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Review Article

NOSOCOMIAL *STENOTROPHOMONAS MALTOPHILIA* INFECTIONS

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Abstract

Stenotrophomonas maltophilia (*S.maltophilia*) is a ubiquitous, gram negative, multi drug resistant bacillus that causes hospital acquired infections associated with a high mortality rate.The pathogen shown to survive several biocides used in the hospital. The major reservoir of S.maltophilia was found to be hospital water and the persons often come in contact with hospital environment water sources leads to nosocomial outbreaks of infection. Manifestations of infections include pneumonia, often in mechanically ventilated patients, bacteremia, skin and soft tissue infection, catheterized urinary tract infection and endocarditis. Treatment of S.maltophilia is difficult because the organism is resistant to agents that used for nosocomial infection. There have also been reports of the organism developing resistance to Trimethoprim-sulfamethoxazole (TMP-SMX) which was initially considered as the drug of choice for S.maltophilia infections. The combination of ticarcillin-clavulanate plus TMP-SMX appears to be the most satisfied drug regimen for this infection.

Key Words: S. maltophilia, nosocomial infection.

INTRODUCTION

S.maltophiliais a gram negative bacillus emerging as an opportunistic nosocomial pathogen associated with high mortality and morbidity in debilitated and severely immunocompromised patients. Ultra microcells of S.maltophilia are able to pass through a 0.2micro meter filter; also they are tolerated to biocides used in hospital. Hospital tap water can act as the reservoirs of this nosocomial pathogen. The transmission of S.maltophilia to susceptible individuals may occur through direct contact with the source or via the hands of health care personnel [(1,2)].

Figure 1: *Positive sample for Stenotrophomonasmaltophiliain the silicone tube of hand-piece*

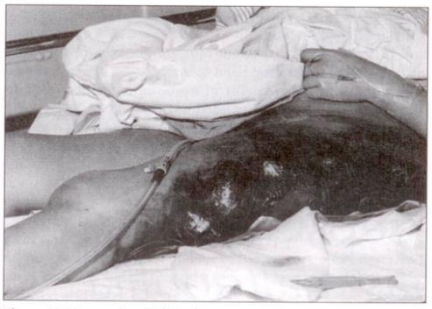

Figure 2: Metastatic cellulitis due to*S.maltophilia*

Gram negative organisms have become increasingly troublesome pathogens in the hospital environment. With the continuous development of broad spectrum antibiotics, increasing number of multidrug resistant micro- organisms are being recognized. One such organism is, S.maltophilia. In hospital settings it is an uncommon pathogen, typically causing soft tissue infection of contaminated wounds. In the hospital settings particularly among critical care and oncology patients, S.maltophilia may cause catheter-related bacteremia, pneumonia, soft tissue infection, meningitis, prosthetic valve endocarditis and ocular infections[3,4].

The Incidence ofS. maltophilia hospital acquired infections is increasing, particularly in the immunocomprimised patient population, and cases of community – acquired S. maltophilia have also been reported. Infections can occur in both children and adults. The transmission of S. maltophilia to susceptible individuals may occur through direct contact with the source. The hands of healthcare personnel have been reported to transmit nosocomial S. maltophilia infection in an intensive care unit. S. maltophilia has been co-cultured with P.aeruginosa in respiratory samples obtained from CF patients. Cough-generated aerosols from CF patients have the potential to provide airborne transmission of S. maltophilia. Risk factors for this infection include underlying malignancy, indwelling devices, chronic respiratorydisease, immunocompromised host, prior use of antibiotic, long term hospital stay etc[5,6]. A US multiple hospital study of patients infections in the ICU during 1993-2004 reported S. maltophilia as being among the 11 most frequently recovered organisms. A study of bacteremia in adult patients in a medical centre in northern Taiwan during 1993-2003 reported that risk factors associated with mortality for patients with S. maltophilia bacteremia included ICU stay (p=0.042), central venous catheter (cvc)use(p=0.003), mechanical ventilation (p=0.008). During 1993 -2003, a study of paediatric patients in a university hospital in Taiwan indicated malignancy (p=0.049), failure to remove the catheter (p=0.021), and a lack of effective antibiotic treatment (p=0.05). a study during 1993-2003 of adults with S. maltophilia bacteremia in 2 hospitals and medical centre in Taiwan identified thrombocytopenia(p=0.001) and S. maltophilia shock(p=0.013) as independent risk factors for mortality . In us study of CF sputum microbiology from1995-2008, the prevalence of *S. maltophilia* increased from 6.7%- 12 %(p=0.01) and *S. maltophilia* was recovered more often from patients with <40%than from those with >40% predicted forced expirated volume (p=0.07). the data from the CF foundation patient registry from 1995-2005 revealed a significant increase in incidence(13.8%) and prevalence (16.4%) of S. maltophilia across all age groups of patients studied . in 2004 SENTRY antimicrobial surveillance program, among paediatric patient isolates , S. maltophilia was among the top 15 pathogens isolated from north America and latin America but not from Europe. Surveillance of antimicrobial resistance in German ICU (SARI) monitored S. maltophilia as one of the 13 most important organisms associated with nosocomial infections. *S. maltophilia* is a waterborne organism and exposure to this bacterium can occur both in and outside the clinical settings. In health care environment, S. maltophilia has been isolated from several sources, including suction tube of dental chair units, contaminated endoscopes, and tap water etc[7,8,9,10].

Treatment

S. maltophilia is usually resistant to multiple antimicrobials, including expanded-spectrum penicillins, third-generation cephalosporins, carbapenems, aminoglycosides, and quinolones. Trimethoprim-sulfamethoxazole is the antimicrobial agent of choice for this pathogen but is bacteriostatic. Further, resistance to this agent is increasing. Certain combinations of antibiotics are synergistic and may be appropriate for patients harboring resistant organisms or with life-threatening infections[11,12].

Emergence antibiotic resistance

These organisms will arise the resistance to a board array of antibiotics. The lower membrane permeability that contributes to resistance to beta- lactams including cefepime, ticarcillin-clavulanate, ceftazidime andpiperacillin-tazobactam[13].

Table 1: New treatment strategies for S. Maltophilia

Antimicrobial approach	mechanisms
Antimicrobial peptides	Membrane disruption and cell lysis
Trimethoprim-sulfamethoxazole and tigecycline.	Synergy of antimicrobials
Tigecycline and amikacin	Synergy of antimicrobials
Aerosolized colistin and doxycycline	Bactericidal combination therapy
Aerosolized levofloxacin	Bactericidal
Tigecycline	Inhibition of protein synthesis
moxifloxacin	Bactericidal
Cationic compounds	Interaction with negative charges on cell wall resulting in disruption of binding sites
Nano emulsions	Membrane fusion and cell lysis
Phage therapy	Cell lysis
Plant oils	Unknown
EGCG from green tea	Membrane damage, inhibition of DNA gyrase
Peptide inhibitor of beta lactamase	Inhibitor of beta-lactamase L1

CONCLUSION

S.maltophilia is emerging as a significant pathogen worldwide, which is highly resistant to antibiotics. It causes infections that result in increased morbidity. There is a need to continue to monitor its antibiotic resistance, persistence, and spread within the community and health care settings.

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