (2 cases, 8%), Dematiaceous fungi (2 cases, 8%), *Rodotorula* (2 cases, 8%) and *Exophiala* (one case, 4%) as shown in Table 1. Sixty percent of cases with positive fungal specimen were males (Table 2) and 27.52% had the history of otalgia. 33.74% of the individuals had a history of water remained in their external auditory canal after bathing or swimming and 10.97% of this group were positive for fungal resident agents.

Table 1: Fungi species isolated from the outer ear canal

Species	Number	Percent
Penicillium	8	32%
Cladosporium	5	20%
Alternaria	2	8%
Aspergillus flavus	2	8%
Dematiaceous	2	8%
Rodotorula	2	8%
Exophiala	1	4%
Candida albicans	1	4%
Candida tropicalis	1	4%
Candida parapsilosis	1	4%
Total	25	100%

Table 2: Rate of positive specimen by gender

Culture	Sex	Male	Female	Total
Positive		15	10	25
Negative		127	91	218
Total		142	101	243

Discussion

Although a wide spectrum of fungal agents can cause otomycosis, the more prominent ones are limited.^{6,8,10-12} Distribution of fungal agents isolated from the ear canal of healthy individuals in this study did not support the results of other studies which differentiated normal otic residents from true pathogens.¹³⁻¹⁵ In this study, 20% of the isolates belonged to the genus of *Aspergillus* and *Candida* species but no isolate of *Aspergillus niger* (the most common causal agent for otomycosis) was detected. In conclusion, the results of this study revealed a relative similarity between normal otic residents and true pathogens. In this study, the rate of the recovered fungal isolates from the healthy ear canal was more than that in other investigations.^{13,17} This could be due to the difference in the season of sampling (spring), geographical location and different environmental conditions (climate, sanitary and hygienic amenity and cultural habits). Similar to results of Dibb's study,¹⁶ our fungal isolates were significantly more in males than in females. It might be due to the Iranian tradition in which women wear scarf to cover their hair and ears. This makes a physical barrier for the entrance of fungal and other airborne microorganism to the ear canal. *Candida albicans* is reported as a common agent for otomycosis. It can be found in the

mouth, vagina and gut as a normal flora but not on the skin.¹⁸ On the other hand, the other *Candida* species are skin normal flora which are frequently reported as causative agents of otomycosis but their role in otomycosis is variable, as mentioned in many studies.^{19,20,21} *Penicillium* species have worldwide distribution in the nature and their spores are floating in the air, occasionally causing otomycosis,¹⁸ although not being a common cause of it.^{19,22} Although in our study, *Penicillium sp* was the most dominant isolate (32.5%), our data were not in accordance with those of Ozan et al.²⁰ In this study, many fungi such as *Rodotorula*, *Alternaria*, *Exophiala* and dematiaceous fungi were detected but there are poorly

acknowledged data on their roles in otomycosis. Ozcan et al. noted that wearing scarf, presence of dermatomycoses and swimming are the most predisposing factors in otomycosis.²⁰ Our findings suggested that the normal fungal otic residents probably have a potential risk for causing otomycosis in susceptible individuals.

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