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Research Article

## Ventilation tube a fleeting alcove for multi drug resistant non-hemolytic *Staphylococcus epidermidis*

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### ABSTRACT

Health care associated infections are escalating globally. Ventilation tube is one of the potential reservoirs for microorganisms. In view of this a prospective study was undertaken to detect the microbial spectrum, haemolytic assay and antibiotic susceptibility of nosocomial bacteria on ventilation tube. Samples were collected by wiping the sterile moist swab over the ventilation tube in intensive care unit (ICU). Collected samples were subjected to standard isolation and characterization procedures. *Staphylococcus epidermidis* was isolated from the collected samples. For hemolytic assay, loopful of *Staphylococcus epidermidis* culture was streaked on freshly prepared blood agar and incubated overnight. Hemolytic assay revealed non-hemolytic *Staphylococcus epidermidis*. Antimicrobial susceptibility test was performed according to CLSI (2007). Bacterial isolates were subjected to disc diffusion test against gentamicin (120µg), vancomycin (30µg), erythromycin (15µg) tetracycline (30µg), ampicillin (10µg), amoxicillin (10µg) doxycycline (30µg), bacitracin (10µg) and ceftazidime (30µg). Antimicrobial susceptibility test revealed *Staphylococcus epidermidis* sensitivity to gentamycin and vancomycin but resistant to all antibiotics tested.

**Keywords:** Health care associated infection; Commensals; Skin infection; Antibiotic susceptibility.

### INTRODUCTION

Health care associated infections are recognized as public health predicament worldwide and the infections are even more startling in the 21<sup>st</sup> century (Samuel S.O. 2010). The world health organization (WHO) estimates 190 million hospitalized patients annually worldwide, 9 million patients contact health care associated infections and 1 million patients succumb to death due to health care associated infections (Paris: C-CLIN Paris-Nord, 1995). *Staphylococcus epidermidis* is a normal inhabitant of human skin frequently known to cause foreign body associated infections (Rupp.M.E et al., 1994; Kloos WE et al., 1975). The pathogenesis of *S.epidermidis* infection is linked with the ability to form biofilm on polymer surface such as ventilation tube (Lucilla B et al., 1997). Mechanical ventilators are associated with hospital acquired infections and the disease occurs 10 to 20% more to patients who are on ventilator longer than 48 hours and is associated with significant increase in length of stay in hospital, mortality and cost (Jarvis WR 2007). Since the infections associated with *S. epidermidis* are chiefly acquired during hospitalization, it is not surprising that resistant pathogens

pose an amplified challenge to the hospital for prevention and treatment (Bradley JS et al., 2007).

### METHODOLOGY

Surface samples were collected by wiping the surface of selected areas with sterile cotton swab. Sampling procedures was done according to CDC (2003). All collected samples were transported to Research Laboratory for isolation, characterization and antibiotic susceptibility test according to standard procedures (Baron J & Finglod S., 2007; CLSI 2007).

A standard inoculum adjusted to 0.5 McFarland was swabbed on Muller – Hinton agar and antibiotic disc of gentamicin (120µg), vancomycin (30µg), erythromycin (15µg) tetracycline (30µg), ampicillin (10µg), amoxicillin (10µg) doxycycline (30µg), bacitracin (10µg) and ceftazidime (30µg) were placed at equidistance after drying the plate for 2-4 min and incubated at 37°C for 24 hours and the zone of inhibition was measured and compared with standard antibiotic susceptibility chart (CLSI, 2007).

### RESULTS

*Staphylococcus epidermidis* was the predominant bacteria isolated from the ventilation tube in Intensive care Unit (ICU). It was present on all the ventilation tubes that were used in this study.

The results of the antibiotic susceptibility test are shown in table 1. *S.epidermidis* was found to be sensitive to gentamycin and vancomycin. On the other

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**Table 1: Antibiotic susceptibility of *Staphylococcus epidermidis* against antibiotics**

Groups	Antibiotic agent	Potency ( $\mu\text{g}$ )	Inhibition zone (mm)	S/I/R
Aminoglycoside	CN	120	25	S
Glycopeptides	VA	30	22	S
Penicillin	E	15	9	R
	AMP	10	14	R
	AML	10	14	R
Tetracycline	DO	30	11	R
	TE	30	10	R
Cephalosporin	CAZ	30	7	R
Others	B	10	14	R

S: sensitive, I: Intermediate, R: resistant. CN: Gentamycin, VA: Vancomycin, E: Erythromycin, TE: Tetracycline, AMP: Ampicillin, AML: Amoxicillin, DO: Doxycycline, B: Bacitracin, CAZ: Ceftazidime.

hand, *S.epidermidis* was resistant to erythromycin, tetracycline, ampicillin, amoxicillin, doxycycline, bacitracin and ceftazidime.

Ceftazidime showed the least inhibition zone (7mm), followed by erythromycin (9mm), tetracycline (10mm), doxycycline (11mm), ampicillin, amoxicillin and bacitracin (14mm) respectively. Where as inhibition zone for gentamycin was 25mm and 22mm for vancomycin which is the indicator of sensitivity.

## DISCUSSION

*S.epidermidis* is commonly found on human skin that sometimes causes human illness. They are usually dismissed as contaminant but now it is the most important bacteria causing nosocomial infection especially in individuals with weakened immune system, newborn children and people with implanted medical devices (D Isaacs. 2003). Difficulty in distinguishing the *S.epidermidis* strain is commonly encountered by researchers (Von Eiff C *et al.*, 2001). According to our findings *S.epidermidis* residing on the ventilation tube is likely to infect other anatomical sites of the same patient during medical procedures via various modes of transmission. However, this does not hold true in every case due to many influencing factors.

The significant finding of this study is isolation of gram positive *S.epidermidis* from ventilation tube contrast to gram negative bacteria causing pneumonia reported by researcher (P G Flanagan *et al.*, 2001). This indicates the moist environment of ventilation tube bolsters the proliferation of *S.epidermidis* (M Dwivedi *et al.*, 2009). *S.epidermidis* was isolated from the outer surface of ventilation tube hence *S.epidermidis* could be considered transient bacteria however, periodic screening will aid in determining if ventilation tube continuously harbours *S.epidermidis* which could have been originated from various sources namely medical personnel, patient attendants and contaminated air, in addition inadequate decontamination protocol could also be the governing factor.

Antibiotic susceptibility test revealed a contrast finding compared to other findings (Denise O. Garrett *et al.*, 1999). This study showed *S.epidermidis* sensitive to

vancomycin and gentamycin and resistant to ampicillin, amoxicillin, erythromycin, tetracycline and doxycycline.

The best method to reduce the frequency of resistant bacteria is to use antibiotic rotation or cycling (Jean-Louis Vincent. 2003). The choice of antibiotic treatment can affect the bacterial spectrum of the entire hospital community. Infections caused by *S.epidermidis* are often persistent and relapsing especially it is correlated with the ability to form biofilm on polymer surface (Valentin-weigand P *et al.*, 1993). In addition, biofilm infections often give recurring symptoms until proper therapy is given. The most inexpensive method available is to break the chain of infection to implement the same identifying the epidemiological factors are imperative CDC (2002) Further, strict implementation of sterilization and disinfection protocols (Rutala MW 2004)

## CONCLUSION

Continuous education on infection control should be advocated. Hospital-wide campaigns and screening should be done periodically and remind hospital personnel on better implementation of existing infection control guidelines to reduce the probability of health care associated infections caused especially by antibiotic resistant bacteria.

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