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Research Article

Sphingomonas paucimobilis- An Emerging Hospital Acquired Infection

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Abstract

Background: *Sphingomonas paucimobilis* widely found in nature, especially in water and soil, and has been isolated from hospital environments such as distilled water, nebulizers, and multiple equipment used in medical care. It has been implicated as a causative agent of infections in immunocompromised patients, plus healthcare-associated infections. *S. paucimobilis* is an emerging pathogen and it should not be discarded as contaminants. Here, we report a case of *S. paucimobilis* bacteremia as an emerging Hospital acquired infection.

Material and Methods: Pre-fumigation and Post-fumigation from various sites in the ICU, OT and NICU were sent to the BioTRak Research Foundation for further process. Organisms were identified by using an automated system (VITEK, model no. VK2C 16927).

Result: Growth was monitored before and after fumigation. Among all these three, maximum growth of *S. paucimobilis* were isolated from ICU and least amount of growth were isolated from the floor of OT, whereas in NICU, moderate growth were isolated from phototherapy and ventilator.

Conclusion: *S. paucimobilis* is an emerging pathogen responsible for Bacteremia and septic shock in healthy as well as immunocompromised patients. So, care has to be taken for that and organism should be reported as an important nosocomial pathogen. It also indicates that hospitals must carry out strict sterilization and fumigation protocols as part of their protocol.

Keywords: *NICU (Neonatal Intensive Care Unit); ICU (Intensive Care Unit); OT (Operation Theatre)*

Introduction

Sphingomonas paucimobilis is a strictly aerobic, yellow pigmented, oxidase positive, catalase positive, motile gram negative bacterium as well as an opportunistic pathogen. It is widely found in nature, especially in water and soil, and has been isolated from hospital environments such as distilled water, nebulizers, and multiple equipment used in medical care [1]. It has been implicated as a causative agent of infections in immunocompromised patients, plus healthcare-associated infections. Although the infections associated with *S. paucimobilis* were reported to occur rarely, it has been more frequently reported in clinical settings [2].

S. paucimobilis has been reported to cause outbreaks of bacteremia among immunocompromised patients in hematology and oncology units; these outbreaks are possibly related to bacterial colonization of hospital water systems [3,4]. *S. paucimobilis* outbreak in mechanically ventilated neonates was linked to contaminated temperature probes [5]. It has also been reported to cause outbreak of septicemia

in 13 neonates in a Neonatal Intensive Care Units (NICU) [6]. Thus, in the current study we report *S. paucimobilis* as an emerging Hospital Acquired Infection.

Methodology

This study was carried out for a period of eleven months at BioTRak Research and Diagnostics Centre Foundation, Kharghar, Navi Mumbai. Pre-fumigation and post fumigation swabs were collected from various sites in the Intensive Care Unit (ICU), Operation theatre (OT) and Neonatal Intensive Care Unit (NICU). Sample was processed in sterile and aseptic condition in laminar air flow. Before processing Swabs were incubated in peptone water for 2 hrs at 37°C. Material used for culture was Nichrome wire loop, Media for streaking and incubated swabs. Then small well was prepared from the swab incubated in peptone water on Blood agar plate and Macconkeys agar plate then streaked it with the help of sterile nichrome wire loop and prepared one smear for gram staining. And all plates are incubated at 37°C for 24 hrs. Next day after completion of incubation observed the growth present on Plates. Observation was on Blood Agar Plate: Deep yellow, smooth, convex, raised and non haemolytic small colonies were observed and on Macconkeys agar plate: non lactose fermenting colonies were observed.

