

BACTEREMIA DUE TO STENOTROPHOMONAS MALTOPHILIA – A SERIES OF THREE CASES

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ABSTRACT

Bacteremia due to Stenotrophomonas maltophilia – a series of three cases. Stenotrophomonas maltophilia is an aerobic ubiquitous gram-negative bacillus that has been isolated from humans, animals, soil, food, and pharmaceuticals. Because of its limited invasiveness and low level of pathogenicity, it is rarely responsible for community-acquired serious infections. In recent years, S. maltophilia has been increasingly reported as a cause of life-threatening infections, in particular in immune compromised patients. Antimicrobial pressure, indwelling venous catheterization, long-term hospitalization, aggressive cytoreductive treatments for malignancy and neutropenia seem to be contributory factors. Management is problematic because of resistance to commonly used antibiotics including those of carbapenem class. In vitro susceptibility testing specific guidelines are not available for management. The development of rapid, inexpensive and reproducible culture systems such as Vitek II has made possible the recognition of this as a cause of bacteremia. In particular more information on nosocomial reservoirs and routes of transmission of the bacterium is needed for effective infection control strategies. Here we report a series of three cases of Stenotrophomonas maltophilia bacteremia from patients admitted in a paediatric ICU.

Key Words: *Stenotrophomonas maltophilia, Bacteremia, Nosocomial infection*

INTRODUCTION

Stenotrophomonas maltophilia is an aerobic ubiquitous gram-negative bacillus that has been isolated from humans, animals, soil, food, and pharmaceuticals.^[1] Because of its limited invasiveness and low level of pathogenicity, it is rarely responsible for community-acquired serious infections.^[2]

In recent years, *S. maltophilia* has been increasingly reported as a cause of life-threatening infections, in particular in immune compromised patients. Antimicrobial pressure, indwelling venous catheterization, long-term hospitalization, aggressive cytoreductive treatments for malignancy and neutropenia seem to be contributory factors.^[3] The morbidity and mortality associated with severe *S. maltophilia* infections may be high for several reasons: (a) this species is inherently resistant; (b) its antimicrobial resistance may increase when patients who are colonized with *S. maltophilia* are treated with antibiotics over extended periods.^[4] Sources of *S. maltophilia* colonization include hands, antiseptic soaps, hand lotion, respiratory equipment and/or fluids, intravenous solutions, central venous catheters, pressure monitoring devices, indwelling Foley catheters, urometers and irrigation solutions etc.^{5.}

Cells of *S. maltophilia* are straight or slightly curved nonsporulating gram-negative bacilli that are 0.5 to 1.5 µm long. They occur singly or in pair's. They are motile by means of several polar flagella. The colonies are smooth, glistening, with

entire margins and are white to pale yellow on Blood Agar.⁶

S. maltophilia is an obligate aerobe. Growth does not occur at temperatures lower than 5°C or higher than 40°C and is optimal at 35°C. It grows easily on blood and MacConkey agar. Little is known of the putative virulence factors of *S. maltophilia*. The failures to distinguish between colonization and infection have fostered the belief that *S. maltophilia* is an organism of very limited pathogenicity.^[7, 8]

S. maltophilia is known to produce a diffusible signalling factor, which is responsible for virulence factors of biofilm formation. The adherence of the strain of *S. maltophilia* to both glass and teflon was investigated by Jucker et al.⁹ They noted that adhesion to these negatively charged materials was promoted considerably by the positive charge manifested by this strain at physiologic pH.

Here we report a series of three cases of *Stenotrophomonas maltophilia* bacteremia from a paediatric ICU.

CASE REPORT

Case 1 was a 2 year old female child admitted to paediatric ICU with complaints of high grade fever (102°F) with chills and rigor for 4 days. Her complete blood count showed Hb (13.5gm %). Total leucocyte count (3.5x 10³/ul) with platelet count (255 x 10³/ul), SGPT –67 IU/L. Her chest X-ray was normal, pulse, BP and other parameters were within normal limits. She was empirically put on IV Amoxy clavulanic acid and anti-malaria. On the 3rd day of admission Widal test was done which was

positive for O & H antigen in 1:160 dilutions. A provisional diagnosis of enteric fever was made and patient was put on injection ceftriaxone and a blood culture was sent to Sampurna laboratory Microbiology department. Table 1 shows the details of the investigative findings of the patient.

