



## Streptococcus suis infection in pigs

### “Take home” messages

- There are 35 ‘capsular’ types of *Streptococcus suis* (Ss), with type 2 being predominant in diseased pigs.
- Under modern conditions of pig production Ss has become a key bacterial pathogen particularly in early weaned piglets on multi-site units where immunosuppressive viruses, such as PRRS, are present.
- Disease syndromes associated with Ss are:
  - meningitis
  - polyserositis/arthritis
  - septicaemia and
  - pneumonia.
- The effectiveness of current vaccines in adequately controlling Ss infections is presently problematic.
- Studies with live Ss vaccines have been promising but health concerns constitute an important constraint since Ss is a zoonotic agent, which can infect humans.

***With the current limitations of Ss vaccines there is considerable scope for effective antimicrobials to combat this troublesome organism, particularly in situations where co-infections of Ss with PRRS virus occur***

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## **S. suis infections – disease syndromes**

*S. suis* is one of the most important bacterial pathogens in contemporary pig production.

It is recognized as a distinct species from other group D streptococci and has been subdivided into serotypes by the antigenic specificity of its capsular polysaccharides.

Workers in Quebec, Canada have characterised 35 types, known as “capsular” types rather than “serotypes”. Capsular type 2 predominates in diseased pigs in most countries and is classically associated with:

- meningitis
- polyserositis/arthritis and
- septicaemia.

However, in recent years co-infections of *Ss* with PRRS and SIV viruses have become very common components of the Porcine Respiratory Disease Complex (PRDC).

*Ss* can be found as part of the normal flora of the upper respiratory tract of the pig with animals harbouring more than one type in their tonsils. Attempts to eliminate *Ss* by medicated or segregated early weaning systems (MEW or SEW) on modern multi-site production units have failed, since pigs are colonized by *Ss* very early in their lives and most pigs carry *Ss* at weaning.

The first serious recorded outbreak of meningitis in growing pigs caused by *Ss* type 2 was in the UK in 1973. Major outbreaks increased dramatically over subsequent years and type 2 became the main cause of clinical meningitis in weaned and growing pigs in UK.

Early nervous clinical signs of meningitis include ataxia and adoption of unusual postures, which soon progress to an inability to stand, paddling and convulsions. The eyes are often staring with reddening of the mucous membranes. Other signs of *S. suis* infection include sudden death, endocarditis, rhinitis, abortions and vaginitis. A useful summary of the contemporary and varied manifestations of *Ss* infections was provided in the *Veterinary Record* (2004) 155. 14. 412.



In diagnostic reports from the Veterinary Laboratories Agency (VLA) for England and Wales it was noted that:

“*S. suis* serotype 14 was isolated from pneumonic lungs in 17-18 week old housed finishers.

The organism was considered contributory to a more complex multifunctional respiratory disease problem. In another case sudden death occurring in 1-5% of each batch of 280 pigs 7 days post weaning was investigated by submission of a dead pig. PM examination revealed a fibrinous peritonitis from which *Ss* serotype 3 was isolated in pure culture.

The Winchester, England laboratory carried out PM examination of two neonatal piglets with a history of body tremor, oedematous limbs and recumbency, which revealed systemic infection with *Ss* serotype 2.

Both pigs had generalized lymph node enlargement and the brains were grossly oedematous, although there was no gross congestion of the meninges.”

Halbur, Schmitt and Thanawongnuwech reported from the USA in 2000 on the substantial losses for producers associated with *Ss* induced septicaemia and meningitis. Losses could be particularly severe in herds endemically affected with PRRS virus.

Nursery mortality rates of 10-25% are common in herds co-infected with *Ss* and PRRS virus despite aggressive antimicrobial therapy and use of commercial or autogenous *Ss* vaccines and PRRS vaccines. During the years 1995-2000 there was a 9x increase in the number of *Ss*/PRRS virus co-infection cases reported to the Iowa State University's Diagnostic Laboratory at Ames, Iowa, USA.

PRRS virus primarily infects cells of the macrophage/monocyte/dendritic cell lines including pulmonary alveolar macrophages (PAM's) and pulmonary intravascular macrophages (PIM's). They are important defence mechanisms for clearance of circulating bacteria such as *Ss*. Damage to PAM's and PIM's is thought to account for much of the PRRS virus induced predisposition to *S. suis* associated disease.

Janke, B.H. reported also from Iowa, USA, that *S. suis* was a common co-pathogen with Swine Influenza Virus (SIV) in pneumonic syndromes. It was less common than *Pasteurella multocida* but more common than:

- *H. parasuis*
- *A. pleuropneumoniae* and
- *B. bronchiseptica*.

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## Role of vaccines in control programmes

The effectiveness of vaccination in adequately controlling *Ss* infection is presently equivocal (Amass, S.F.). Commercial *Ss* bacterins are available in many countries and may contain up to 5 different capsular types of *Ss*. Studies in mice have defined the severe limitations of these vaccines. They were efficacious in preventing disease caused by the capsular types of *Ss*, which were contained in the vaccine but were ineffective in providing cross protection against other capsular types.

Autogenous bacterins are widely used but their efficacy has usually not been proven in controlled trials. Live attenuated *Ss* vaccines are currently under investigation. Busque and others in Canada reported in 1997 that up to 80% of 4 week old piglets vaccinated intramuscularly 2-3x with a live avirulent strain of *Ss* type 2 were protected against clinical streptococcosis following challenge with *Ss* type 2.

Conversely a live, virulent strain of *Ss*, endemic to one farm, was used by Torremorell and others in 1998 for nasal or tonsillar swabbing to attempt to induce immunity. However, in the controlled investigation statistically significant differences in death loss or the number of pigs clinically affected with meningitis or joint problems were not detected between the vaccinated and non-vaccinated groups. Efforts to improve the safety and efficacy of the *Ss* vaccines however continue.

It must not be forgotten that extreme caution must be taken when handling live virulent cultures of *Ss*, since it is a zoonotic agent which causes disease in humans.

Human cases are rare, but serious and the vast majority of them have been attributed to *Ss* type 2.



## Summary on role of vaccines in control programmes

- Vaccination against Ss helps to reduce piglet mortality to more manageable levels; it does not however achieve full control of the problem.
- Sow vaccination may improve piglet mortality rates and is less costly and labour intensive than vaccination of piglets.
- When considering the use of an autogenous vaccine, on-farm epidemiological studies should be performed in order to identify the appropriate strains to be included in the vaccine.
- Studies with live Ss vaccines have been promising, but greater efficacy and safety are now key requirements.

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