PHENOXYPEN ®

TECHNICAL BULLETIN 2026

Understanding *Streptococcus suis*
Key insights into Serotype Diversity, Virulence and Diagnostics

Phenoxypen® contains the narrow-spectrum penicillin phenoxymethylpenicillin, making it an effective and targeted treatment option for streptococcal infections in pigs.

This addition to the range of treatment options is very significant, since Streptococcus suis is the most important streptococcal swine pathogen worldwide. Next to causing septic diseases, mostly in 5- to 10-weeks-old piglets, it is also important as a zoonotic agent.

Serotypes

Nine serotypes were originally described, based on antigenicity of capsular polysaccharides (CPS)[1]. In the following years, a total of 26 additional serotypes followed. In 2005, serotypes 34 and 32 were removed from the *S. suis* taxon, and serotypes 33, 26, 22 and 20 were suggested to be classified as *Streptococcus orisratti*.[2–4] Currently, 29 verified *S. suis* serotypes exist.

Serotype 2 is considered the predominant and most virulent serotype in most European and Asian countries. However, serotype 9 is most frequently isolated from diseased pigs in Spain, Germany, and the Netherlands.[5] Untypable isolates are still being discovered. Some of them are non-encapsulated, hence impossible to serotype using antisera. The use of multiplex PCR is significant in serotyping these isolates.

Virulence

Bacterial virulence has been described as the ability to invade and replicate in the host and to evade the host immune system. On many occasions, strains have been defined as virulent or avirulent solely based on the clinical condition of the animal from which the strain was recovered. Research has identified virulence factors of *S. suis* involved in processes such as adhesion, invasion, immune evasion, and inflammatory injury.[6]

The best validated *S. suis* virulence factor is the CPS. This is one of the most important factors, because it helps the bacterium resist phagocytosis and survive in the host.[7] As most low virulence strains are encapsulated, indicating that additional virulence factors are necessary for full virulence. Unencapsulated strains can also occasionally invade host tissue and cause disease.[8] Peptidoglycan, teichoic and lipoteichoic acid components have been implicated as virulence factors, mainly involved in resistance to killing by phagocytic cells, adherence to host cells, resistance against cationic antimicrobial peptides, and/or induction of exaggerated inflammation. These bacterial cell wall components may be surface exposed even in encapsulated strains, inducing an exaggerated inflammatory response of the host.[9]

> *The best validated S. suis virulence factor is the CPS.*

Products secreted by *S. suis* are also known as virulence factors. Of these the hemolysin suilysin (SLY), a pore-forming toxin, is the best characterized being able to damage epithelial, endothelial, and phagocytic cells.[10] EPF (extracellular protein factor) and MRP (muramidase-released protein) also play an important role as a secreted product in *S. suis* infection. EPF is historically linked with highly virulent strains, while the exact role of MRP is not always essential in every model.

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Diagnostics

Presumptive diagnosis of *S. suis* infections is generally based on clinical signs, age of animals, and macroscopic lesions. Confirmation is achieved by the isolation of the infectious agent, whether or not combined with the observation of typical microscopic lesions in tissues. Isolation includes bacterial culture from clinical samples. After that, serotyping is an important part of the routine diagnostic procedure. It can be carried out by different techniques, but many laboratories have adopted the agglutination technique. Some isolates cross-react with more than one typing antiserum, and some strains are auto agglutinating, keeping the percentage of untypable strains around 20%.[11]

Serotyping is an important part of the routine diagnostic procedure.

Matrix assisted laser desorption/ionization time-of-flight mass spectrophotometry (MALDI-TOF MS) can also be used for *S. suis* identification, as an alternative to the use of biochemical tests. There is the possibility to use PCR-based tests for some serotypes. PCR can as well be used to identify virulence-factors, such as the earlier mentioned SLY, MRP and EPF. This can be of help to assess the pathogenic potential of the specific strain.

In addition, technologies continue to evolve as well, like Multilocus sequence typing (MLST) and whole-genome sequencing (WGS) analysis of *S. suis* strains. These techniques can contribute to the discovery of (new) sequence types.

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