

[ CASE REPORT ]

## First Reported Human Case of Spondylodiscitis by *Staphylococcus condimentii*: A Case Report and Literature Review

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### Abstract:

*Staphylococcus condimentii* is a Gram-positive coccus that was first isolated from soy sauce mash. Only four cases of human *S. condimentii* infections have been reported to date. We herein report the first case of spondylodiscitis caused by *S. condimentii*. A 72-year-old Japanese man complaining of lower back pain and numbness in his legs was diagnosed with spondylodiscitis. A computed tomography (CT)-guided biopsy was performed. A culture of the intravertebral disc aspirate yielded *S. condimentii*. The result was confirmed using gene sequencing methods. The patient was successfully treated without relapse. This case shows that *S. condimentii* can be pathogenic and cause invasive infection.

**Key words:** *Staphylococcus condimentii*, coagulase-negative staphylococci, spondylodiscitis, gene sequencing

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### Introduction

*Staphylococcus condimentii* is a coagulase-negative Gram-positive coccus that was first isolated from soy sauce mash in 1998 (1). Coagulase-negative staphylococci are considered to be less pathogenic than coagulase-positive staphylococci, such as *Staphylococcus aureus*. Coagulase-negative staphylococci are commensals of human skin and mucous membranes. However, *S. condimentii* is found in fermented foods and starter cultures (1, 2), and is not a part of the normal bacterial flora of the human skin (3). Human infections with *S. condimentii* are rare, and the first case was reported in 2014 (4).

We herein report the first case of spondylodiscitis caused by *S. condimentii*.

### Case Report

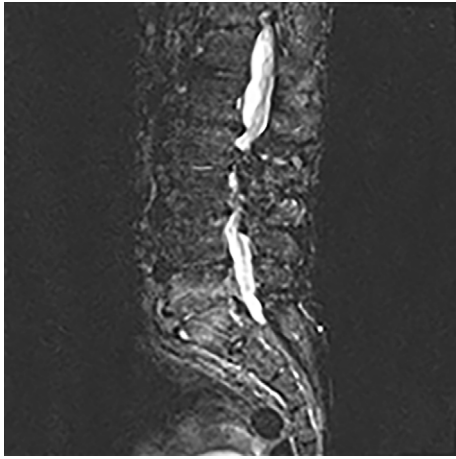
A 72-year-old Japanese man was admitted to our hospital with a 3-week history of progressive lower back pain and numbness in his legs. He had visited a local orthopedic clinic 10 days prior to admission, where he had received a sacral epidural block, which had not relieved his symptoms. He had type 2 diabetes mellitus which was being treated with teneligliptin and ipragliflozin.

On admission, he was alert and oriented and was not in acute distress. His vital signs were as follows: body temperature, 36.7 °C; pulse rate, 87 beats/min; blood pressure, 110/60 mmHg; respiratory rate, 16 breaths/min; and oxygen saturation, 98% while breathing ambient air. A physical examination revealed localized tenderness at the L5-S1 level, but there were no other local signs of infection, such as swelling or redness. He did not have a heart murmur, and he showed no neurological abnormalities. No other abnormali-

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**Figure.** Short TI inversion recovery magnetic resonance image of the lumbar spine. The image reveals spondylodiscitis at L5-S1.

ties were detected on a physical examination. He denied any history of trauma, intravenous drug use, or recent infection.

Laboratory tests showed the following results: white blood cell (WBC) count, 11,300/ $\mu$ L (neutrophil 85.3%); C-reactive protein (CRP), 17.43 mg/dL; and hemoglobin A1c, 8.4%. His serum creatinine and liver function tests were normal. Short TI inversion recovery magnetic resonance imaging (MRI) of the lumbosacral spine revealed a high signal intensity area at the L5-S1 intervertebral disc and adjacent vertebrae (Figure). Contrast-enhanced computed tomography (CT) revealed L5 and S1 vertebral endplate destruction, but no other infectious foci were detected. The patient was provisionally diagnosed with spondylodiscitis, and empirical antibiotic treatment with cefepime (1 g every 8 hours) and vancomycin (1 g every 12 hours) was initiated after performing a CT-guided intervertebral disc biopsy.

Two sets of blood cultures collected on admission were negative. The finding for gram staining of the CT-guided intravertebral disc aspirate was negative. Culture of the aspirate was positive for Gram-positive cocci. The isolate grew as small white, smooth colonies on blood agar. The isolate was identified using matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS) with a MALDI Biotyper (Bruker Daltonics, Bremen, Germany) as *S. condimentii* (log score 1.907).

