Bacteremia Secondary to Uncommon Gram-Negative Bacilli Transmitted From the Canine in a Patient With Multiple Myeloma

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Abstract
Sphingobacterium multivorum is a gram-negative rod found in the environment and rarely associated with human infections. Sphingobacterium is the causative agent of infections in an immunocompromised host in most cases. We report a rare case of cellulitis in an immunocompromised host by Sphingobacterium multivorum.

Keywords
Sphingobacterium, Sphingobacterium multivorum, immunocompromised, multiple myeloma

Introduction
Sphingobacterium as a genus consists of many different subspecies, which are Sphingobacterium multivorum, Sphingobacterium mizutae, Sphingobacterium spiritorum, and Sphingobacterium thalphphilum. S multivorum is usually found in nature, specifically in soil, plants, water, and food. However, Sphingobacterium also makes up the gut microbiota in domestic canines as they produce sphingospholipids, regulating homeostasis in their digestive system. Sphingobacterium is detected in both hospitals and natural environments, and approximately up to 50 species have been identified in this genus. A search of the literature reveals only a handful of cases of Sphingobacterium causing infection in an immunocompetent host; most of the cases are seen in individuals who are immunocompromised. Improved microbiological techniques are being frequently used to identify the uncommon organisms causing infections. The cases usually reported with cellulitis progress to bacteremia and, eventually, sepsis. Our patient presented similarly and was treated promptly, which prevented severe complications.

Case Report
A 70-year-old female presented from her primary care’s office with pain in her legs along with redness and edema. She stated that she had mild bilateral leg swelling for the past 2 weeks. She started having left leg pain and erythema, which was worse on the day of her presentation. The patient admitted that the rash started after her dog played with her legs, playfully scratching, biting, and licking her leg intermittently. She denied any fever, chest pain, abdominal pain, or confusion. Her past medical history was significant for multiple myeloma, which was in remission at the time of presentation on maintenance therapy with lenalidomide and dexamethasone. Other past medical history was significant for chronic back pain secondary to spinal stenosis, and osteolytic lesions from multiple myeloma, chronic obstructive pulmonary disease, hypertension, hypothyroidism, and hyperlipidemia. Medications on admission include oxycodone extended-release 40 mg twice daily, oxycodone immediate-release 10 mg every 4 hours as

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needed, lisinopril 10 mg daily, amlodipine 10 mg daily, levo-
thyroxine 75 µg daily, dexamethasone 12 mg once weekly, 
lenalidomide 10 mg daily for 3 weeks on and 1 week off, aspi-
rin 81 mg daily, and atorvastatin 10 mg at night time.

Laboratory analysis on admission is summarized in Table 1. A bedside ultrasound was negative for deep venous thrombo-
sis. The patient was admitted with an initial diagnosis of 
cellulitis and pneumonia and seen by infectious disease. Procalcitonin on admission was 3.2 ng/mL (0.5-2.0 ng/mL—
low risk for sepsis; suggest repeat in 6-24 hours; ≥ 0.5 ng/mL—
determinate risk for sepsis; ≥ 2.0 ng/mL—high risk for sepsis) 

| Laboratory value | Normal values |
|------------------|---------------|
| Hemoglobin       | 12-16 g/dL    |
| White cell count | 4.5-10.8 K/µL |
| Platelet count   | 130-400 K/µL  |
| Blood urea nitrogen | 7-8 mg/dL |
| Serum creatinine | 0.61-1.3 mg/dL|
| Serum sodium     | 136-145 mmol/L|
| Serum potassium  | 3.5-5.3 mmol/L|
| Procalcitonin    | <0.5 ng/mL—low risk for sepsis |
|                  | 0.5-2.0 ng/mL—indeterminate risk for sepsis; suggest repeat in 6-24 hours |
|                  | >2.0 ng/mL—high risk for sepsis |
| Albumin          | 3.4-5 g/dL    |
| Globulin         | 2.4-3.5 g/dL  |

The patient’s cellulitis improved with the antimicrobial 
regimen, and she was discharged with 7 days of levoflaxa-
cin. Repeat blood cultures were negative. During the patient’s 
admission, oncology was consulted for managing her multi-
ple myeloma, both lenalidomide and dexamethasone were 
stopped temporarily and resumed after she completed the 
course of antimicrobials. The remainder of her hospital stay 
was otherwise uneventful.

