# Catheter-related Bloodstream Infection Caused by *Stenotrophomonas maltophilia* in An Adult Patient with End-stage Renal Disease: Successful Treatment with Ceftazidime and Removal of Catheter

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## Abstract

Catheter-related bloodstream infection (CrBSI) is an important clinical problem in critically ill patients, such as patients with end-stage renal disease (ESRD). We report a case of CrBSI caused by *Stenotrophomonas maltophilia* (*S. maltophilia*) in an adult patient with ESRD. It is not known whether *S. maltophilia* is susceptible to ceftazidime (CAZ) becasue there is no standard breakpoint for CAZ. Following removal of the catheter and a 17-day course of CAZ the patient made a good recovery. (J Intern Med Taiwan 2014; 25: 215-219)

**Key Words: *Stenotrophomonas maltophilia*, Catheter, Bloodstream infection, End-stage renal disease**

## Background

*Stenotrophomonas maltophilia* (*S. maltophilia*) was first isolated in 1943 as *Bacterium bookeri*, and then renamed as *Pseudomonas maltophilia*[1]. Later, it was named *Xanthomonas maltophilia* according to rRNA cistron analysis[2]. After a large study of *Xanthomonas* strains, the name was changed to *S. maltophilia* according to DNA-rRNA hybridization studies, and sequencing and mapping of PCR-amplified 16S rRNA genes[3].

*S. maltophilia* is not a highly virulent pathogen, but it has emerged as an important nosocomial pathogen associated with higher mortality rates[4]. A variety of infections are associated with *S. maltophilia*[5], including indwelling catheter infections[6]. Patients with end-stage renal disease (ESRD) are more susceptible to infections from indwelling catheters[7]. Thus, catheter-related *S. maltophilia* bacteremia has been described in these patients with ESRD[8-9]. Resistance of *S. maltophilia* to multiple antibiotics, as well as the potential adverse reactions

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associated with the use of trimethoprim-sulfamethoxazole (TMP-SMX), has made the choice of drugs very difficult in patients with ESRD[10]. Although Betriu et al found that ceftazidime(CAZ) was the most active of the cephalosporins for *S. maltophilia*[11], it is not known whether *S. maltophilia* is susceptible to CAZ becasue there is no standard breakpoint for CAZ. Here we report an interesting case of catheter-related bloodstream infection (CrBSI) caused by *S. maltophilia* in an adult receiving hemodialysis. We treated this patient successfully with CAZ and catheter removal.

## Case presentation

A 78-years-old female presented with fever and chills. She had a history of ESRD for three years and received dialysis through a tunneled hemodialysis catheter. She suffered from fever and chills while on hemodialysis for one day prior to the present admission. She was sent to the emergency department of our institute. Upon admission, she was afebrile, with a blood pressure of 120/80 mmHg, and had a gangrenous lesion on her right big toe. At admission, the laboratory results were as follows: white blood cell count, 18,900/mm$^3$; and C-reactive protein (CRP), 7.65 mg/dL. A plain chest radiograph showed cardiomegaly. Based on these findings, sepsis was suspected and she was admitted to the infectious diseases ward for further management.

On the day of admission, the patient was treated for sepsis with a 400 mg stat dose of teicoplanin plus 2000 mg/day of CAZ. Blood and urine samples were obtained for culture. On day 3 following admission, *S. maltophilia* was isolated. *S. maltophilia* was identified with a Vitek-2 System (Biomerieux, Hazlewood, Mo.). We performed an antibiotic susceptibility test for *S. maltophilia*. The results indicated that *S. maltophilia* was sensitive to TMP-SMX and resistant to the cephalosporin group (including cefmetazole, CAZ, cefotaxime, cefepime, and cefpirome), penicillin group (ampicillin, amoxicillin-clavulanate, piperacillin, piperacillin-tazobactam,), carbepenem group (imipenem-cilastatin, and meropenem), aminoglycosides (gentamicin and amikacin), and fluoroquinolone (ciprofloxacin). We continued using CAZ because of the potential adverse reactions known to be associated with TMP-SMX especially in patients with ESRD, according to Salter's recommendation[10]. During the hospitalization, serial microbiological studies, as well as analysis of blood samples taken via the catheter, showed *S. maltophilia* growth. After obtaining consent from the patient and her family, we removed the catheter on day 10 following admission, after which her condition started improving. *S. maltophilia* was isolated from the tip of the hemodialysis catheter. Her vital signs stabilized and she received a full 17-days course of CAZ. She was followed-up at an outpatient department, and she recoved well.

