



STATUS OF AIRBORNE BACTERIAL DISPERSAL IN AND AROUND OLD BUS STAND, THANJAVUR, TAMIL NADU, INDIA

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ABSTRACT

Microbial diversity near old bus stand of Thanjavur was studied in the present investigation. The bacterial species isolated from the air sampling are *Staphylococcus* sp. *Klebsiella pneumoniae*, *Escherchia coli* and *Pseudomonas* sp. Their biochemical profile was studied and their antimicrobial resistance were also studied. *Staphylococcus* sp. and *Escherchia coli*, had shown highest level of zone of inhibition (19mm) against Tetracycline as well as Norfloxacin, Co-Trimoxazole. Thus the present investigation, put forth a initiation or alert to the public and recommend the need of higher level of hygienic usage of the public rest rooms of Old bus stand, thanjavur.

Keywords: Norfloxacin, *Escherchia coli*, *Staphylococcus* sp.

INTRODUCTION

The analysis of microbial diversity of indoor environments, is important because of its potential impact on human health. It is estimated that humans in industrialized countries spend as much as 90% of their lives indoors [1, 2]. Indeed, for billions of humans, the “great indoors” comprises the new human ecosystem. BEs contain an enormous variety of potential microhabitats for microorganisms and are continually colonized by human and outdoor-associated microbiota [3-5]. Understanding the ecological dynamics of the microbiota in BEs may help us develop strategies to define and promote an indoor microbiome that minimizes disease risk. While it has long been known that viable bacteria can be cultured from virtually any surface in an indoor ecosystem, we know relatively little about the true diversity and viability of the indoor microbiome. In the past, studies of microbial diversity relied mainly on culture-based techniques [6]. However, the application of culture-independent sequencing techniques to the study of BE microbiology has already greatly expanded our understanding of the origin and diversity of BE microbes [2].

Restrooms, a essential need for the people of any country, are a shared public space with clear disease transmission potential [3]. However, the potential for

disease transmission from a surface fomite relies on the accumulation and continued viability of pathogenic taxa.

This spatial study revealed the dominance of human-associated microbes on restroom surfaces. In addition to that, their tolerance level and people resistance level are of different parameters taken into consideration to assess the disease dispersal. Hence the present study indeed aim to study the airborne microbes around Old bus stand, Thanjavur, Tamil Nadu, India.

MATERIALS AND METHODS

Study Area

The study was carried out in Old Bus stand, Thanjavur District during 2014 - 2015.

ISOLATION OF MICROORGANISMS

Air sampling and microbiological examination

The microbiological samples were collected from New Bus stand, ThanjavurDt, and Old Bus stand, Thanjavur Dt. by exposing the prepared petridishes containing NA, LB, KB and Potato dextrose agar (PDA) for the period of 15 minutes. Upon exposure, the plates were transported to the laboratory for examination. The bacterial culture plates were incubated at 37°C for 24 hrs

while the fungal culture plates were incubated at 27°C temperature for 48-72 hrs.

The total number of colony forming units (cfu) was enumerated and converted to organisms per cubic meter air. Bacterial colonies were initially characterized by morphology and microscopic examination and identified further by biochemical tests. The fungal colonies were identified the test were based mainly on gross colonial appearance, microscopic examination of the spore and hyphal characteristics of lactophenol cotton blue preparations.

IDENTIFICATION OF BACTERIA

The bacteria was identified by using gram staining and biochemical analysis by using the method followed by Bailey and Scott (1966).

Antimicrobial Activity

The antibiotic sensitivity of isolated bacterial species to the commercial antibiotic tests was analyzed by disc diffusion method. Antimicrobial activity test was carried out following the modification of the method originally described by Bauer [7].

Statistical Analysis

The results obtained in the present investigation were subject to statistical analysis like Mean (\bar{x}) and Standard Deviation (SD) by Zar [8].

RESULTS

The present study investigated the airborne microbial diversity around public rest rooms (toilet) near Old bus stand, Thanjavur District, Tamilnadu, India. The study site was exposed with different nutrient medium such as Nutrient Agar (NA), Luria Bertani Agar (LB), King's-B medium (KB) and Potato Dextrose Agar (PDA) for 15 minutes and the bacterial and fungal colonies assemblages were identified after 24 and 72 hr incubation respectively. Table 1 reveals that the average number of colonies obtained on the different nutrient media, in which PDA represented higher colony number (5.33 ± 0.53) while LB revealed lowest record with 4.93 ± 0.59 and NA and KB have around 5 number of colonies. The isolated colonies were identified as *Escherchia coli*, *Streptococcus* sp. *Klepsiellapneumoniae* and *Pseudomonas* sp. and their morphological characters of the isolated bacteria were presented in table 2. The biochemical characterization of these bacterial species were depicted in table 3. Those of the isolated bacteria species were subjected to different antibiotic disc and identified their level of antibacterial resistance. Table 4 reveals that, there is gram positive and gram negative bacteria, such as *Staphylococcus* sp. and *Escherchia coli*, had shown highest level of zone of inhibition (19mm) against Tetracycline as well as Norfloxacin, Co-Trimoxazole and Ampicillin while *Pseudomonas* sp. and *Klepsiella pnuemoniae* reveal only 18mm zone of inhibition as maximum against Norfloxacin, Tetracyclin and Cefotaxime.