The result was confirmed using 16S rRNA sequencing (5). A comparison to sequences in the Basic Local Alignment Search Tool (BLAST) database (<http://www.ncbi.nlm.nih.gov/BLAST>) revealed that the sequence was 100% identical to that of *S. condimentii* in a 1398-bp region (GenBank accession number MF678874.1). Since 16S rRNA sequencing sometimes does not differentiate closely-related *Staphylococcus* species (6), we also conducted *sodA* gene sequencing, which is useful for obtaining an accurate species-level identification of coagulase-negative staphylococci (7). The *sodA* gene of the sample showed 100% sequence identity to that of *S. condimentii* strain DSM 11674 in a 432-bp

region (GenBank accession number MF679042.1).

Antimicrobial susceptibility testing was performed using the MicroScan WalkAway system (Beckman Coulter, Tokyo, Japan). The isolate was susceptible to all antibiotics tested, including oxacillin, cefazolin, clindamycin and levofloxacin, according to Clinical and Laboratory Standards Institute M 100-S28 (8).

The patient's lower back pain and numbness in his legs gradually resolved after starting treatment. His antibiotic treatment was changed to cefazolin (1 g every 8 hours) on Day 9 based on the results of antimicrobial susceptibility testing. His antibiotic treatment was switched to oral clindamycin (300 mg 3 times a day) after 4 weeks of intravenous therapy. He took clindamycin for a total of 19 weeks. At the end of the course, his symptoms had disappeared, and his WBC count and CRP level had returned to normal. He remained symptom-free over a further six months of follow-up.

## Discussion

Infectious spondylodiscitis, which is an infection of the intervertebral disc and adjacent vertebrae, accounts for 3-5% of cases of osteomyelitis (9). The most frequent pathogen of infectious spondylodiscitis is *S. aureus*, which accounts for about 50% of the cases (10). Case series studies of spondylodiscitis have shown that 3-12% of cases are caused by coagulase-negative staphylococci (11-14). Most cases of coagulase-negative staphylococcal spondylodiscitis are caused by species that colonize the human skin and mucous membranes, such as *S. epidermidis* (10-12). According to the Infectious Diseases Society of America (IDSA) guidelines, a second aspiration biopsy is recommended in patients with suspected native vertebral osteomyelitis if a skin contaminant is cultured on the first image-guided aspiration biopsy sample (15). However, *S. condimentii* is not known as colonizer of human skin and mucous membranes (3). In addition, the original culture of the aspiration biopsy in the present patient did not grow any microbes other than *S. condimentii*. For these reasons, we regarded *S. condimentii* as the cause of the spondylodiscitis without a second biopsy.

The IDSA guidelines recommend six weeks of antibiotic therapy for the treatment of osteomyelitis caused by oxacillin-susceptible staphylococci (15). In the present case, fluctuation of the patient's symptoms and systemic inflammatory markers resulted in a prolonged duration of therapy. However, this does not necessarily mean that *S. condimentii* is a refractory pathogen and long-term antibiotic therapy is required for the treatment of *S. condimentii* infection.

This patient had been treated with sacral epidural block before his admission. The block injection may have been the source of the infection. However, he had suffered from lower back pain prior to the block injection. Hematogenous spread is the most common mode of infection in spondylodiscitis (10), but the blood cultures collected before the start of antibiotic therapy were negative. Therefore, the

**Table. Characteristics of Cases of Human Infection with *Staphylococcus condimentii*.**

Infection focus	Age (years)/ Sex	Definitive antibiotic treatment	Outcome	References
catheter related bloodstream infection	17/F	cefazolin	survived	3
surgical site infection	7/F	clindamycin, dicloxacillin	survived	16
surgical site infection	49/M	flucloxacillin moxifloxacin/ rifampicin cotrimoxazole amoxicillin/ clavulanic acid	survived	17
meningitis	65/F	ceftriaxone	survived	18
spondylodiscitis	72/M	cefazolin, clindamycin	survived	this report

mode of infection remains unclear in this case.

Only four previous cases of human infection due to *S. condimentii* have been reported: two cases of surgical site infection, a case of catheter-related bloodstream infection, and a case of meningitis (4, 16-18) (Table). All four patients recovered. Coagulase-negative staphylococci are often resistant to methicillin (3), but all four previously-reported cases of *S. condimentii* infection as well as the present case were susceptible to methicillin (4, 16-18). Given the rarity of *S. condimentii* infection in humans, more investigations will be needed to determine the prevalence of methicillin resistance. Gene-sequencing techniques, such as a *sodA* gene-sequence analysis and whole-genome sequencing, are necessary for the accurate discrimination of *S. condimentii*. The need for sophisticated diagnostic techniques to confirm infection may be one of the reasons for the limited number of case reports.

In summary, we present the first known case of spondylodiscitis caused by *S. condimentii*, which is considered to be a low-virulence pathogen. The organism was identified through MALDI-TOF MS and a gene-sequencing analysis. This case and the four previous case reports reveal that *S. condimentii* can cause various infections in humans, although such infections are rare.

Written informed consent for the publication of the clinical details was obtained from the patient.

**The authors state that they have no Conflict of Interest (COI).**

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