



## Case report

## New technology meets clinical knowledge: Diagnosing *Streptococcus suis* meningitis in a 67-year-old man<sup>☆</sup>



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## ARTICLE INFO

## Keywords:

*Streptococcus suis*

Bacteremia

Meningitis

Matrix assisted laser desorption ionization

time-of-flight mass spectrometry

MALDI-TOF MS

## ABSTRACT

*Streptococcus suis* (*S. suis*) infection is known to be caused by the exposure to contaminated animals, specifically pigs and wild boars. This pathogen can cause bacterial meningitis, and one report indicated that it is the most common pathogen causing bacterial meningitis in Vietnam (Mai et al., 2008). A 67-year-old man was diagnosed with *S. suis* bacteremia and meningitis. In general, identification of this pathogen using standard biochemical methods takes time. We successfully diagnosed *S. suis* bacteremia in this patient, however, using the relatively new technology called Matrix-Assisted Laser Desorption/Ionization Time-of-Flight mass spectrometry (MALDI-TOF MS). Knowledge of the characteristics of *S. suis* and this newer technology led to the definitive diagnosis and prompt management of this patient. Herein, we highlight the use of a new technology in the context of sound microbiological knowledge in caring for patients.

## Introduction

*Streptococcus suis* (*S. suis*) infection is known to result from contact with contaminated animals or pork products. Most reported cases are from Southeast Asia, where there is ample contact between humans and farm animals, such as pigs. The major clinical manifestations of *S. suis* infection are sepsis and meningitis. When this pathogen is detected by blood culture, it is important to consider lumbar puncture to rule out meningitis because of the high rate of hearing loss and relapse among infected patients [2]. We report on the early diagnosis of a case of *S. suis* bacteremia and acute bacterial meningitis using Matrix-Assisted Laser Desorption/Ionization Time-of-Flight mass spectrometry (MALDI-TOF MS). Early detection of *S. suis* using MALDI-TOF MS and possession of sound microbiologic knowledge of this specific pathogen may lead to early diagnosis of acute bacterial meningitis due to this pathogen.

## Case report

A 67-year-old man with a history of hypertension, hyperlipidemia, well-controlled type 2 diabetes mellitus, benign prostate hypertrophy, and gastroesophageal reflux disease (GERD) presented to the

emergency department (ED) with generalized body aches.

Ten days prior to hospitalization, while slaughtering pigs, he accidentally cut his right hand. During the next few days, he noticed swelling and pain of his right hand that resolved spontaneously within a few days. Five days later, he noticed fatigue, appetite loss and chills. The next day, head, neck and lower back pain developed, and he visited our ED. At that time, nonspecific cervical pain was diagnosed and acetaminophen was prescribed. Two days prior to hospitalization, he noticed generalized body aches that became progressively worse. The next day, he presented to the ED for further evaluation. Two sets of blood cultures were obtained, which became positive for gram-positive cocci in chains the day after. He was called to return to the hospital for admission.

He did not have a productive cough, night sweats, dysuria, polyuria, or a skin rash. His past medical history was as above. He took tamsulosin, valsartan, lansoprazole, and recently a nonsteroidal anti-inflammatory drug (NSAIDs) as needed for the generalized body pain. He denied any food and drug allergies. The patient owned a meat-packing company and slaughtered pigs and wild boars daily. He had a 30-pack-year smoking history and had drunk three glasses of Japanese sake daily for 47 years.

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On admission, the physical examination revealed a blood pressure of 163/96 mmHg, heart rate of 93 beats per minute, respiratory rate of 20 breaths per min, temperature of 37.4 °C, and an oxygen saturation of 97% in ambient air. He was in no acute distress, but reported moderately severe neck pain, which limited range of motion. There was no cervical lymphadenopathy. Significant vertebral tenderness was noted from the lower cervical to the lower lumbar spine. Extremity examination revealed several well-healed lacerations sustained from slaughtering pigs and wild boars. Neurologic examination was unremarkable.

