

A retrospective evaluation of actions taken to control *Streptococcus suis* infection

Dennis J. Villani, DVM

Summary

Retrospective evaluation of several actions taken to control an outbreak of *Streptococcus suis* in nursery pigs is described. Minimizing variation in weaning age, with concurrent use of an autogenous vaccine and administration of ceftiofur sodium at processing and weaning, appeared to contribute to a decrease in nursery mortality.

Keywords: swine, *Streptococcus suis*, pig flow, nursery, mortality

Received: June 15, 2002

Accepted: September 4, 2002

Streptococcus suis remains a troubling disease in modern production systems. Multiple factors appear to contribute to the expression of clinical signs. Overcrowding, poor ventilation, excessive temperature fluctuations, and mixing of pigs with an age variation greater than 2 weeks have been indicated as important stress factors in the development of *S suis* infection in susceptible pigs.¹

Clinical signs are most notably death with no premonitory signs, and meningitis characterized by early CNS signs, including incoordination, inability to stand, paddling, opisthotonus, convulsions, and nystagmus. Septicemia, arthritis, and pneumonia are also associated with *S suis* infection.¹

Case Description

History

A 7000-head nursery received pigs bi-weekly from an off-site, 2500-sow herd located within 4.8 km. The two buildings at the nursery site each had seven 130-m²

Table 1: Actions taken to reduce the infection rate during an outbreak of *Streptococcus suis* in a 7000-head nursery after a sudden increase in nursery mortality to 20% in October 1999.

October-December 1999

More rapid response to treat individual sick pigs
Culture and histopathology of brain tissue in moribund pigs: no isolates
Improved sanitation at sow farm
Reduced temperature fluctuations in nursery
Medicated nursery drinking water (several successive antibiotics)
Medicated nursery feed

January-February 2000

More strict adherence to rules on fostering and all-in, all-out pig flow at the sow farm
Adherence to strict all-in, all-out nursery pig flow
Culture of brain tissue: *S suis* serotype 7 isolated
Autogenous vaccine used in pigs at weaning and sows 4 and 2 weeks before farrowing
Reduced variation in weaning ages

June 2000

Culture of brain tissue: *S suis* serotype 4 isolated
Culture of lung tissue: *S suis* serotype 8 isolated

July 2000

Addition of *S suis* serotypes 4 and 8 to autogenous vaccine
Increased average weaning age of pigs
Pigs injected at 1-2 days of age and at weaning with ceftiofur sodium

rooms, with each room managed all-in, all-out. A revamped school bus delivered weaned pigs from the sow farm to the nursery site every Thursday and Friday. The bus was parked at the nursery site when not in use.

In October 1999, there was a sudden increase in nursery mortality, with losses in some groups exceeding 20%. Mortality rates exceeding 15% continued through December.

Clinical signs included coughing (typically starting 2 to 3 weeks after placement), acute meningitis, and death. Brain tissue from moribund pigs was submitted to a diagnostic laboratory, and histopathological lesions associated with streptococcal meningitis were reported. No bacteria were isolated. Many actions were implemented in an attempt to reduce the infection rate (Table 1).

October through December 1999 Management changes. After the diagnosis of *S suis* infection was made, the initial response was to implement conservative management changes both at the sow farm and nursery. The emphasis at the nursery was on responding more rapidly to disease

Swine Veterinary Services, PC, 1516 W Main Street, Greensburg, IN 47240; Tel: 812-663-5731; Fax: 812-663-4273; E-mail: villani@hsonline.net.

This article is available online at <http://www.aasv.org/shap.html>.

Villani DJ. A retrospective evaluation of actions taken to control *Streptococcus suis* infection. *J Swine Health Prod.* 2003;11(1):27-30.

breaks with appropriate individual treatment of sick pigs, and minimizing temperature fluctuations in the nursery rooms. Antibiotics used in the drinking water, initiated at placement, included amoxicillin, tiamulin, and trimethoprim-sulfa. Chlor-tetracycline combined with tiamulin was used in the feed. At the sow farm, the level of sanitation was improved, particularly in the processing of neonatal piglets.

Response to management changes. Although mortality was acceptable (<3%) in some groups of pigs after the initial management changes, the infection rate of *S suis* continued to escalate, with mortality rates exceeding 10% in some groups.

January through July 2000

Management changes. After isolation of *S suis* serotype 7 from brain tissue of moribund pigs in January 2000, vaccination with an autogenous vaccine was initiated in

March. Sows and gilts were vaccinated 4 and 2 weeks before farrowing and pigs were vaccinated once at weaning. Additional cultures were performed in June to determine if the autogenous vaccine was effective in controlling the clinical expression of serotype 7. *Streptococcus suis* serotype 4 was isolated from brain tissues and serotype 8 was isolated from lung tissues of affected pigs, and these two serotypes were added to the autogenous vaccine in July.