Then we put these colonies for identification in VITEK2-compact (Model no.vk2c16927) For identification procedure carried out was, we collected all the required material for procedure like tube holder cassette, sterile tube, nichrome wire loop, density checker, and Gram negative bacilli identification cards. (GN ID CARD) Two sterile tubes were taken and added 3 ml sterile normal saline in each tube, one tube is labelled as blank and another is labelled as identification then with the help of sterile nichrome wire loop growth present on Macconkeys agar plate is inoculated in identification tube and mixed well with the help of vortex machine. And checked the density with the help of density checker, density must be within range (0.50 to 0.63). Adjusted the density of suspension in the required range then Gram negative card is inserted in the tube and loaded into the machine. Identification process is carried out within 4 to 6 hrs. The identification of *Sphingomonas paucimobilis* was done by automated system. The organism was identified by slandered microbiological methods [7].

Results

Microbiological analysis of 17 swabs from various sites in the ICU, NICU and OT were done. Out of which 9 swabs were positive for growth of *Sphingomonas paucimobilis*. The results are as under, 6 pre and post- fumigation swabs were collected each from the floor, patient Bed, Monitor, Dressing trolley, Medicinal trolley and Ventilator in the ICU. 5 swabs were collected each from the floor, Wall, Table, Light and Anesthesia machine in the OT and 6 swabs were collected each from Phototherapy, Ventilator, Baby beds A/C and Medicinal trolley in the NICU.

Sr. No	ICU	Growth
1.	Floor	*S. paucimobilis*
2.	Bed	*S. paucimobilis*
3.	Monitor	*S. paucimobilis*
4.	Dressing trolley	*S. paucimobilis*
5.	Medicinal trolley	*S. paucimobilis*
6.	Ventilator	*S. paucimobilis*

Table 1: *Isolation of S. paucimobilis from the intensive care unit.*

Sr. No	OT	Growth
1.	Floor	*S. paucimobilis*
2.	Wall	No Growth
3.	Table	No Growth
4.	Light	No Growth
5.	Anesthesia machine	No Growth

Table 2: *Isolation of S. paucimobilis from the operation theatre.*

Sr. No	NICU	Growth
1.	Photo therapy	*S. paucimobilis*
2.	Medicinal trolley	*Bacillus sp.*
3.	Baby Beds	*Bacillus sp.*
4.	Ventilator	*S. paucimobilis*
5.	A/C	*Pantoea agglomerans*