A complete blood count (CBC) revealed a white blood cell count of 9300 per mm<sup>3</sup>, hemoglobin 16.3 g per dl, platelet count 116,000 per mm<sup>3</sup>. His basic metabolic panel was normal except for a blood sodium level of 129 milliequivalents per L (reference range, 135–145) and blood glucose of 184 mg per dl (reference range, 70–110 mg per dl). Liver function tests were slightly elevated with an aspartate aminotransferase (AST) and alanine aminotransferase (ALT) of 44 units per L (reference range, 13–33) and 48 units per L (reference range, 8 to 42), respectively. An hemoglobin A1c was 6.1% and sedimentation rate 32 mm over 1 h. A urinalysis was negative for pyuria, but had 1 + occult blood. An MRI of his spine did not reveal specific signs of vertebral osteomyelitis or discitis.

The blood culture results were positive for gram-positive cocci in chains, and it was sent for Matrix-Assisted Laser Desorption/Ionization Time-of-Flight mass spectrometry (MALDI-TOF MS) testing, and *S. suis* was detected with the score value of 2.129. This specific pathogen is known to cause meningitis with bacteremia. Thus, a lumbar puncture was performed. The results revealed a cell count of 1159 cells per microliter with 30% monocytes and 70% neutrophils. The glucose level was 31 mg per dl, a protein of 140 mg per dl, which is consistent with acute bacterial meningitis.

Initially, he was treated with a continuous infusion of penicillin G and vancomycin intravenously. The final culture showed *S. suis*, sensitive to penicillin. After starting intravenous antimicrobials, his body aches and back pain slowly improved. Given the presence of meningitis, some experts recommend longer duration of antimicrobial treatment because the relapse rate is high, despite *S. suis* generally being susceptible to in vitro penicillin [2]. We completed a six-week course of intravenous antimicrobials, and the patient recovered completely without relapse, although, several months later benign senile hearing loss was diagnosed, which we believe was not related to *S. suis* infection.

## Discussion

Although *Streptococcus suis* (*S. suis*) infection occurs sporadically, a few outbreaks have been reported in Southeast Asia and China [1,3]. In 2005, an outbreak of *S. suis* infection in southwest China affected 204 people, 38 of whom died (18.6%) [3]. In a report from Vietnam, the mortality rate of this infection was 2.6% (4 of 151 patients died). Most of the cases reported in Japan from 1994 to 2007 were sporadic. Pigs and wild boar are considered reservoirs of *S. suis*, and we believe the reason for the low incidence of this infection in Japan is because there is

less frequent contact between humans and pigs [4]. One report suggests that the density of pigs and incidence of human *S. suis* infection have some correlation [5].

The clinical presentation of *S. suis* infection is reported to be sepsis and bacterial meningitis. The hallmark of *S. suis* pathogenicity is its ability to circulate widely in the bloodstream and maintain a state of bacteremia for a period of time, which is considered the reason meningitis occurs [4].

Although the mortality of *S. suis* infection is relatively low at 2.6%, the complication of hearing loss is high at 66.4% [1]. Given the higher complication rates and some cases of relapse despite two to four weeks of antimicrobials, longer courses of therapy may be necessary. In this case, blood cultures were obtained in the ED and within a day of hospital admission, we successfully detected *S. suis* using MALDI-TOF MS, a rapid molecular diagnostic method. MALDI-TOF MS has proven to be a rapid, accurate and cost-effective microbial identification method for clinically relevant bacteria including streptococcus species [6,7]. Traditionally, microbiological species identification of cultured streptococci is performed either by biochemical methods, or by agglutination methods, which generally take longer to produce results. Because we detected this specific pathogen with this relatively new technology and knew the risk factors and possibility of bacterial meningitis in this setting, we made the decision to perform a lumbar puncture earlier in his clinical course and were able to reach a diagnosis of bacterial meningitis quickly.

MALDI-TOF MS is rapidly attracting interest from many microbiologists and clinicians. Knowing the microbiologic characteristics and classic clinical presentations of specific bacteria are also very useful when treating patients. This case suggests that the combination of microbiological knowledge and the use of new technology can improve the care of patients.

## Conflict of interest

The authors declare no conflict of interest.

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