

UNDERSTANDING THE SPREAD OF RESPIRATORY DISEASE IN NURSERY PIGS

Cate Dewey
Department of Population Medicine
University of Guelph

ABSTRACT

Blood samples were taken from 21 sows and their piglets on two farms. The pigs were sampled at 1, 3, 5, 7, 9, and 11 weeks of age. The serum was tested for antibodies against Porcine Reproductive and Respiratory Syndrome virus (PRRS), *Mycoplasma hyopneumonia* and swine influenza virus (SIV). On both farms, PRRS and mycoplasma were active in the nursery but SIV was not spreading through the barn. Inconsistent vaccination of sows and gilts lead to variable maternal antibody levels in the nursing pigs. This resulted in the spread of PRRS beginning the week after weaning. The spread of PRRS through the nursery was very rapid when the pigs were 5 to 7 weeks of age. The mycoplasma vaccine was not optimally effective when it was given to pigs that were less than 3 weeks of age. This is likely due to the interference with the maternal antibodies. Serological profiling of pigs for respiratory disease can be used to determine the effectiveness of the current vaccination program and to understand the spread of diseases through a group of pigs. Using this information, the producer can make informed decisions about the use of antimicrobials to control disease and vaccinations to prevent disease.

INTRODUCTION

Nursery pigs in Ontario are often exposed to Porcine Reproductive and Respiratory Syndrome virus (PRRS) and *Mycoplasma hyopneumonia*. There has been concern about swine influenza virus (SIV) over the past few years in both nursery and grower/finisher pigs. When pigs are infected with multiple respiratory pathogens, they have significantly more severe clinical disease than those exposed to only one pathogen at a time. The resulting disease is worse than the simple combination of the two diseases. Therefore it is important to understand when loss of maternal antibody protection occurs for these diseases and when the disease begins to spread through the nursery barns. Using this information, we can determine when to institute disease control measures.

Society is pushing the livestock industries to raise animals without in-feed antibiotics. The primary reason for this is the rise in antibiotic-resistant bacteria affecting the human population. Although there are many causes of these drug-resistant bacterial infections, one concern is the use of antimicrobials in food-producing animals. This concern has lead several European countries to restrict the use of in-feed antibiotics used for pigs.

Producers in North America are taking a pro-active stance in response to what has happened elsewhere and are investigating the possible ramifications of similar changes to our swine industry. Several important initiatives have begun. Producers are increasing their knowledge of antimicrobials through the Ontario Swine Medicines course and the Canadian Pork Quality program. Producers with their veterinarians are actively evaluating the use of antimicrobials on their production units. This will ensure that antimicrobials are used in the most effective manner.

There are many Ontario researchers currently working on the best approach to raising nursery pigs without antimicrobials, or with reduced levels of antimicrobials. The purpose of this project was to understand the spread of respiratory disease in nursery pigs through the use of serological profiling of pigs on commercial farms.

METHODS

Two commercial production units volunteered to cooperate in this study. On each farm, blood samples were taken from 21 sows in the farrowing room and five pigs from each of their litters. The pigs were bled every other week until they were 12 weeks old. The serum from these pigs and sows was tested by Animal Health Laboratory of the University of Guelph for antibodies against the PRRS virus (IDEXX ELISA), Mycoplasma hyopneumonia (DACO ELISA) and Swine Influenza virus (HI). These results were graphed to show the number of pigs that were positive for these diseases at one week of age, determine when they lost their colostral immunity and when they became actively infected in the nursery.

On farm 1, we conducted a vaccine trial. Within each litter, pigs were assigned to be vaccinated against Mycoplasma hyopneumonia using the Inglevac[®] M hyo, Boehringer-Ingelheim vaccine. The pigs were randomly assigned to be vaccinated at 2, 3 or 4 weeks of age or were left as unvaccinated controls. Half of the control pigs were vaccinated against PRRS at weaning (3 weeks of age) and the other half were left as unvaccinated controls. All of the pigs that received the mycoplasma vaccine also received the PRRS vaccine.