Table 3: *Isolation of various organisms from the neonatal intensive care unit.*

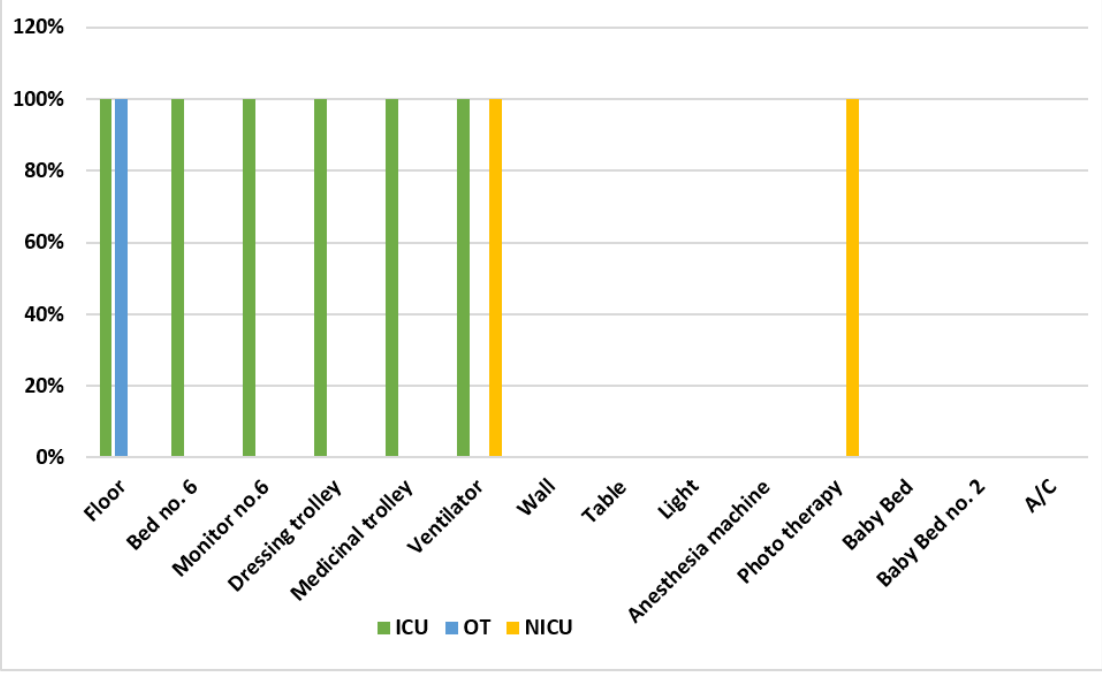

Figure 1: *Percentage of microbial growth in ICU, NICU and OT.*

According to graph Sphingomonas paucimobilis is present on Floor, Patient Bed, Ventilator, Dressing trolley and Phototherapy units.

Discussion

Sphingomonas paucimobilis earlier named as *Pseudomonas paucimobilis* and renamed as *Sphingomonas paucimobilis* in 1990. Currently it has more than 30 subspecies [8]. *Sphingomonas paucimobilis* is a gram negative bacilli that is emerging as an opportunistic nosocomial infection in debilitated patients but an established link with the source of infection generally fails [9].

The cell membrane of *Sphingomonas* lacks lipopolysaccharide constituent which is associated with endotoxin activity which explains the apparent lack of lethality of these organisms. It is widely distributed in natural environment; the source of infection for *Sphingomonas paucimobilis* may be associated with contamination of fluids in hospital. It have been isolated from hospital water supplies, respirators', stock distilled water, blood, wound, hospital dialysis equipment, patients with meningitis, septicemia, bacteremia, peritonitis, wound infections, soil, river water, deep subsurface sediments, corroding copper pipes, drinking water rhizosphere and surface of plants [10]. It can be transmitted possibly via the hands of healthcare workers. Thus, acute observation by microbiology laboratory staff, good communication with doctors and OT staff and implementation of an epidemiological investigation can lead to reduction in infection of *Sphingomonas paucimobilis*.

We recovered *Sphingomonas paucimobilis* from sites such as ventilators, OT floor, Medicinal and dressing trolley and phototherapy. Figure 1 shows the growth percentage of *Sphingomonas paucimobilis* to be maximum in intensive care unit (ICU) amongst the three. Subsequently it also depicts the least amount of *Sphingomonas paucimobilis* which was seen to be isolated from the floor of operation theatre, interestingly; NICU also shows moderate growth of the organism from phototherapy and ventilator. Growth was monitored from these before and after fumigation.

The given results illustrate microbial growth percentage even after fumigation was carried out. On the contrary, cases reported till date is seen to demonstrate low mortality and good prognosis. Most of the cases reported were in the hospitals mainly in neonatal intensive care units. First case of *Sphingomonas paucimobilis* was reported in 1979 in an infectious leg ulcer patient and since then this organism has been reported to cause variety of diseases. In India, first case was seen in a patient with UTI undergoing a renal transplant. Many studies investigated that in case of Community acquired infection *Sphingomonas paucimobilis* was the causative agent showing symptoms of primary bacteremia [11,12]. Because of its ability to survive in low nutrient condition, oligotrophic niches, reverse osmosis systems, dial sate and ventilators have been implicated as sources of infection. So, evidently *Sphingomonas paucimobilis* is an important nosocomial pathogen which can cause bacteremia and septicemia especially in neonates.

Conclusion

S. paucimobilis is an emerging pathogen responsible for Bacteremia and septic shock in healthy as well as immunocompromised patients. Our study indicate that *Sphingomonas paucimobilis* which can be discarded as contaminant because at first colonies look like Gram positive bacilli so care has to be taken to perform all biochemical test for confirming the organism as *Sphingomonas paucimobilis* and it should be reported as an important nosocomial pathogen as also suggested. The significance of this study conclude that hospitals must carry out strict sterilization and fumigation protocols if this organism is reported in their setup by clinical microbiologist.

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