**Discussion**

*Sphingobacterium multivorum* is an omnipresent non-lactose-
fermentative gram-negative bacillus with cell membrane rich 
in sphingophospholipids, rarely causes infection in humans, 
and can be life-threatening with resistance to many commonly 
administered antimicrobials.5 Initially, it was classified as 
*Flavibacterium* but renamed as *Sphingobacterium* because 
of sphingoglycolipid rich cell membrane.1 It was first 
described in 1981 as *Flavibacterium*. Yabuuchi et al described 
the genus *Sphingobacterium* in 1983.7 It survives in moist 
environments and can contaminate laboratory culture and 
blood culture systems; hence, potential contamination should 
be considered when multiple cases are reported from the same 
facility.5

Like other cases reported in the medical literature from 
genus *Sphingobacterium*, *S multivorum* is known to cause cel-
ulitis and other pathologies in the immunocompromised host. 
In the case report, our patient presented with telltale signs of 
cellulitis, which was different from other cases described in the 
literature as the source of infection. To date, 2 cases of *S multi-
vorum*, one causing cellulitis and other causing necrotizing fas-
citis, have been described in the literature, with both patients 
being immunocompromised and on long-term steroids.3

*Sphingobacterium multivorum*, as discussed earlier, is usually 
found in the environment, predominantly in the soil and 
water. However, in our patient, she could have acquired the 
infected from her pet canine. As this organism lives in the 
canine’s gut, they can get easily transferred by saliva to a 
host, and in the immunocompromised host, they can poten-
tially lead to fatal conditions. Several cases have been reported 
where the immunocompromised host had eventual bactere-
emia secondary to their primary mode of infection.2

Other infections associated with *S multivorum* include necrotizing fasciitis, peritonitis, respiratory infection, cystitis, meningitis, bacteremia mostly in immunocompromised 
patients such as patients with malignancy undergoing chemo-
therapy, patients with diabetes mellitus, chronic liver disease, 
patients undergoing hemodialysis, cystic fibrosis patients, 
patients with HIV (human immunodeficiency virus), and 
patients with the chronic obstructive pulmonary disease.1,5
For bacterial identification, the 16S ribosomal RNA sequence is widely used primarily with unreliable results on conventional testing. The taxonomy of genus *Sphingobacterium* is still being determined since several organisms were identified from the soil, sludge, plants, and food in the past decade.\(^8\) *Sphingobacterium* is known to show a varying degree of pattern to antimicrobial resistance. In our case, the microbe was susceptible to trimethoprim-sulfamethoxazole and quinolones but resistant to cephalosporins. This was not surprising given that *Sphingobacterium* can produce an extended \(\beta\)-lactamase, making it resistant to cephalosporins.\(^9\) The patient, in our case, made an excellent recovery from the use of trimethoprim-sulfamethoxazole and levofloxacin. However, 2 recent cases discussed by Nemoto et al responded to cefazolin with complete resolution of the symptoms even though the minimum inhibitory concentration of cefazolin against the isolated organisms was \(>4\ \mu\)g/mL.\(^3\)

**Conclusion**

Infections with *Sphingobacterium* have been gaining more attention recently, but a literature review shows a limited amount of cases where this microbe is blamed for a series of infections. While a few cases of *Sphingobacterium*, causing infection in the immunocompetent host, have been documented, most cases show infections in an immunocompromised host. It is also worthwhile to note that sometimes the most innocuous sources of infections can be overlooked. Our case reiterates that in an immunocompromised host, even the most harmless microbe can become an opportunistic pathogen; hence, it is essential that along with a detailed history, appropriate workup can go a long way in the care of our patients.

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**Ethics Approval**

Our institution does not require ethical approval for reporting individual cases or case series.

**Informed Consent**

Verbal informed consent was obtained from the patient(s) for their anonymized information to be published in this article.

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