FUNGAL CONTAMINATIONS OF EQUIPMENT IN ANAESTHESIA ROOMS, AHVAZ, IRAN

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ABSTRACT: Bio-aerosols including, fungal spores are usually distributed at indoor and outdoor. Inhalation and/or contact to fungal spores could be cause several severe and fatal nosocomial infections among predisposed patients. Aspergillus, Penicillium, Cladosporium, Alternaria, and different species of yeasts are the main airborne fungi. The aim of present study was to determine fungal contaminations of equipment in anaesthesia rooms in Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran. 94 samples from the different part of laryngoscope blade, facial mask, connections, anaesthesia desks and expiratory valves of anaesthetic machines through swab and spread on the Sabouraud dextrose agar medium. Cultured media were incubated at 25-27°C for 1-2 weeks and all growth fungi were isolated and identified. In all sampled sites the growth of saprophytic fungi was observed with exception of anaesthetic drug. The most common contaminant was Cladosporium species that isolated from 46% samples. Indoor air quality in equipment in anaesthesia rooms could be an important factor for infections. The results showed that the fungal contaminations of some instruments in critical rooms in hospital should be considered as a risk factor for patients and other workers.

Keywords: Anaesthesia Room, Anaesthesia Instrument, Fungal Contamination.

INTRODUCTION

Saprophytic fungal spores are usually distributed at atmosphere and indoor and outdoor areas contaminated to such spores during day and night. One of the most important indoor area is hospital environment that contaminated with a variety of pathogenic and nonpathogenic microorganisms (1). Therefore, spores of fungi can persist on surfaces for prolonged and transferred to human body and cause many disorders in predisposed individuals, such as allergic disease, respiratory and systemic infections (2). In addition, contact to contaminated equipment could be one of the infection sources.

The airborne fungal spores (bio-aerosols) are formed mainly by filamentous fungi, especially; Aspergillus, Penicillium, Cladosporium, Alternaria, Paecilomyces, Scopulariopsis and different species of yeasts including; Candida, Rhodotorula, Cryptococcus, Trichosporon and Geotrichum (3-6). Araujo et al. have believed that Penicillium species can be used as a general indicator of indoor airborne fungal levels at hospital environment (7). Indoor moisture, ventilation, temperature, and suitable nutrients availability are affect the presence of fungal contaminates and fungal spores load (3). Although, the presence of fungal spores in outdoor is unavoidable and less important for human, such contaminates have an important role in several severe and fatal nosocomial infections among hospitalized patients especially in critical wards (6).
Invasive fungal infections due to filamentous or yeast fungi are the major fungal infections complication among predisposed patients. Immunodeficiency, patients undergoing high-dose chemotherapy, patients with haematological malignancies, solid organ transplant recipients, long stay in intensive care units (ICUs) and neonatal intensive care units (NICUs) are usually associated to invasive fungal infections (8-10). Although the species of Aspergillus, Fusarium, Scedosporium and Mucorales are the main responsible fungi for invasive infections, any filamentous fungi have potential for producing infections. The aim of present study was to determine fungal contaminations of equipment in anaesthesia rooms, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.

MATERIALS AND METHODS
In the present study 95 samples were taken from the different parts of several instrument and anaesthesia drugs in the several anaesthesia rooms in Imam Khomeini hospital, Ahvaz Jundishapur University of Medical Sciences, Iran. All samples were collected using by moisturized sterile swabs from the different part of laryngoscope blades (n=18), facial masks (n=19), connections (n=17), anaesthesia desks (n=18) and expiratory valves of anaesthetic machines (n=17). In addition six swabs were also collected from anaesthetic drugs (Sodium thiopental). Swabs were cultured on Sabouraud’s dextrose agar, SDA, (Merck, Germany) and incubated at 25-27°C for 1-2 weeks, aerobically. Plates were examined daily and all growth fungal colonies were isolated and subcultured on fresh SDA slant. Filamentous fungi were identified based on colony morphology on SDA and microscopic morphology of slide cultures. Yeasts were also identified according to coloration colonies on CHROMagar Candida (CHROMagar Candida®, France), germ tube test and morphology on Cornmeal agar (Difco, USA).

RESULTS
In the present study, out of 95 cultured samples 41(43.2%) instrument were yielded several saprophytic fungi. Our results shows that the most common contamination samples were taken from anaesthesia desks (14 of 18, 77.8%) followed by, expiratory valves of anaesthetic machines (9 of 17, 52.9%), facial masks (7 of 19, 36.8%), connections (6 of 17, 35.3%) and laryngoscope blades (5 of 18, 27.8%). In this work no contamination was observed on anesthesia drugs that stored in refrigerator. The most common contaminant was Cladosporium species that isolated from 23(46%) samples. Other fungi were Alternaria species 8(16%), Penicillium species 5(10%), A. niger 4(8%), A. flavus 3(6%), Aspergillus species 2(4%), Derecselera species 2(4%), Acremonium species 1(2%), C. albicans 1(2%) and C. glabrata 1(2%) (Table 1).

In our study both yeasts (C. albicans and C. glabrata) were only isolated from expiratory valves of anaesthetic machine. Poly microbial cultures were recovered from 9(22%) of samples. Our study shows that dematiaceous fungi including, Cladosporium and Alternaria species were as the most common recovered fungi 33(66%) followed by hyaline fungi 15(30%) and Candida species 2(4%). On the other hand, out of 15 hyaline fungi, the several species of Aspergillus were accounted for 60% of isolates.

