The incidence of bloodstream infection due to *S. maltophilia* did not change significantly in the intensive care units over time, ranging from 0.16 to 1.0 episode (median, 0.58 episode) per 1,000 patient-days ($P = .5$) and from 0.25 to 1.24 episodes (median, 0.84 episode) per 1,000 central line–days ($P = .1$) (Figure). In the hematology ICU and the marrow transplant units, the number of bloodstream infections due to *S. maltophilia* per 1,000 patient-days ranged from 0 to 1.6 (median, 0.7; $P = .08$).

The use of imipenem increased significantly during the study period, from 82.4 DDDs per 1,000 patient-days in 1999 to 208.4 DDDs per 1,000 patient-days in 2006 ($P < .001$). The use of meropenem also increased, from 41.2 to 160.1 DDDs per 1,000 patient-days ($P < .001$), and the use of cefepime increased from 7.8 to 449.5 DDDs per 1,000 patient-days ($P < .001$). The use of ceftazidime during the study period decreased significantly from 100.3 to 17.9 DDDs per 1,000 patient-days ($P < .001$). In the hematology unit, the use of imipenem increased from 56.8 to 152.5 DDDs per 1,000 patient-days ($P < .001$), and the use of meropenem increased from 117.4 to 428.8 DDDs per 1,000 patient-days ($P = .001$).

The effect of the use of carbapenem on rates of bloodstream infection due to *S. maltophilia* is controversial.[7,8] Metan et al.[8] showed, using multivariate analysis, that carbapenem use increased the incidence of *S. maltophilia* bloodstream infection. Sanyal et al.,[1] in a Kuwaiti hospital, found that the numbers of *S. maltophilia* isolates increased from 1993 to 1997, and that this change correlated significantly with an increase in the annual consumption of carbapenem. Del Toro et al.,[2] in a multicenter study from Spain, showed that the incidence of *S. maltophilia* infection ranged from 3.4 to 12.1 cases per 10,000 patients discharged. On the other hand, more recent studies have showed a stable incidence of *S. maltophilia* infection. Meyer et al.[4] found that the number of *S. maltophilia* isolates at German intensive care units participating in surveillance of antimicrobial use and resistance in intensive care units did not increase from 2001 to 2004, with a mean incidence of 0.13 isolates recovered per 1,000 patient-days.[4] According to Meyer et al.,[4] overall antibiotic and carbapenem use increased slightly during the 4-year period.

In our hospital, bloodstream infection due to *S. maltophilia* was more frequent in the intensive care unit (90% of cases) than in non–intensive care units. Despite the significant increase in the usage density of fourth-generation cephalosporins and of carbapenems in the hospital, the rate of bloodstream infection due to this pathogen remained stable over the 7-year study period.

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Clinical Features and Treatment Outcomes of Infections Caused by *Sphingomonas paucimobilis*

To the Editor—Sphingomonas paucimobilis isolates have been recovered from diverse sources, including hospital water systems, respiratory therapy equipment, and various clinical specimens.[1] Several case reports and case series of *S. pauci-*

TABLE. Demographic and Clinical Characteristics of 23 Patients with *Sphingomonas paucimobilis* Infection

Patient	Age in years, sex	Underlying condition(s)	Type of infection	Source of isolate	Nosocomial infection	Indwelling device
1	48, M	Hepatocellular carcinoma	Cholangitis	Blood	Yes	None
2	66, M	Asthma, AOSD	Wound infection	Wound	Yes	None
3	28, M	Herpes occipitoradialis	Ear pyoderma	Pus	Yes	None
4	69, M	Lung cancer	Neutropenic fever (pneumonia)	Blood	Yes	None
5	64, F	Breast cancer	Neutropenic fever (unknown focus)	Blood	Yes	Tunneled CVC
6	8, M	ALL	Neutropenic fever (unknown focus)	Blood	Yes	Tunneled CVC
7	50, M	Hepatocellular carcinoma	Catheter-related infection	Catheter tip	Yes	Nontunneled CVC
8	52, M	Lymphoma	Catheter-related infection	Blood	Yes	Tunneled CVC
9	59, F	AML	Catheter-related infection	Blood	Yes	Tunneled CVC
10	1, M	Anaplastic ependymoma	Catheter-related infection	Catheter tip	Yes	Nontunneled CVC
11	56, F	Multiple myeloma	Catheter-related infection	Blood	Yes	Tunneled CVC
12	17, M	Ewing sarcoma	Catheter-related infection	Blood	Yes	Tunneled CVC
13	47, M	Lymphoma	Catheter-related infection	Blood	Yes	Tunneled CVC
14	48, F	Breast cancer	Catheter-related infection	Blood	Yes	Tunneled CVC
15	55, M	ESRD	CAPD peritonitis	Dialysate	Yes	CAPD catheter
16	62, M	ESRD	CAPD peritonitis	Dialysate	Yes	CAPD catheter
17	14, F	ESRD	CAPD peritonitis	Dialysate	Yes	CAPD catheter
18	<1, F	Chylothorax	Primary bacteremia	Blood	Yes	Nontunneled CVC
19	71, F	Head and neck cancer	Primary bacteremia	Blood	Yes	Nontunneled CVC
20	2, F	Aplastic anemia	Primary bacteremia	Blood	Yes	Tunneled CVC
21	<1, M	Neonatal sepsis	Primary bacteremia	Blood	Yes	Nontunneled CVC
22	45, F	None	GI infection	Blood	No	None
23	27, F	None	GI infection	Blood	No	None

NOTE. ALL, acute lymphocytic leukemia; AML, acute myelocytic leukemia; AOSD, adult-onset Still disease; CAPD, continuous ambulatory peritoneal dialysis; CVC, central venous catheter; ESRD, end-stage renal disease (and receiving peritoneal dialysis); GI, gastrointestinal.

mobilis infection have been published.[2-8] However, little is known about the clinical features of *S. paucimobilis* infections. Thus, we retrospectively analyzed patients with infections caused by *S. paucimobilis* to evaluate the clinical features and treatment outcomes associated with this pathogen.