In January 2000, rules on fostering and creating nurse sows were reviewed at the sow farm (fostering limited to pigs <3 days of age, except to create nurse litters within a farrowing room), and strict all-in, all-out pig flow was enforced. Breeding records were evaluated, and the importance of achieving consistency in breeding numbers by controlling gilt entries was emphasized.

As the average weaning age had dropped to less than 18 days, with wide variation in

pig ages (Figure 1), the weaning schedule was changed in July 2000 to Thursday and Monday instead of Thursday and Friday, allowing 4 additional days for pigs to nurse.

In July 2000, injections of ceftiofur sodium (Naxcel; Pharmacia Animal Health, Kalamazoo, Michigan) were implemented at 1 to 2 days of age when pigs were processed (10 mg per pig) and at weaning (20 mg per pig).

Response to management changes. The *S suis* serotype 7 bacterin introduced in March did not appear to have an effect on mortality rate. Nursery mortality rates exceeded acceptable levels for pigs that were weaned through July 2000. Improved nursery mortality was observed in groups of pigs weaned after August 1, 2000, when average weaning age had increased (Figure 1), variation in weaning age had become less extreme, and the three-way autogenous

Figure 1: Changes in mortality and average weaning age in a 7000-head nursery during an outbreak of *Streptococcus suis* infection.

