VACCINATION AGAINST 

STREP. SUIS

VACCINATION WITH SUBUNIT BACTERIN REDUCES MORTALITY DUE TO Streptococcus suis IN AN ENDEMICALLY INFECTED HERD


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Summary

Disease caused by infection of piglets with Streptococcus suis is responsible for some of the most significant and disturbing losses in swine production. The disease is recognized by many producers and veterinary swine specialists as the most important infectious disease currently affecting swine production in North America.

The three main objectives of this vaccine trial were to control disease in piglets by vaccinating sows in an infected herd, to determine whether vaccination alters anti-Streptococcus suis antibody titre in sow colostrum, and to compare the disease in two groups that were vaccinated with subunit bacterins to a control group. Two strains of S. suis (serotypes 3 and 9) were isolated from untreated pigs showing signs of meningitis in this herd. Two subunit vaccines (A and B) were prepared from a combination of both of these strains and were combined with adjuvant. The control group was given placebo vaccine (C) prepared from sterile saline and adjuvant. Sows and gilts were randomly assigned to one of the three groups and were vaccinated intramuscularly at four weeks before farrowing and one week before farrowing. Barn staff recorded the identification of pigs that died and whether they showed signs of S. suis disease prior to death. The antibody titre in the colostrum of the sows that were vaccinated with vaccine A (titre of 3581) or vaccine B (titre of 1807) was significantly (P < 0.01) greater than the titre in the colostrum of the control sows (titre of 109). Likewise, piglets nursing sows vaccinated with A or B vaccines had greater antibody titres than piglets nursing control sows. The number of piglets born alive was not different among groups A, B or C, but more pigs in control group C died of S. suis disease than in vaccine groups A or B. In conclusion, both vaccine A and vaccine B reduced death from S. suis disease in litters from sows or gilts vaccinated with either of them. Both the vaccinated sows and their piglets had more antibody than controls.

Introduction

Throughout Canada, Streptococcus suis is responsible for a wide variety of diseases in pigs including meningitis (brain infections), polyserositis (arthritis), septicemia (generalized infection throughout the piglet), pneumonia, abortions and others. The meningitis and poor viability in weaned pigs can be particularly disturbing to barn staff who are trying to produce healthy, vigorous livestock.

These Gram positive bacteria are also responsible for a wide variety of infections in older swine. Although older animals are less likely to develop meningitis, infected older pigs can have arthritis, pneumonia, other diseases or serve as carriers of the infection and transmit it to young pigs. A recent study compared six types of medicated early weaning (MEW) management techniques that are often used to try to break the chain of infection, but found that none were able to prevent infection of piglets by Streptococcus suis. Infected pigs at the slaughter plant also represent a threat to human health. S. suis can cause serious disease in which deafness is a frequent result of S. suis-induced meningitis in people. As a zoonotic disease (which can spread from animals to people), it is important to control to maintain export markets. Pork worth over three-quarters of a billion dollars was exported from Canada in 1993.

These studies were conducted in order to develop an effective subunit vaccine for the prevention of S. suis disease in piglets. The goal of vaccine development was addressed by three specific objectives:

- Reduce disease in piglets. The meningitis and poor viability in weaned pigs is particularly disturbing to barn staff and expensive for all producers who want healthy, vigorous stock.
- Compare death loss in vaccinated and control litters. Comparison of the effect of treatments will indicate the potential value of this vaccine to control this widespread disease.
- Measure antibody in colostrum. This measurement serves as a further explanation of how the benefits of vaccination occur.
Experimental Procedure

The strains of *Streptococcus suis* used for vaccine production originated from different pigs in the same herd with systemic disease. The strains were stored frozen at -70°C in infected spinal cord until used to produce the vaccine. These strains were serotype 3 and serotype 9.

The subunit vaccine was prepared from *Streptococcus suis* that were grown under special conditions designed to duplicate the environment experienced during an infection in a pig. This was designed to cause the production of antigens that are most important for the production of a protective immune response.

All colostrum samples were titrated in an ELISA (to measure antibody that reacts) against the *S. suis* extracted antigens. The titre of the colostrum was determined to be the highest dilution giving an absorbance greater than the mean plus one standard deviation of the background wells. Background wells contained no colostrum.

Sows were randomly (balanced for parity) allocated to one of three groups and vaccinated twice at one month and one week before farrowing. Sows in the three groups were given one of two subunit vaccines or an antigen-free control. The effect of vaccination was determined by measurement of the amount of antibody present in sow colostrum, and the amount of *S. suis* disease in piglets from vaccinated and control litters.

Results

The level of anti-*Streptococcus suis* antibodies in the colostrum of sows and gilts vaccinated with subunit vaccine was significantly (P < 0.01) greater than the titre in the colostrum of those given the control. This indicates that sows do not develop effective immunity just from the *Streptococcus suis* bacteria that are naturally present in the herd. Also this confirms that vaccination with the subunit vaccine has a major impact on colostrum antibody levels.

Since the vaccinated sows had higher colostrum antibody titres than controls, it was expected that their piglets would also have higher antibody titres than piglets nursing control sows. The titres in the serum from a sample of piglets nursing sows that had been vaccinated with subunit vaccines A or B were significantly (P < 0.05) greater than the titre in piglets that suckled control sows. This confirms that antibody was transferred to nursing piglets.

The greater antibody titre in vaccinated sows was translated into reduced mortality for their piglets. Piglets from sows vaccinated with either subunit A or subunit B had a mortality of 9%; whereas those in the control group had a mortality of 17% due to *Streptococcus suis* diseases as shown in Figure 2.
In order to ensure that this beneficial effect was due to increased sow immunity, we also compared the death loss in litters from sows with low colostrum antibody titres with the death loss in litters from sows with high antibody titres. The death loss due to Streptococcus suis in piglets from sows with a colostrum antibody titre greater than 500 was only about one third of the loss in litters nursing sows with lower antibody titres.

Finally we checked the age at which piglets died to see whether piglets from vaccinated sows were just dying later. Of the piglets which died from Streptococcus suis diseases, those from the control group died at an average age of 51 days, vaccine subunit A piglets died at an average age of 45 days and vaccine subunit B piglets died at an average age of 52 days. The slight differences in age when death occurred were not significant (P = 0.16). Therefore the subunit vaccines truly reduced disease in this herd.

In conclusion, vaccination with Streptococcus suis subunit vaccine increased the antibody titre in the colostrum of vaccinated sows and gilts. This passive protection was passed to nursing piglets and resulted in lower piglet mortality.

This experimental Streptococcus suis vaccine was shown to be an effective tool for control of disease in this herd. This information will lead to future development of commercial vaccines that will provide swine producers with a tool to control this devastating disease.

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