## Discussion

We reported a case of CrBSI caused by *S. maltophilia* in an adult patient with ESRD. Catheters cause up to 50% of nosocomial bacteremias, and central vascular catheters account for 80%–90% of such infections[5]. National estimates from the United States indicated that as many as 250,000 BSIs associated with central vascular catheters occur each year in the United States, with an attributable mortality of 12%–25% and an estimated cost of $25,000 per case[7]. These risk factors for *S. maltophilia* infection are summarized in Table[12-22].

Our patient was in critical condition prior to the commencement of CAZ therapy, and her condition stabilized following the removal of the catheter. Araoka et al reported patients with underlying diseases including ESRD is extremely vulnerable to this organism. *S. maltophilia* bacteremia has a mortality rate of up to 51% if appropriate antibiotics are not instituted early[16]. Although knowledge of local susceptibility patterns of *S. maltophilia*

Table 1. Literature Review of Risk Factors and Mortaliry rate for *Stenotrophomonas maltophilia* infection

| Country | Study Design | Enrolled cases | Risk factors | Mortality rate | References |
|---|---|---|---|---|---|
| Turkey | case–control | 37 cases | 1. Presence CVC<br>2. Carbapenem use | 21.6% | 12 |
| USA | case–control | 13 cases | Prior use of antibiotics | No record | 13 |
| Taiwan | Retrospective review | 84 episodes | Long-term hospitalization or ICU stay | 33.0% | 14 |
| USA | case–control | 30 cases | 1. Presence CVC<br>2. Previous aminoglycoside use | 30.0% | 15 |
| Japan | Retrospective review | 53 cases | 1. Neytropenia<br>2. Presence CVC<br>3. Mixed infection with enterococci | 51.0% | 16 |
| Australia | Retrospective review | 45 episodes | 1. Presence CVC<br>2. Prior use of antibiotics | 18.0% | 17 |
| Taiwan | Retrospective review | 50 episodes | 1. Receiving mechanical ventilation in the ICU<br>2. Presence CVC | 62.0% | 18 |
| Italy | Retrospective review | 37 cases | 1. Neutropenia<br>2. Severe cellulitis | 24.0% | 19 |
| USA | Retrospective review | 102 cases | 1. Presence CVC 212.Neutropenia | 48.3% | 20 |
| USA | Retrospective review | 217 episodes | 1. Presence CVC<br>2. Prior intensive care unit admission<br>3. Neutropenia | 11.0% | 21 |
| Taiwan | Retrospective review | 14 episodes | 1.Presence CVC<br>2.Prior use of antibiotics | 30.7% | 22 |

is helpful in determining empirical antibiotics, appropriate antibiotic therapy may not be possible because of lack of standard breakpoints. Micozzi's studies have suggested an association between inappropriate antibacterial treatment and mortality[18]. Wang's study showed *S. maltophilia* were susceptible in vitro to the combination of ticarcillin and clavulanic acid (72%), and to levofloxacin (55%)[19]. In our patient, the antibiotic susceptibility result of *S. maltophilia* showed resistance to all antibiotics except for TMP-SMX, and therefore TMP-SMX has been regarded as an agent of choice in this patient. However, TMP-SMX is relatively unsafe in patients with ESRD[23]. Levofloxacin is not appropriate choice for such an ESRD patient with cardiomegaly and QTc prolongation. Ticarcillin and clavulanic acid is not avaiable at our institute and minocycline is only bacteriostatic effect. At the critical moment, we chose CAZ because of less adverse reaction and and possible activity in previous study[11]. Concerning treatment of this patient, the infection was controlled only after the catheter was removed. Friedman et al emphasized the importance of the removal of indwelling catheters and commencement of appropriate antibiotic therapy because all deaths were preceded by an episode of *S. maltophilia* infection, although underlying disease processes also played a major role[17]. Hanna et al concluded that patients with documented CrBSI, should have their catheter removed within 48 to 72 hours to prevent relapse[24]. In our patient, the removal of the catheter was an important part of the treatment.

## Conclusions

We reported a case of CrBSI caused by *S. maltophilia* in an adult patient with ESRD. The treatment approach included the removal of the catheter and a 17-day course of CAZ. Isolation of *S. maltophilia* from blood culture should prompt a careful review of the patient with particular

emphasis on the commencement of appropriate antibiotic therapy and prompt removal of indwelling catheters whenever possible.

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# 尿毒症病患罹患導管相關嗜麥芽單胞菌 (*Stenotrophomonas maltophilia*) 血流感染：移除導管與使用頭孢他啶 (Ceftazidime) 成功治療病患

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## 摘　要

導管相關血流感染是種嚴重疾病，在尿毒症病患是一個重要的臨床問題。我們報告一例嗜麥芽單胞菌 (*Stenotrophomonas maltophilia*) 引起在尿毒症病患的血流感染。目前並沒有頭孢他啶 (Ceftazidime) 對於嗜麥芽單胞菌的判讀標準。本案例移除導管與使用頭孢他啶成功治療病患。