Case 2: A 9 year old female patient with H/O high grade fever (103°F) with chills and admitted to the same nursing home in paediatric ICU. On examination her vital parameters were normal, P/A soft, chest X-ray was normal, CBC and other investigations were within normal limits. This patient was empirically put on I/V amoxy clavulinate and anti-malarial and was kept under observation for 2 days to see the effect of antibiotic regimen. Her fever continued to be in the range of 101-103°F and so a blood culture was sent to our laboratory. Meanwhile, she was given anti-malarial and a Widal test was done which was positive in 1:80 dilutions in both O & H antigens. The patient was kept on I/V ceftriaxone as a provisional diagnosis of enteric fever was made and blood culture report was awaited.

After 24 hours of incubation in BacTAlert, (Biomérieux, Durham, USA) the blood culture bottle showed indication of growth. Table 1 shows the details of investigations)

Case 3: A 7 year old female patient with similar complaints as the first two cases was admitted in the same nursing home on a different day. On examination her vital parameters were normal. The investigations were within the normal limits. A blood culture was sent to our laboratory which showed a positive indication in the BacTAlert, (Biomérieux, Durham, USA) System.

Table 1: Shows the details of the investigative findings in the above 3 patients.

Investigations	<u>Case 1</u> 2 yrs/F	<u>Case 2</u> 9 yrs/F	<u>Case 3</u> 7 yrs/F
Hemoglobin gm%	11.5	13.5	13.0
Total Leucocyte count X 10 ³ /ul	3.0	4.5	9.0
Differential Count			
Neutrophils %	40	44	60
Lymphocytes %	54	53	37
Monocytes %	02	02	02
Eosinophils %	04	01	01
Malaria parasite	N/S	N/S	N/S
SGPT IU/L	67	58	70
Creatinine mg/dl	0.5	0.8	0.9
Widal test	O – 1:160 H – 1:160	O – 1:80 H – 1:80	O – 1:80 H – 1:80
C-reactive protein mg/L	5.6	4.5	6.0
Blood culture	S.maltophilia	S.maltophilia	S.maltophilia

Table 2: Shows the anti-biogram of the three patients.

Antimicrobial	Case1		Case2		Case3	
	MIC	Interpretation	MIC	Interpretation	MIC	Interpretation
Ampicillin	≥32	R	≥32	R	≥32	R
Amoxicillin/Clavulanic Acid	≥32	R	≥32	R	≥32	R
Ticarcillin	≥128	R	≥128	R	≥128	R
Piperacillin/Tazobactam	≥128	R	≥128	R	≥128	R
Cefalotin	≥64	R	≥64	R	≥64	R
Cefoxitin	≥64	R	≥64	R	≥64	R
Cefixime	≥4	R	≥4	R	≥4	R
Ceftazidime	≥64	R	≥64	R	≥64	R
Ceftriaxone	≥64	R	≥64	R	≥64	R
Ertapenem	≥8	R	≥8	R	≥8	R
Amikacin	≥64	R	≥64	R	≥64	R
Gentamicin	8	I	8	I	8	I
Nalidixic Acid	≥32	R	≥32	R	≥32	R
Ciprofloxacin	≥4	R	≥4	R	≥4	R
Norfloxacin	≥16	R	≥16	R	≥16	R
Ofloxacin	≥8	R	≥8	R	≥8	R
Fosfomycin	≥256	R	≥256	R	≥256	R
Nitrofurantoin	≥512	R	≥512	R	≥512	R
Trimethoprim/Sulfamethoxazole	<=4	S	<=4	S	<=4	S

Blood culture of the three patients was collected under all aseptic precautions in paediatric blood culture bottles (Biomérieux, Durham, USA) and incubated in BacT Alert (Biomérieux, Durham, USA) blood culture system. After 24 hours of incubation, the system indicated growth in the culture bottles. Subculture was done on Blood and MacConkey agar plates. A direct Gram's smear was made from blood culture bottles which showed few Gram negative bacilli. After 24 hours the plates showed growth of bacterial colonies. On the basis of colony morphology, gram staining, Gram negative panel (N235) was selected for identification and sensitivity of the microorganism on Vitek II fully automated microbiology analyzer (Biomérieux, Durham, USA).

