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LABORATORY SURFACES CAN ACT AS A SOURCE FOR TRANSMISSION OF INFECTION?

Gurjeet Singh*, Raksha, R.K. Mukhia, A.D. Urhekar

Department of Microbiology, Mahatma Gandhi Misson's Medical College and Hospital, Kamothe, Sector-18, Navi Mumbai-410209, Maharashtra, India.

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***Author for Correspondence**
Gurjeet Singh
Department of Microbiology, Mahatma Gandhi Misson's Medical College and Hospital, Kamothe, Sector-18, Navi Mumbai-410209, Maharashtra, India.

ABSTRACT

Background: Laboratory surfaces harbor many microbial pathogens as the patient samples are kept on laboratory surfaces during processing. The aim of the study was to find out bacterial and fungal pathogens on laboratory surfaces of various sections of Microbiology laboratory – Bacteriology, Mycology, Serology, media preparation and discard section. This study will help design methods to help in prevention of laboratory acquired infection among laboratory workers and others who transport the samples from patients to laboratory and also collect the reports. **Material and Methods:** This prospective study was conducted in a microbiology laboratory of Mahatma Gandhi Hospital, Navi Mumbai, India. The period of study was 6 months from November 2013 to April 2014. Samples were collected from - various surfaces of microbiology laboratory with moistened (pre-moistened with sterile peptone water) two cotton swabs. One swab was inoculated onto MacConkey agar, Blood agar, and Chocolate agar media and incubated at 37ºC for 24 to 48 hours and other inoculated on Sabouraud's dextrose agar media and incubated for 1 to 7 days at 25-28°C. **Results:** We isolated and identified various bacteria and fungi from these surfaces. In our study, the distribution of microorganisms on laboratory surfaces were *Bacillus* species 36.36% followed by Coagulase negative *Staphylococcus* 14.29% *Staphylococcus aureus* 12.99%, *Diptheroids* 10.39%, *Micrococcus* 9.09%, *Pseudomonas aeruginosa* and *Klebsiella* species 6.49% each, *Aspergillus* species 2.60% and *Candida* species 1 1.30% were isolated. **Conclusions:** Our study showed that all areas of the laboratory are contaminated with pathogenic / non pathogenic bacteria and fungi. It indicates that these are a potential source of transmission of

infection from the hands of laboratory workers to themselves / others if proper precaution is not taken.

Keywords: Laboratory-acquired infection, bacteria, fungi, disinfectants and health care workers.

INTRODUCTION

Microorganisms are found everywhere and constitute a major part of every ecosystem. In these environments, they live either freely or as parasites. In some cases, they live as transient contaminants in fomites or hands where they constitute major health hazards and sources of community and hospital-acquired infections. The increasing incidence of epidemic outbreaks of certain diseases and its rate of spread from one community to the other has become a major public health concern. One of the most implicated probable sources of infections are door handles of laboratories and washrooms. [1]

Nosocomial infection is a major challenge to the health care system and results in significant mortality, morbidity, and economic burden to the patients [2]. These infections may result in substantial higher health care costs to government agencies [3]. Intensive care unit (ICU) patients are at great risk of acquiring nosocomial infections because of breaches in host defense as a result of trauma, invasive medical devices, and/or corticosteroid therapy [4-6].

Laboratory associated infections can occur in health care workers due to uncleanness of the laboratory surfaces and the door handles and others which frequently used. The largest survey of infections was reported in 1976 by Pike R.M. and he found that 4079 laboratory-acquired infections were due to involvement of 159 microbial agents. The mortality and morbidity rate due to the laboratory-acquired infection was 173 deaths which were reported by the workers [11-12].

MATERIAL AND METHODS

This prospective study was carried out at Microbiology laboratory, Department of Microbiology, Mahatma Gandhi Misson's Medical College and Hospital, Navi Mumbai, India over a period of six months from November 2013 to April 2014. Samples were collected from the laboratory surfaces by using strict aseptic precaution. Samples were collected using the swab-rinse technique of the American Public Health Association as described by Reynolds KA [7]. Surfaces were swabbed with sterile, cotton tipped applicator

(swab stick) moistened with sterile peptone water. The samples were inoculated on MacConkey agar, Blood agar, and Chocolate agar plates, and spread evenly over their entire surfaces using a sterile bent-glass rod. This was to allow quick recovery of all organisms picked up in the swab. The plates were incubated aerobically for 24 hours at 37^{o}C [8]. Identification and characterization of bacterial isolates was done by standard methods.

