Incidence of microorganism in different rooms of Science Department

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Abstract

Microbes are found everywhere in our environment even inside a laboratory. Among different contamination in laboratory, the most common biological contaminants are microbial contaminants with bacteria, molds, yeasts, viruses, algae and protozoa. So, contamination during working in laboratory became the biggest problem due to unwanted grown of microorganism which create false positive result. Therefore, this study was carried out from March 2022 to May 2022 with the aim to explore the total microbial count. Plates exposing technique was done for the count of bacteria and fungi from different rooms of science department which were Laboratory (6), class rooms (4) and office room (2). From the settle plate method, bacteria and fungi were isolated and identified. Among bacterial isolates, *Citrobacter* spp., *Bacillus* spp., *S. aureus*., and *E. coli* were identified and among fungal isolates, *Aspergillus* spp., *Penicillum* spp., *Rhizopus* spp. and *Fusarium* spp. were identified. This study concluded that from science department, different bacteria and fungi were isolated in which MDR bacteria were also isolated which is one of a biggest global concern. Therefore, the laboratory and the rooms should be disinfected regularly.

Keywords: Total microbial count, Bacteria, Fungi, Antibiotic susceptibility test

Introduction

Microbes are found everywhere in our environment even inside a laboratory. Among different contamination in laboratory, the most common biological contaminants are microbial contaminants with bacteria, molds, yeasts, viruses, algae and protozoa. So, contamination during working in laboratory became the biggest problem due to unwanted grown of microorganism which create false positive result. Microbial contaminants was caused due to cross contamination by different laboratory practices like handling microorganisms, spilling of cultures, nonsterile media, contamination in reagents, incorrect plugging in pipettes, transfer from inanimate object, direct from hands etc. If air quality of laboratories is contaminated with high load of microorganisms, unwanted microorganisms can enter and grow in culture (Mahmoudabadi, 2007). Among different methods of reducing contaminants in laboratory, 70% alcohol is found to be effective in reducing contamination of Laboratory equipment's than other agents like detergents. (Alothman *et al*., 2009; Parmar, 2004; Nelson, 2006).

One of the common problem in laboratory is microbial contamination through microbial cultures. Unwanted bacterial and fungal cultures from laboratory are reported as high contaminants. It is occurred as improper management in laboratory which resulted incorrect research as well as global health concern. So, many research works were done to find out the laboratory contaminates which challenge in the present time to reduce contaminates in laboratory by following good laboratory practices (Borst *et al*., 2004; Hans *et al*., 2002; Hsuan *et al*., 2003 and Mahmoudabadi, 2007).

Materials and Methods

Research design: This cross sectional study was done for duration of 3 months from March 2022 to May 2022 on laboratory work. The purposive sampling method was used for samples collection.

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Laboratory processing of the sample

Total microbial count from Science Department

From science department, total microbial count was done from classes (4), laboratories (6) and office rooms (2). Nutrient agar (NA) was used for isolation of bacterial counts whereas Potato dextrose agar (PDA) was used for isolation of fungal counts (Muhammad *et al*., 2015). To evaluate the numbers of bacteria and fungi in the indoor environment of Science Department, the settle plate method was used in which each plate was exposed for the duration of 15 minutes then incubated at 37°C for bacteria and 30°C for fungi for 24hrs to 48hrs.

Isolation and identification of bacteria and fungi

Isolates were identified according to standard methods and confirmatory tests was done based on Bergey's Manual (1994). Gram Staining and biochemical tests were done for identification of bacteria. Morphological identification and lactophenol cotton blue staining method were used for identification of fungi.

Antibiotic Susceptibility Tests

Antibiotic susceptibility test for isolated bacteria was done by modified Kirby- Bauer disc diffusion method. Firstly, Mueller-Hinton agar was prepared in Petri dishes. Then, a bacterial suspension (*S. aureus*, *Bacillus* spp., *E. coli*, and *Citrobacter* spp.) in NB was made and adjusted the turbidity of the bacterial culture to match the McFarland standard (0.5). Then, the test bacteria were spread over the MHA plates and different discs of antibiotic were transferred on it. All plates were incubated at 37^0C for 24 hrs. After incubation, all plates were observed and examined the diameter of each zone of inhibition and compared with standardized zone size according to CLSI (2016).

Data analysis

All experimental data were entered in MS excel and analysis was done.