Table 1. Number of Colonies of bacteria and fungi observed in different nutrient media after 15 minutes exposure near public rest room of Old Bus stand, Thanjavur District, Tamil Nadu, India.

S.No.	Nutrient Medium	Number of Colonies
1	Nutrient Agar (NA)	5.00±0.90
2	Luria Bertani Agar (LB)	4.93±0.59
3	King's B (KB)	5.03±0.89
4	Potato Dextrose Agar (PDA)	5.33±0.53

Table 2. Name and Morphological characters of bacteria isolated from public rest room of New Bus stand, Thanjavur District, Tamil Nadu, India.

S. No	Morphological Character	<i>Escherchia Coli</i>	<i>Streptococcus sp.</i>	<i>Staphylococcus sp.</i>	<i>Klepsiella sp.</i>	<i>Pseudomonas sp.</i>
1	Size	Large	Moderate	Moderate	Small	Puctiform
2	Shape	Filamentous	Circular	Irregular	Circular	Rhizoid
3	Pigmentation	Pink	Colorless	Pink	Pink	Colourless
4	Margin	Rhizoid	Entire	Curled	Undualated	Curled
5	Elevation	Pulvinate	Embonate	Convex	Pulvinate	Umbonate
6	Texture	Smooth	Rough	Rough	Smooth	Rough
7	Appearance	Glistening	Dull	Dull	Glistening	Dull
8	Optical Property	Tansluscent	Translucent	Translucent	Translucent	Opague

Table 3. Biochemical characterization of airborne bacterial species isolated from public rest room near Old Bus stand, Thanjavur

S. No.	Morphological and Biochemical Characterization	Isolated Bacterial Colony			
		<i>Staphylococcus sp.</i>	<i>Pseudomonas sp.</i>	<i>Klepsiella pneumoniae</i>	<i>E.coli</i>
1.	Gram staining	‘+’	‘+’	‘-’	‘-’
2.	Shape	Coccus	Coccus	Rod	Rod
3.	Motility Test	‘-’	‘-’	‘-’	‘+’
4.	Indole Test	‘-’	‘-’	‘-’	‘+’
5.	Methyl Red Test	‘-’	‘+’	‘±’	‘+’
6.	VogesProskauer Test	‘+’	‘+’	‘+’	‘-’
7.	Citrate Utilization Test	‘-’	‘±’	‘+’	‘-’
8.	Oxidase Test	‘+’	‘-’	‘-’	‘-’
9.	Triple Sugar Iron Test	‘+’	AG	AG	AG
10.	Catalase Test	‘-’	‘+’	‘+’	‘+’
11.	Carbohydrate fermentation Test				
	Glucose	‘+’	‘+’	‘+’	‘+’
	Lactose	‘+’	‘+’	‘-’	‘+’
12.	Sucrose	‘+’	‘+’	‘+’	‘-’
13.	Ureas Hydrolysis Test	‘-’	‘+’	‘+’	‘-’
14.	Starch Hydrolysis Test	‘-’	‘-’	‘+’	‘-’
15.	Hydrogen Sulfide Production	‘-’	‘-’	‘+’	‘+’

Table 4. Antibacterial resistance of bacteria isolated from public rest rooms at Old Bus stand, Thanjavur against selected antibacterial discs

Antibiotics	Zone of Inhibition			
	Gram Positive	Gram Negative		
	<i>Staphylococcus sp.</i>	<i>Pseudomonas sp..</i>	<i>Klepsiella pneumoniae</i>	<i>Escherchia coli</i>
Norfloxacin	Nil	18	18	19
Gentamicin	18	16	16	18
Tetracycline	19	18	18	9
Cefotaxime	Nil	18	18	Nil
Co-Trimoxazole	0	15	16	19
Ampicillin	0	0	0	19

DISCUSSION

The present investigation studied the microbial diversity near public restrooms at old Bus stand, Thanjavur. Generally, public rest rooms are of heavier usage as it is the only sources of outing human excretions. As this study focused on public restroom at bus stand, the level of contamination, threatening microbial biome at and near the place are high due to huge number of travelers. In the present investigation, the bacterial species isolated were of potential disease causing agents such as *Staphylococcus sp.*, *Pseudomonas sp.*, *Escherchia coli* and *Klepsiella pneumoniae*. Scott et al. (1982) stated that, the public rest rooms had been greatly contaminated with microbes from human secretions as saliva skin, urine and faecal origin. Reynolds [9] studies revealed that, the most implicated probable sources of infections is door handles

of toilets and bathroom. The present study focused only on airborne microbes which may of outcome of toilet sources and it may from the sources revealed by Reynolds (2005). Studies of hostel restroom, toilet seat have lower number of *Staphylococcus aureus* and *Pseudomonas sp.* than sinks and floor. The present study was in accordance with this and same group of bacterial species in and around public rest rooms near old bus stand, Thanjavur. Sabra (2013) studied the bacterial public health hazards in the public female restrooms at Taif, KSA.

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CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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