Diagnosis of *Streptococcus suis* infections

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Summary: *Streptococcus suis is a commensal organism that can occasionally cause outbreaks of meningitis, endocarditis, and/or arthritis. Isolation of S. suis from respiratory sites is common and should be disregarded, as these strains tend to be nonvirulent. Isolation from the central nervous system is best achieved by obtaining cerebral spinal fluid (CSF) and using this sample for blood agar plating and Gram stains. Alternatively, a swab can be inserted through the foramen magnum into the sub-meningeal space. Serotyping of S. suis is only clinically useful when a federally licensed vaccine is to be employed as part of the control strategy.*

Streptococcus suis is a common organism of the nasal cavity of pigs. It is so prevalent that experiments with medicated early weaning show *S. suis* colonizing baby pigs before 10 days of age.[1] Diagnosing *S. suis* based on laboratory results can be tricky, because many isolations lack pathological significance.

Clinical signs

I recognize only central-nervous-system (CNS) signs, endocarditis, or arthritis as being indisputably due to *S. suis*. CNS signs include head tilting, circling, ataxia, and even paddling. Arthritis is usually manifested as an enlarged joint, often with purulent exudate.

Many have claimed that *S. suis* is involved in respiratory lesions, but this has never been adequately proven. I believe that *S. suis* is rarely, if ever, involved in pneumonia or other respiratory conditions, except perhaps in the very rare case of fully susceptible pigs. Isolating *S. suis* from lungs is very common, and can be routinely achieved with care. However, pigs experimentally infected with *S. suis* do not develop respiratory lesions.[2] In addition, using DNA fingerprinting,[3] we found that while CNS isolates from the Midwest were relatively similar to each other, respiratory isolates were very heterogeneous, suggesting that they are part of the normal flora and do not get involved in disease.

Virulence factors in these strains are another source of proof that *S. suis* is not involved in respiratory lesions. Two proteins, MRP and EF, have been shown to be associated with virulence in *S. suis*.[4] While most CNS isolates tend to be MRP+EF+, respiratory isolates tend to be MRP- EF-.[5]

Thus, finding *S. suis* in respiratory sites is largely irrelevant and can be clinically disregarded in most cases. On the other hand, isolating *S. suis* from the brain/meninges or cerebral spinal fluid (CSF) clearly indicates a serious condition you should take steps to treat.

Sampling

Since the exact isolation site is very important, take great care collecting samples if you perform a field necropsy. Opening the brain case with the necropsy knife frequently results in contamination with skin streptococci, which makes diagnosis difficult.

Lisa Tokach of Abilene Veterinary Hospital in Kansas described a technique for obtaining CSF and attempting isolation from the sample that I find very useful. Hold a recently euthanized animal upright in a sitting position while bending its head forward. Insert a vacutainer needle through the foramen magnum to obtain a sample of CSF. To avoid blood contamination of the sample, I usually withdraw the tube before withdrawing the needle.

Another easy technique is to cut open the neck at the atlanto-occipital joint and insert a swab in the sub-meningeal space following the underside of the cranial bone. If you will be sending the swab to a diagnostic lab, immerse it in transport media. Many commercial swabs already have the media inside a small glass vial that you must break.

You can use the CSF samples for direct plating onto blood agar. I have also had good success using direct Gram staining of CSF after centrifugation. In many cases, you'll be able to see chains of Gram-positive cocci, giving a presumptive diagnosis of *S. suis*.

Lesions

I have not had much luck finding good lesions of congestion and purulent exudate in brain/meninges, even in acute cases with obvious CNS signs. Sometimes small amounts of whitish material can be seen on the surface of the brain, but these tend to be exceptional. Lesions of endocarditis are easier to see, but they are relatively rare. Make your final diagnosis by isolation or with histopathology.

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Diagnostic notes are not peer-reviewed.

Serotyping

Once the organism has been isolated and properly identified, it is commonly submitted for serotyping, even though the value of this is somewhat questionable. There are many serotypes of *S. suis* (30 described and probably more), many of which are very rare. Serotype 2 represents 80%–90% of CNS isolates in Europe but only about 50% in the United States.[6] Many serotypes of *S. suis* (non-2 *S. suis*) cause meningitis and this has prompted an interest in serotyping.

When deciding whether or not to serotype, you may be confronted with several possible scenarios:

- If the isolate is from the lung and the pig was submitted for a non-neurological condition, disregard the isolate and do not serotype.
- If a clear neurological outbreak exists and you decide to use an autogenous vaccine, obtain a good CSF sample or meningeal isolate and use for vaccine. Serotyping is not critical.
- If a clear CNS condition exists and you decide to use a federally-licensed vaccine, obtain a good isolate and serotype to make sure that the serotype is present in the vaccine.
- If a clear CNS condition exists and you decide against vaccination, obtain a good isolate and do antibiotic sensitivity. Serotyping is not necessary.

Serotyping is only critical when you decide to use a federally licensed vaccine, to determine if the serotype is present in the vaccine. We do not have good evidence for or against serotype cross protection in *S. suis*; therefore, this seems a reasonable precaution to take. However, if the proteins MRP and EF (especially EF) prove to be protective as well as being virulence factors, it is possible that a vaccine with good levels of these proteins would cross protect between serotypes. Up until now however, the few non-2 *S. suis* that we have tested have all been MRP- EF-, suggesting that these strains have other virulence factors. [5]

Implications

- Only consider *S. suis* a relevant problem if you obtain CSF or brain/meninges isolates. You should also consider occasional arthritis or endocarditis isolates if there are many affected animals on the farm.
- Disregard *S. suis* from respiratory sites in the absence of clinical signs.
- Use CSF or brain/meninges swabs for isolating relevant *S. suis*.
- Use these isolates for autogenous vaccine production, for antibiotic sensitivity, and for serotyping if you will be using a licensed vaccine.

References

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