Results

Table 1: Total number of Microorganisms isolated from different rooms of Science Department

S. No	Room	NA (For Bacterial count)	PDA (For fungal count)
1.	Microbiology Laboratory	70	11
2.	Zoology Laboratory	5	10
3.	Botany Laboratory	30	26
4.	Chemistry Laboratory	10	5
5.	Environment Laboratory	Too numerous to count	3
6.	Physic Laboratory	37	8
7.	Common office	300	4
8.	Coordinator office	10	3
10.	Class room-45	Too numerous to count	23
11.	Class room-46	22	4
12.	Class room-47	6	0
13.	Class room-49	8	6

Table 2: Identification of bacteria and fungi from microbiology laboratory

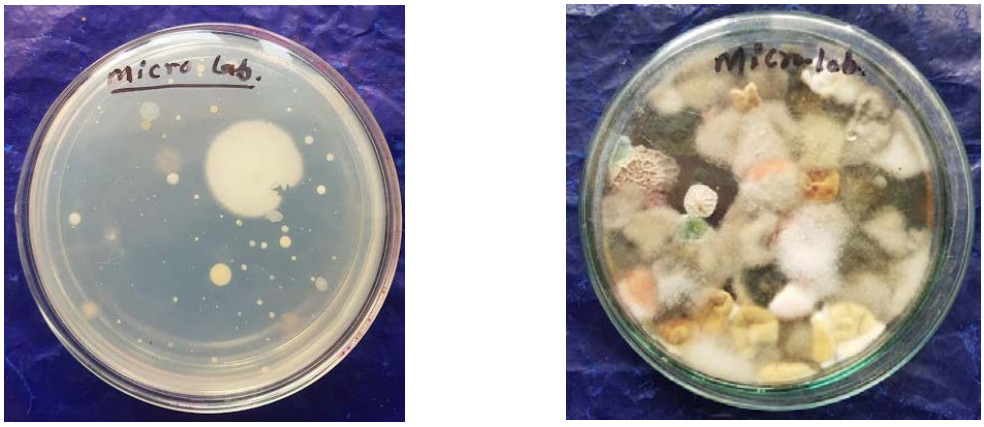
S.no	Bacterial isolates	Fungal isolates
1.	*S. aureus*	*Aspergillus* spp.
2.	*Bacillus* spp.	*Penicillum* spp.
3.	*E. coli*	*Rhizopus* spp.
4.	*Citrobacter spp.*	*Fusarium* spp.

Table 3: Antibiotic susceptibility test of bacteria

Types of Bacterial Isolates	Bacterial Isolates	Antibiotics				
		AZM_{15}	**COT_{25}**	**AMP 10**	**CIP $_5$**	**CFX_{30}**
Gram Positive bacteria	*B. subtilis*	**S**	**S**	**R**	**S**	**R**
	S. aureus	**S**	**S**	**R**	**S**	**R**
		NIT $_{300}$	**NA_{20}**	**AMP 10**	**E_{15}**	**COT_{25}**
Gram Negative bacteria	*E. coli*	**S**	**R**	**R**	**R**	**R**
	Citrobacter spp.	**R**	**S**	**S**	**S**	**R**

R=Resistance, S=Susceptibility

AMP-Ampicilin, AZM-Azithromycin, CIP-Ciprofloxacin, NIT-Nitrofurantoin, NA- Nalidixic acid; COT- Co-trimoxazole, NIT-Nitrofurantoin, E= Erythromycin and CFX-Cefixime.



NA **PDA**

Bacteria isolation (NA) and Fungi isolation (PDA)

Discussion

During air quality analysis, NA and PDA plates were exposed for examining the bacteria and fungi were counted and types of bacteria were also identified. Similar isolates were identified from exposing plates of different places of science department. Higher bacterial number were found in Environment Laboratory (TNTC), class room 45 (TNTC) and common office (TNTC) where as higher number of fungi were found from Botany Laboratory and class room 45. Similar bacteria *S. aureus*, *Bacillus subtilis*, *E. coli*, and *Citrobacter* spp. were identified from different areas of Science department. Among fungal isolates, *Aspergillus* spp., *Penicillum* spp., *Alternaria* spp., *Rhizopus* spp., and *Fusarium* spp. were identified. Similar study was done by Muhammed *et al*., (2015), in which bacterial contaminates were isolated from microbiology laboratory only, in which *S. aureus*, *Bacillus subtilis, as well as S. epidermidis* and *Deptheroids* were identified. However, Nelson *et al.,* (2006) identified coagulase negative *Staphylococci* for the study of Microbial Flora on Operating Room.

Ghayoor, *et al*., (2015) recorded the higher Rate of contamination and found that *S. epidermis* (36.36%) and *B. subtilis* (31.81%) were the common contaminants in Microbiology laboratory.

In antibiotic susceptibility test, the bacterial isolates were found to be resistance to different antibiotics. Among total isolates, both Gram positive bacteria *B. subtilis* and *S. aureus* were resistant to Ampicillin and Cefotoxin whereas Gram negative bacteria *Citrobacter* spp. Was found to be resistance to Nitrofurantoin and Cotrimoxazol. In this study, *E. coli* was found to be sensitive to Nitrofurantoin. All isolated bacteria were found to be MDR bacteria. So, the antibiotic resistance in microbial contamination of laboratory is one of a biggest global concern.

Conclusion

This study concluded that from science department, different bacteria and fungi were isolated. From microbiology laboratory, MDR bacteria were also isolated which are major contaminates. Therefore, the laboratory and the rooms should be disinfected regularly.

Recommendations

This study isolated and identified the bacteria and fungi which showed the air quality of classroom as well as laboratory of science department. So, seasonal survey should be conducted for microbial control as well as for removal of the risk of a cross-contamination. For further study, air quality of whole college should be examined for studying the potential sources of contamination.

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