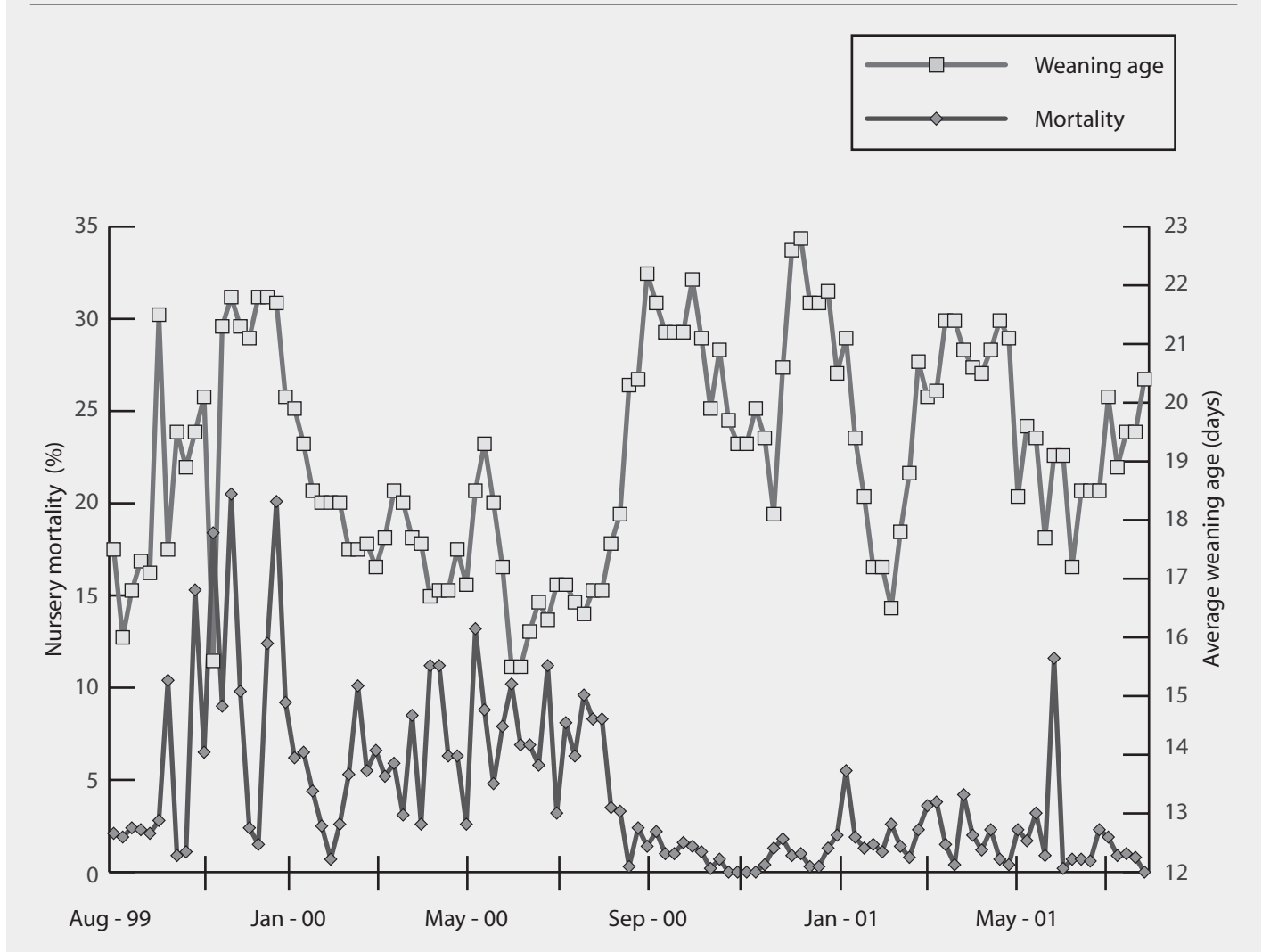
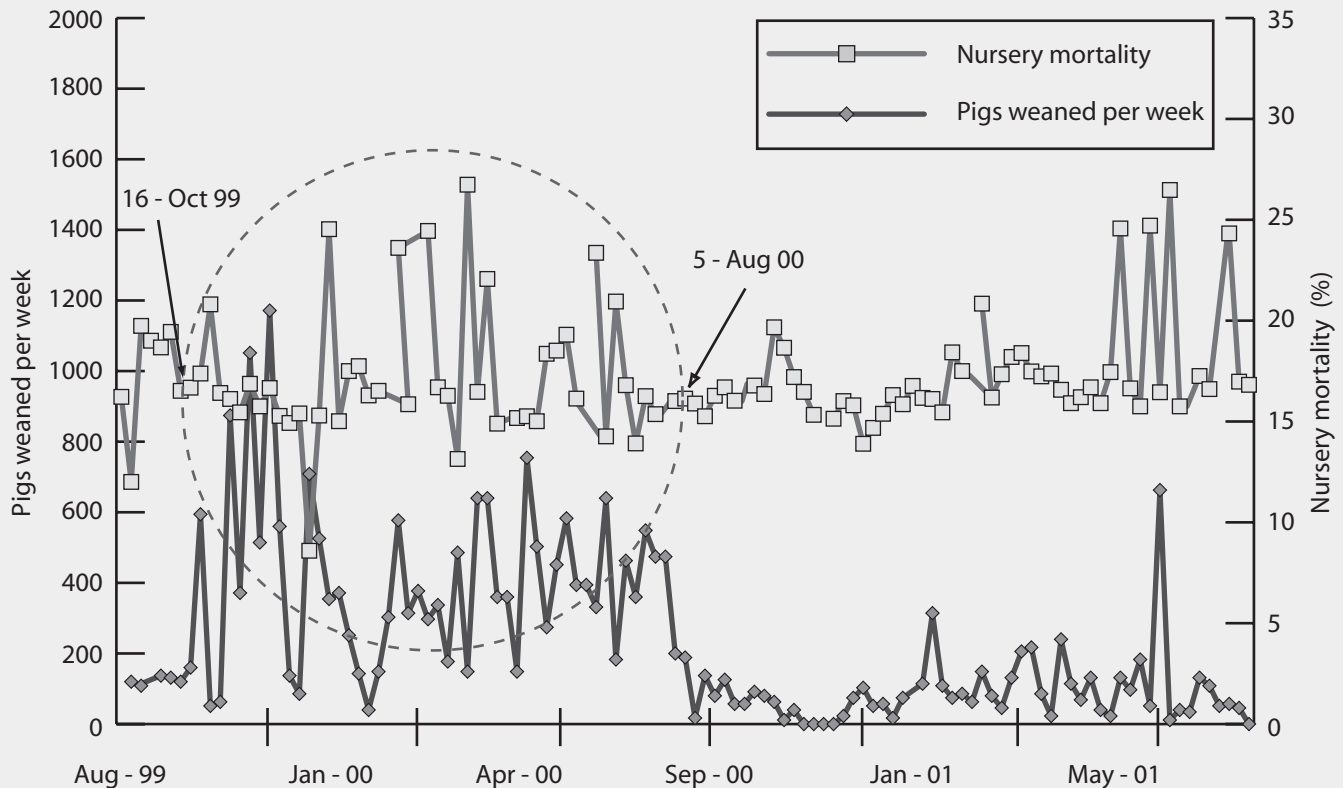


Figure 2: Pigs weaned per week and mortality in a 7000-head nursery infected with *Streptococcus suis*. A period of extreme variation in weekly production of weaned pigs is circled.



S suis vaccine had been introduced. However, concurrently with these changes, ceftiofur sodium injections were administered to pigs at processing and weaning, and this may also have contributed to the reduction in nursery mortality.

Retrospective evaluation of actions taken to control *S suis* infections

Pig flow, the term used to describe the regular movement of pigs from one stage of production to the next, refers in this case to the movement of pigs from the sow farm to the nursery at weaning. Pig flow is one of many factors that have an impact on the health of nursery pigs.