The growth of gram negative bacilli in all the three cases was identified by:

Vitek II as *Stenotrophomonas maltophilia* susceptible to Trimethoprim/sulphamethaxone only and resistant to fluoroquinolones, cephalosporins and carbapenems. The patients were put on Trimethoprim sulphamethaxole. After 5 days the patients became afebrile and were discharged from hospital.

DISCUSSION

S. maltophilia is an organism of low virulence and frequently colonizes fluids used in the hospital setting (e.g., irrigation solutions, intravenous fluids) and patient secretions (e.g., respiratory secretions, urine and wound exudates).¹⁰ *S. maltophilia* usually must bypass normal host defenses to cause human infection.

In their review of 106 intensive care unit patients infected or colonized with the bacterium, Villarino et al were unable to attribute the death of any patient directly to *S. maltophilia* infection.^[11]

Adherence to plastic is considered an important property of bacteria commonly implicated in line-related colonization and infection, and strains of *S. maltophilia* of both clinical and environmental origin have been reported to adhere to several types of plastic materials including intravenous cannulae.⁽¹²⁾

The ability of *S. maltophilia* to survive and multiply within total parental nutrition and other types of IV fluids may also contribute to the pathogenesis of IV line related infection.¹³ The portal of entry of *S. maltophilia* infection is frequently unknown. In our case IV cannulae might be the source of entry as all the three patients were put on I/V ceftriaxone. However, culture of I/V cannula was not done to prove it.

Infections caused by *S. maltophilia* are particularly difficult to manage because clinical isolates are frequently resistant to many antimicrobial agents particularly drugs of Beta lactam class and so it is challenging to both the clinicians and

laboratorians alike. There is a paucity of clinical investigations to determine the optimal therapy of infections associated with the bacterium; in particular, there have been no controlled trials and recommendations for therapy are often based on retrospective studies. If *S. maltophilia* is recovered from several patients in the same area, sections of an ICU or ward can become the focus of further spread within the hospital setting.^{14, 15}

Effective infection control measures can minimize or limit the spread of this and other organisms in the ICU.

Appropriate isolation procedures, rather than antimicrobial therapy, should be used to control the spread of *S. maltophilia*.¹⁶

Medical personnel, including medical students, housekeeping staff, attending physicians, nursing personnel, and respiratory therapists, are potential carriers of the organism from patient to patient.

Several strategies to prevent *S. maltophilia* infections have been proposed including avoiding inappropriate use of prolonged antibiotics, prolonged implantation of foreign devices, reinforcement of hand hygienic practices and wearing gloves etc.¹⁷

Management of infections caused by *S. maltophilia* is challenging to both clinicians and microbiologists due to the fact that little is known about the epidemiology of this organism. The rapid, inexpensive, reproducible culture system like VirecII has made possible the recognition of this organism as a cause of bacteremia which was not possible by manual culture methods. However, the reinforcement of hygienic measures will limit the nosocomial spread of this organism thus avoiding unnecessary antibiotic treatment.

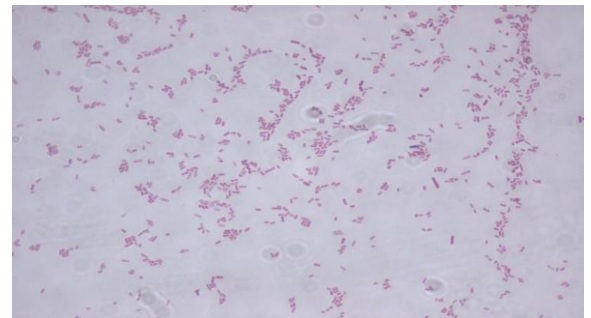


Figure I: Grams stain showing Gram negative bacilli



Figure II: Colonies of *Stenotrophomonas maltophilia* on MacConkey agar



Figure III: Colonies of *Stenotrophomonas maltophilia* on Blood Agar plate

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