RESULTS

Table 1: Shows different area of the laboratory included in study.

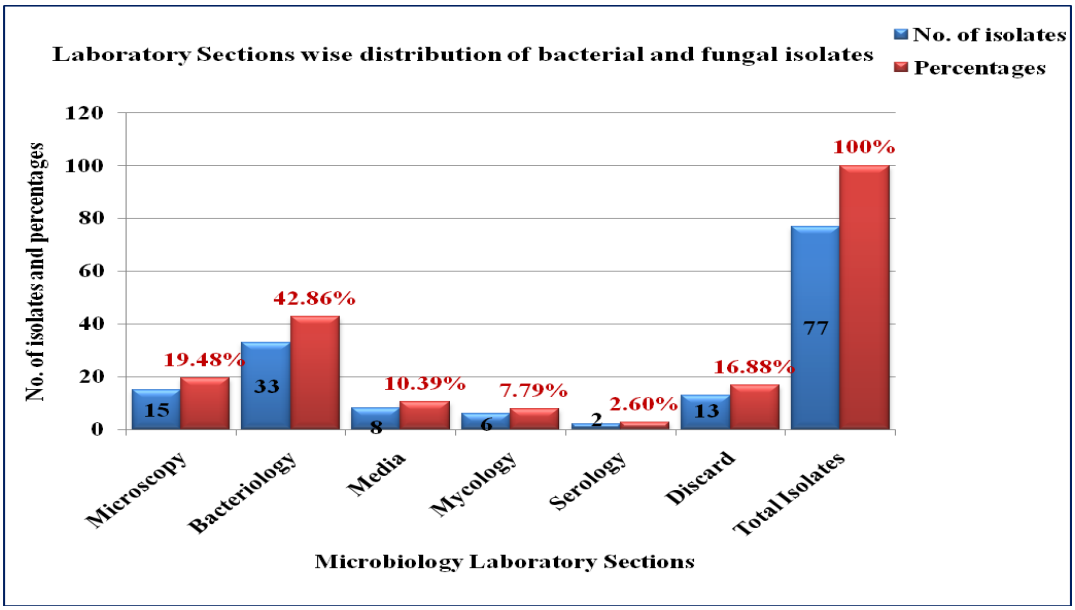
Sr. No.	Surface of lab area	Sample tested	Growth N (%)
1	Microscopy section	7	7 (100)
2	Bacteriology section	8	8 (100)
3	Media preparation section	5	5 (100)
4	Mycology section	3	3 (100)
5	Serology section	3	3 (100)
6	Autoclaving and discard section	4	4 (100)
	Total	30	30 (100)

Table 2: shows bacterial and fungal isolates from laboratory surfaces

Sr. No.	Isolated organisms	Total No. of n=77 (%)
1	*Bacillus* species	28 (36.36)
2	Coagulase negative *Staphylococcus*	11 (14.29)
3	*Staphylococcus aureus*	10 (12.99)
4	*Diptheroids*	8 (10.39)
5	*Micrococcus*	7 (9.09)
6	*Pseudomonas aeruginosa*	5 (6.49)
7	*Klebsiella* species	5 (6.49)
8	*Aspergillus* species	2 (2.60)
9	*Candida* species	1 (1.30)
Total – Bacterial and fungal isolates		77 (100)

Table 4: shows contamination of laboratory surfaces.