Streptococcus suis infections in this herd caused the highest mortality from October to December 1999, shortly after the onset of a period of extreme variation in weekly production of weaned pigs (Figure 2). Mortality rates were sporadically high over the next 7 months, and clinical incidence of *S suis* continued, which indicated that the management changes initiated up to January 2000 were ineffective at controlling further infection breaks. Ventilation in the nursery rooms was monitored exten-

sively, and the incidence of *S suis* appeared unresponsive to adjustments made.

Other confounding factors were considered rule-outs in the cause of disease, including parity of sows farrowed, concurrent diseases, labor changes, and crowding. The parity of sows farrowed during the 2-year period ranged from 3.5 to 4.0, which did not indicate a significant change. The sow herd was positive for porcine reproductive and respiratory syndrome (PRRS), which was considered a concurrent disease factor in pig mortality. During this 2-year time period, however, pigs remained PRRS-negative through the nursery and finisher stages as determined by extensive serological monitoring and testing of pooled sera by polymerase chain reaction. Management was consistent except for improvements in overall sanitation, which did not seem to have an effect on nursery mortality for several months. Pig density was considered a causative factor, but nursery mortality did not seem to vary with the number of pigs per room.

Maternal antibody interferes with vaccination in pigs less than 4 weeks of age, especially when sows are vaccinated pre-farrow-

ing. The primary objective of vaccinating the sows twice before farrowing was to provide maximum passive immunity to the pigs. In addition, pigs were vaccinated at weaning to provide active protection to those with inadequate levels of maternal antibody. Although the absence of serotype 7 from cultures in June does not definitively demonstrate that the vaccine was efficacious, its efficacy would have been in question if serotype 7 had been isolated from clinically affected pigs. The impact on mortality of the additional serotypes added to the autogenous vaccine is unclear, because results of concurrent management changes were also having an effect on nursery mortality.

The consistent breeding of sows and gilts to the established target started in February 2000, but the results of this were not seen until July 2000, when consistent target numbers of pigs started coming from the sow farm. This may explain why clinical *S suis* continued in groups of pigs until then, and why group mortality rates exceeded acceptable levels until August 2000.

Starting about the first of January 2000, the average weaning age trended downward

to less than 18 days for most groups until August 2000, when an upward trend exceeded 20 days of age. The change to weaning on Thursday and Monday (July 2000) clearly increased average weaning age, and improvement in nursery mortality also seemed to correspond to the timing of this change. However, prior to October 1999, when the average weaning age was less than 18 days, nursery mortality had been consistently less than 3%. Furthermore, the average weaning age of several groups between October and December 1999 was greater than 20 days when nursery mortality reached its highest levels (Figure 1). Therefore, the increase in average weaning age and weight may not have directly affected the *S suis* infection rate. However, the wide variation in weaned pig numbers, which was probably a causative factor in the *S suis* outbreak, might have been related to each of these variables.

The impact of ceftiofur sodium injections for pigs at processing and at weaning is unclear, because the timing of this action coincided with the improved consistency of

pig numbers weaned per week. Nursery mortality improved after ceftiofur sodium injections and use of the multivalent vaccine were initiated, so it was not possible to make a field-trial comparison of the effectiveness of ceftiofur in treated and non-treated pigs. We believe that the ceftiofur sodium injections alone would not have eliminated clinical *S suis* infections and reduced nursery mortality, but ceftiofur has a low minimum inhibitory concentration for *S suis*, and there may have been some benefit from this program.

Variation in weekly pig numbers is an important stress factor in the development of clinical *S suis* infections.¹ In this case, many actions were implemented to reduce the incidence of *S suis* over a 9-month period. In retrospect, correcting weekly age variation in weaned pigs by minimizing the variation of weekly pig numbers, and concurrently administering an autogenous bacterin and ceftiofur sodium, appeared to be an effective strategy in returning this system to acceptable nursery mortality.

Implications

- During an outbreak of *S suis* infection, pig flow may be a primary factor in development of disease.
- Consistent production from the sow farm is critical to optimizing herd health.
- Minimal variation in weekly numbers of weaned pigs can be achieved without reducing total throughput of pigs by controlling gilt entries and variation in weekly breeding numbers.
- Actions such as use of autogenous bacterins and judicious use of antimicrobials should be considered with other management changes to control *S suis* infection in nursery pigs.

Reference – refereed

1. Higgins R, Gottschalk M. Streptococcal diseases. In: Straw B, D'Allaire S, Mengeling W, Taylor D, eds. *Diseases of Swine*. 8th ed. Ames, Iowa: Iowa State University Press. 1999:563–570.

