"The Cost of Swine Dining": A case of human *Streptococcus suis*

Curtis Behenna, DO[1]; Amanda Kelly, PA[2]; Vetriselvi Moorthy, MD[1]; Gordana Simeunovic, MD[1,2]
[1]Infectious Disease Fellowship, Spectrum Health/Michigan State University
[2]Dept. of Infectious Disease, Spectrum Health, Grand Rapids, MI

SPECTRUM HEALTH
College of Human Medicine
MICHIGAN STATE UNIVERSITY

Introduction:

- *Streptococcus suis (S. suis)* is a zoonotic pathogen that can be transmitted from pigs to humans through the close contact.
- Human infection is rare, but typical presentations include meningitis and permanent sensorineural hearing loss.
- Other clinical manifestations include enteritis, endocarditis, arthritis, endophthalmitis, uveitis and spondylodiscitis.
- We describe a case of human *S. suis* meningitis associated with secondary immune-mediated thrombocytopenia.
- Infection was acquired through the occupational exposure in Michigan, United States.

Initial Presentation:

- 48-year-old immunocompetent female was admitted after presenting with 48 hours of nausea, vomiting and non-bloody diarrhea. Later developed headache, fever and chills.
- Exam revealed fever, pulse-temperature dissociation, vesicular lesion on lower lip, petechial rash on extremities and lethargy. Following admission, symptoms progressed to agitated delirium, bilateral hearing loss and expressive aphasia. No meningeal signs were elicited on exam.
- Labs showed a neutrophil-predominant leukocytosis, normal hemoglobin and profound thrombocytopenia with platelet nadir of 9,000 (reference range: 140,000 – 400,000 cells/microliter). Mild transaminitis and moderate hyponatremia.
- Imaging: MRI of the brain was normal.
- Patient reported an occupational exposure to the swine. For 3 years prior to admission, she was employed at a local pig farm as a caregiver in the nursery. Responsibilities included vaccine administration, castration and deliveries. Unexplained deaths of swine for last 3 years. No ill co-workers.

Differential Diagnosis:

1. Rickettsial disease
   - Thrombocytopenia, hyponatremia, deafness & delirium
2. Herpes simplex virus encephalitis
   - Agitated delirium, fever, with PCR-proven HSV-1 labialis
3. *Streptococcus suis* meningitis
   - Occupation, neutrophilic pleocytosis and hearing loss
4. Trichinellosis
   - Occupation, GI symptoms progressing to CNS disease
5. Brucellosis
   - Brucella suis due to occupation. CNS disease less likely
6. Measles
   - Patient non-immune with acute bilateral deafness
7. Non-viral mimics (autoimmune/paraneoplastic)
   - Middle aged female with agitated delirium

Clinical Course:

- Lumbar puncture: neutrophilic pleocytosis
- After LP, received acyclovir, doxycycline and rifampin
- CSF and peripheral blood cultures yielded no growth
- Universal PCR of CSF revealed *S. suis* nucleic acid
- Metagenomic next-generation sequencing confirmed *S. suis*
- Transitioned to ceftriaxone to complete 6 weeks
- Thrombocytopenia with elevated immature platelet fraction
- Corticosteroids for 2^{o} immune-mediate thrombocytopenia
- Audiologic evaluation: bilateral sensorineural hearing loss
- Favorable clinical recovery, except for persistent hearing loss
- Cochlear implant placed two months following discharge

Discussion:

- *S. suis* is a frequent cause of meningitis in pigs. Human cases are rare, with majority being described in SE Asia. Only 8 cases have been published in North and South America, accounting for only 0.5% of the worldwide case publications. Despite high pork production and serologic data suggesting common exposure to *S. suis*, diagnosis of *S. suis* infection in the US remains low. Possible explanations include:
  - Healthcare providers are not familiar with the disease
  - Microbiologic misidentification by non-molecular based techniques
  - Serotypes in US may be less virulent than those in SE Asia
- *S. suis* infections typically manifest as meningitis with hearing loss in patients with history of close contacts with swine. Several other atypical presentations have been reported. We are first to describe *S. suis* causing an immune-mediated thrombocytopenia, that was treated with corticosteroids.
- Some data suggests that corticosteroids may prevent permanent hearing loss. Our patient's hearing loss was not recovered and required cochlear nerve amplification. We do question if outcome would be different had corticosteroids been started earlier, and hope that future studies will provide more insight on corticosteroid use in *S. suis* infections.

References:

Wertheim HFL, Nghia HDT, Taylor W, Schultsz C. *Streptococcus suis*: An emerging human pathogen. *Clinical Infectious Disease*. 2009; 48:617-25. PMID: 19191659

Huong VT, Ha N, Huy NT, et al. Epidemiology, clinical manifestations, and outcomes of *Streptococcus suis* infection in humans. *Emerg Infect Dis*. 2014;20(7):1105-1114. PMID: 24959701

Willenburg KS, Sentochnik DE, Zadoks RN. Human *Streptococcus suis* meningitis in the United States. *N Engl J Med*. 2006;354(12):1325. PMID: 16554543

Smith TC, Capuano AW, Boese B, Myers KP, Gray GC. Exposure to *Streptococcus suis* among US swine workers. *Emerg Infect Dis*. 2008;14(12):1925-1927. PMID: 19046523

Donsakul K, Dejthevaporn C, Witoonpanich R. *Streptococcus suis* infection: clinical features and diagnostic pitfalls. *Southeast Asian J Trop Med Public Health*. 2003;34(1):154-158. PMID: 12971528

King SJ, Leigh JA, Heath PJ, et al. Development of a multilocus sequence typing scheme for the pig pathogen Streptococcus suis: identification of virulent clones and potential capsular serotype exchange. *J Clin Microbiol*. 2002;40(10):3671-3680. PMID: 12354864

Edmond K, Clark A, Korczak VS, Sanderson C, Griffiths UK, Rudan I. Global and regional risk of disabling sequelae from bacterial meningitis: a systematic review and meta-analysis. *Lancet Infect Dis*. 2010;10(5):317-328. PMID: 20417414

Mai NT, Hoa NT, Nga TV, et al. *Streptococcus suis* meningitis in adults in Vietnam. *Clin Infect Dis*. 2008;46(5):659-667. PMID: 19413493

Nghia HD, Tu le TP, Wolbers M, et al. Risk factors of *Streptococcus suis* infection in Vietnam. A case-control study. *PLoS One*. 2011;6(3):e17604. PMID: 21408132

Kay R. The site of the lesion causing hearing loss in bacterial meningitis: a study of experimental streptococcal meningitis in guinea-pigs. *Neuropathol Appl Neurobiol*. 1991;17(6):485-493. PMID: 1800912

Zhang S, Wang J, Chen S, et al. Effects of Suilysin on *Streptococcus suis*-Induced Platelet Aggregation. *Front Cell Infect Microbiol*. 2016;6:128. Published 2016 Oct 17. PMID: 27800304