Isolates	Sections						Total isolates n=77 (%)
	Microscopy n=15 (%)	Bacteriology n=33 (%)	Media n=8 (%)	Mycology n=6 (%)	Serology n=2 (%)	Discard n=13 (%)	
Bacillus spp.	5 (33.33)	7 (21.21)	4 (50)	3 (50)	1 (50)	8 (61.54)	28 (36.36)
CoNS	2 (13.33)	4 (12.12)	2 (25)	1 (16.67)	1 (50)	1 (7.69)	11 (14.29)
S. aureus	1 (6.67)	6 (18.18)	1 (12.50)	0	0	2 (15.38)	10 (12.99)
Diptheroids	3 (20)	3 (9.09)	1 (12.50)	0	0	1 (7.69)	8 (10.39)
Micrococcus	2 (13.33)	4 (12.12)	0	0	0	1 (7.69)	7 (9.09)
P. aeruginosa	1 (6.67)	4 (12.12)	0	0	0	0	5 (6.49)
Klebsiella spp.	1 (6.67)	4 (12.12)	0	0	0	0	5 (6.49)
Aspergillus spp.	0	0	0	2 (33.33)	0	0	2 (2.60)
Candida spp.	0	1 (3.03)	0	0	0	0	1 (1.30)



DISCUSSION

In our study total 30 samples were collected from different sections of Microbiology laboratory i.e. 1) Microscopy section, 2) Bacteriology section, 3) Media preparation section, 4) Mycology section, 5) Serology section and 6) Discard section. Samples from each section

were 7, 8, 5, 3, 3, 4 respectively. We found that all the sample swabs showed 100% contamination.

In our study the distribution of microorganisms on laboratory areas were Bacillus species 28/77 (36.36%) followed by Coagulase negative *Staphylococcus* 11/77 (14.29%), *Staphylococcus aureus* 10/77 (12.99%), *Diptheroids* 8/77 (10.39%), *Micrococcus* 7 (9.09%), *Pseudomonas aeruginosa* and *Klebsiella* species 5/77 (6.49%) each, *Aspergillus* species 2 (2.60%) and *Candida* species 1 (1.30%). Nworie A. et al. (2012) reported that the isolated bacterial contaminants were *Staphylococcus aureus* (30.1%), *Klebsiella pneumoniae* (25.7%), *Escherichia coli* (15.6%), *Enterobacter* species (11.2%), *Citrobacter* species (7.1%), *Pseudomonas aeruginosa* (5.9%), and *Proteus* species (4.5%). [1]

In our study total bacterial isolates was highest in the bacteriology section (42.46%) followed by microscopy section (19.48%), discard and autoclave section (16.88%), media room (10.39%), mycology section (7.79) and serology section (2.60%). The major bacteria isolated were *Bacillus* spp. (36.36%) followed by Coagulase negative *Staphylococcus* (14.29%), *Staphylococcus aureus* (12.99%), *Diptheroids* (10.39%), *Micrococcus* (9.09%), *Pseudomonas aeruginosa* (6.49%), *Klebsiella* spp. (6.49%). Total fungal isolates was *Aspergillus* spp. (2.60%) and *Candida* spp. (1.30%).

A study by Garcia-Cruz CP (2012) reported that bacterial isolates were highest in emergency area (38.5%), followed by stomatology (23.85%), pediatrics (19.26%) and ICU (17.43%) areas. Isolated bacteria were *Klebsiella* spp. (50.45%) followed by *Pseudomonas* spp. (32.11%), *E. coli* (9.17%) and *Enterobacter* spp. (8.25%). Fungal isolates were *Cladosporium* spp. (29.92%), *Microsporum* spp. (25.19%), *Aspergillus* spp. (17.32%), *Penicillium* spp. (13.38%) and *Candida* spp. (14.1%) [13]. Another study by Nworie A. et al. (2012) reported that bacterial isolates were highest in female toilet handles/knobs (41.7%) and bathroom door handles/knobs (11.5%) than males. Isolated bacteria were *Staphylococcus aureus* (30.1%), followed by *Klebsiella pneumoniae* (25.7%), *Escherichia coli* (15.6%), *Enterobacter* species (11.2%), *Citrobacter* species (7.1%), and *Pseudomonas aeruginosa* (5.9%) and *Proteus* species (4.5%) [1].

CONCLUSION

Our study concluded that laboratory area is a source for transmission of bacterial and fungal pathogens to laboratory staff, health care workers and patents who come to give the samples

and collect the reports. It leads to laboratory associated infections (LAI). The infection can be prevented by regular cleaning of laboratory surfaces with disinfectants and fumigation at weekends.

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