The database at the clinical microbiology laboratory was reviewed to identify patients who had *S. paucimobilis* infection from January 2000 through September 2007 at Samsung Medical Center, Seoul, Republic of Korea. Patients were included in the study if a culture was positive for *S. paucimobilis*, and their medical records were reviewed. Only true infection for each patient was included in the analysis.

We defined clinically significant *S. paucimobilis* infection as recovery of *S. paucimobilis* from culture of specimens from patients with clinical features compatible with systemic inflammatory response syndrome.[9] We defined antibiotic therapy as inappropriate if an antibiotic agent active against *S. paucimobilis* (as determined by in vitro susceptibility testing) at the usual recommended dosage was not administered during the first 48 hours after diagnosis of infection. The definition of catheter-related infection required the presence of no apparent source for the bacteremia except the central venous catheter and required the isolation of the organism in semiquantitative culture (more than 15 colony-forming units of *S. paucimobilis* recovered from a culture of the central venous catheter tip). Possible catheter-related infection was indicated by the finding of a positive blood culture result with no apparent source of the bacteremia except the catheter.

The recovery of *S. paucimobilis* from specimens was accomplished by the processing of blood cultures, body fluids, or catheters in a Bactec Model 9240 (Becton-Dickinson) or BacT/ALERT 3D (bioMérieux). Identification of *S. paucimobilis* and antibiotic susceptibility testing were performed on the Vitek II automated system (bioMérieux).

During the study period, a total of 79 isolates of *S. paucimobilis* were identified. The patients corresponding to 23 of these isolates were enrolled; 56 patients were excluded, because their isolates were considered to represent colonization or contamination. The mean age of patients (±SD) was 38.7 ± 24.8 years, and 15 patients (65.2%) were male. The most common types of infection were catheter-related infection (in 8 patients [34.8%]), followed by primary bacteremia (in 6 [26.1%]), continuous ambulatory peritoneal dialysis peritonitis (in 3 [13.0%]), and gastrointestinal infection (in 2 [8.7%]) (Table). Of the 8 catheter-related infections, 2 were definitely related to catheters and 6 were possibly related to catheters. Six of these infections (75.0%) were cured without catheter removal. Central venous catheters were removed from 2 patients for cure.

Of the *S. paucimobilis* isolates, 13.6% (3 of 22) were resistant to amikacin; 20.0% (4 of 20) were resistant to cefo-

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taxime; 4.5% (1 of 22) were resistant to imipenem; 21.7% (5 of 23) were resistant to ciprofloxacin; and 18.1% (4 of 22) were resistant to the combination of trimethoprim and sulfamethoxazole. (Not all antimicrobials were tested in all isolates.) Twenty-one patients (91.3%) were classified as having nosocomial infection. Only 2 patients (9.7%) were considered to have community-acquired infection; both of the patients had infectious colitis and did not have underlying disease.

All patients received initial empirical antibiotic therapy: broad spectrum cephalosporins with or without aminoglycosides (15 patients); fluoroquinolones (4); first- or second-generation cephalosporins (2); carbapenem (1); and a glycopeptide (1). Of 23 patients, 10 (43.5%) received inappropriate initial empirical antibiotic therapy. However, all patients survived despite inappropriate initial therapy. The presence of atypical lipopolysaccharide constitute bound to the outer membrane of *S. paucimobilis,* with the accompanying deficiency of endotoxin activity, has been proposed to explain the low virulence of *S. paucimobilis.*[1,2] The favorable outcome in our study (all cases survived despite initial inappropriate antibiotic treatment) may support the conclusion that *S. paucimobilis* has a low virulence.

Infections caused by *S. paucimobilis* are usually associated with the use of various indwelling devices, according to the case reports.[2,5,8] This study revealed that two-thirds of patients (17 [73.9%] of 23) had an indwelling device, including central venous catheters and continuous ambulatory peritoneal dialysis catheters. The catheter-related infections caused by *S. paucimobilis* had a good clinical outcome, mostly without catheter removal, in this study.

Most *S. paucimobilis* infections reported in the literature have been nosocomial infections or have been related to nosocomial outbreaks.[2,4,5] This trend was true in the present study as well. There were 2 patients with community-acquired infection; both were admitted to the emergency department with fever and diarrhea, and neither had any healthcare-associated risk factors or underlying diseases. To our knowledge, this is the first report about *S. paucimobilis* as a cause of diarrheal disease in immunocompetent hosts.

The *S. paucimobilis* isolates in this study exhibited antibiotic susceptibility trends that differed from those in other studies. Previous reports suggested that third-generation cephalosporins or aminoglycosides are the antibiotics of choice for the treatment of infection caused by this organism.[1,10] However, 20.0% of the isolates in our study were resistant to cefotaxime, and 13.6% were resistant to amikacin. Carbapenems were the most effective therapy in our study. These differing results reinforce the need to treat these infections with individualized antibiotic therapy, guided by the in vitro susceptibility of each clinical isolate.

Even though we examined only 23 patients with *S. paucimobilis* infection, this is the first study, to our knowledge, to evaluate the clinical features and treatment outcomes of *S. paucimobilis* infections in more than 10 patients.

In summary, our results showed that most *S. paucimobilis* infections are nosocomial and that they are commonly associated with indwelling medical devices. Clinicians should consider *S. paucimobilis* a notable hospital-acquired pathogen, especially in cases involving a device-related infection.

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