Table 1: Contamination rates and contaminants of the instrument in anaesthesia rooms

<table>
<thead>
<tr>
<th>Fungal species</th>
<th>Laryngoscope blade</th>
<th>Facial mask</th>
<th>Connection</th>
<th>Anaesthesia desk</th>
<th>Expiratory valves of anaesthetic machine</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspergillus flavus</td>
<td>0(0.0%)</td>
<td>2(4.9%)</td>
<td>0(0.0%)</td>
<td>1(2.4%)</td>
<td>0(0.0%)</td>
<td>3(7.3%)</td>
</tr>
<tr>
<td>A. niger</td>
<td>0(0.0%)</td>
<td>0(0.0%)</td>
<td>0(0.0%)</td>
<td>2(4.9%)</td>
<td>0(0.0%)</td>
<td>2(4.9%)</td>
</tr>
<tr>
<td>Aspergillus</td>
<td>0(0.0%)</td>
<td>1(2.4%)</td>
<td>0(0.0%)</td>
<td>0(0.0%)</td>
<td>1(2.4%)</td>
<td>2(4.9%)</td>
</tr>
<tr>
<td>Penicillium</td>
<td>0(0.0%)</td>
<td>1(2.4%)</td>
<td>0(0.0%)</td>
<td>1(2.4%)</td>
<td>1(2.4%)</td>
<td>3(7.3%)</td>
</tr>
<tr>
<td>Derecselera</td>
<td>0(0.0%)</td>
<td>1(2.4%)</td>
<td>0(0.0%)</td>
<td>0(0.0%)</td>
<td>0(0.0%)</td>
<td>1(2.4%)</td>
</tr>
<tr>
<td>Alternaria</td>
<td>0(0.0%)</td>
<td>0(0.0%)</td>
<td>1(2.4%)</td>
<td>2(4.9%)</td>
<td>1(2.4%)</td>
<td>4(9.8%)</td>
</tr>
<tr>
<td>Cladosporium</td>
<td>3(7.3%)</td>
<td>0(0.0%)</td>
<td>4(9.8%)</td>
<td>5(12.2%)</td>
<td>3(7.3%)</td>
<td>15(37%)</td>
</tr>
<tr>
<td>Cladosporium + A. niger</td>
<td>1(2.4%)</td>
<td>0(0.0%)</td>
<td>0(0.0%)</td>
<td>0(0.0%)</td>
<td>0(0.0%)</td>
<td>1(2.4%)</td>
</tr>
<tr>
<td>Cladosporium + Alternaria</td>
<td>1(2.4%)</td>
<td>2(4.9%)</td>
<td>1(2.4%)</td>
<td>0(0.0%)</td>
<td>0(0.0%)</td>
<td>4(9.8%)</td>
</tr>
</tbody>
</table>
DISCUSSION
All atmospheric areas (indoor or outdoor) contains several fungal spores that their concentrations differs according to geographical and climatic conditions and outdoor air fungal spores often are the main sources of indoor contaminant (4, 5, 11). The presence of fungal spore on air and the surfaces of materials may be a source of infection for human. Pathogenic or opportunist fungal spores in hospital environments particularly in critical rooms (ICUs, NICUs, and operating rooms) increased the risk of nosocomial infections due to possible inhalation of spores (12). In addition, exposure to contaminated instrument during surgical procedures could be a potentially source of infection.

In a study by Caggiano et al. the most common filamentous fungi from air and surface culture specimens in hospital environment was Aspergillus species (91.8%), followed by Penicillium species, (6%) and Paecilomyces species (1.5%) (12). The dominant airborne fungal species were Penicillium, Cladosporium, yeast, Aspergillus and Alternaria species in Chadeganipour et al. report in Isfahan (11). The frequency of fungal spores in different hospital environments was 13.1% in Caggiano et al. report (12). Our study shows that 43.2% of instrument in anaesthesia rooms contaminated to the different fungal spores. Although all instruments in anaesthesia rooms contain several fungal spores, the load fungal spores on the surfaces of anesthesia desks was more common (77.8%) than others sites.

The level of contamination with fungal spores in the inspiratory and expiratory branches of tracheas reached up to 39.3% containing, Candida, Dermatophytus, Penicillium and Aspergillus species in Arai et al. report (13). In addition they found that 25% of the canisters contaminated with Candida, Penicillium, Dermatophytus, Aspergillus, and Fusarium species, whereas Candida and Dermatophytus species were recovered from 36% of the collector jar. Other studies in Tehran have shown the Penicillium and Aspergillus species and in Mexico Cladosporium species and Microsporum canis are predominant in hospital environments (1, 14). In our study the most common contaminants were dematiaceous fungi including, Cladosporium and Alternaria species (66%). On the other hand hyaline filamentous and Candida species were accounted for 30% and 4%, respectively.

CONCLUSION
Indoor air quality in equipment in anaesthesia rooms could be an important factor for infections. The results showed that the fungal contaminations of some instruments in critical rooms in hospital should be considered as a risk factor for patients and other workers.

ACKNOWLEDGMENTS
We are thankful the department of medical mycology, and anesthesiology affiliated to Ahvaz Jundishapur University of Medical Sciences for supporting project.

REFERENCES