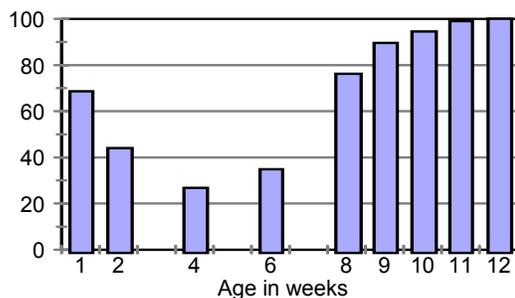
RESULTS AND DISCUSSION

Porcine Reproductive and Respiratory Virus

For this study we designated a PRRS positive SP ratio to be one that was at least 0.4. In farm 1, 29% of the sows had positive SP ratios for PRRS virus and none had SP ratios of more than 2.5. In the first week of life, 69% of nursing piglets had positive titres. This shows that sows can concentrate the antibodies in the colostrum for the protection of their piglets. By 4 weeks of life, only 27% of the pigs still had positive PRRS SP ratios.

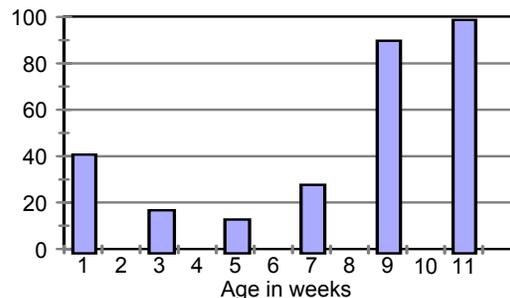
Farm 1: PRRS

Percent of Positive pigs



Farm 2: PRRS

Percent of Positive pigs



Active PRRSV infection (S/P ratio >2.5) was observed in 7% of the nursery pigs. The average age of pigs with active PRRSV infection was 55 days. The youngest pig to show active infection was 33 days of age while the oldest pig was 62 days of age. Four of the pigs with these high SP ratios were further tested to determine whether or not they were infected with the vaccine virus or the wild strain of the virus. We recovered virus from only two of these pigs. In one pig, the virus appeared to be similar to the vaccine and the other was infected with an intermediate strain. The serum results indicated that 5.9% of the pigs that did not receive PRRSV vaccine were actively infected in the nursery while 8.2% of the PRRSV vaccinated pigs became actively infected. This shows that the use of the PRRSV vaccine did not prevent active PRRSV infection in the nursery. Pigs that received the M hyopneumoniae vaccine at 3 or 4 weeks of age were less likely to develop an active PRRSV infection than those that received the vaccine at 2 weeks of age or not at all. This may have been due to high maternal antibody levels in the 2-week old pigs interfering with the development of an active immune response to the M hyopneumoniae vaccine.

On farm 2, 40% of the sows had positive SP ratios for the PRRS virus and none had SP ratios of more than 2.5. In the first week of life, 41% of nursing piglets had positive titres. At three weeks of age, only 19% of pigs had a positive titre. It also shows that the PRRS antibody from the colostrum does not last a very long time. By five weeks, only 13% of the pigs were positive. This means that most of the pigs were susceptible to get PRRS. Of the pigs that were positive for PRRS, three of these pigs were still losing antibody from the colostrums, but 11 pigs had increasing levels of antibodies. These 11 pigs were infected with the PRRS virus when they were 3 weeks old. The producers were not vaccinating these pigs against PRRS, but were vaccinating the sows at weaning. However, there was an indication that these pigs were becoming positive for PRRS while they were nursing or shortly after weaning. Further examination of the SP ratios by parity revealed a difference in the ratio by parity. Only 39% of the gilts had a positive titre. The gilts with negative ratios had values of 0.000 to 0.23. In the sows, the negative values ranged from 0.000 to 0.35. The gilts with positive ratios had values of 0.58 to 1.72. The sows with positive ratios went as high as 0.79. Follow-up discussion with this producer included a review of the vaccination protocol. The producer was going to establish a system to ensure that the vaccination was being given to all sows and gilts.

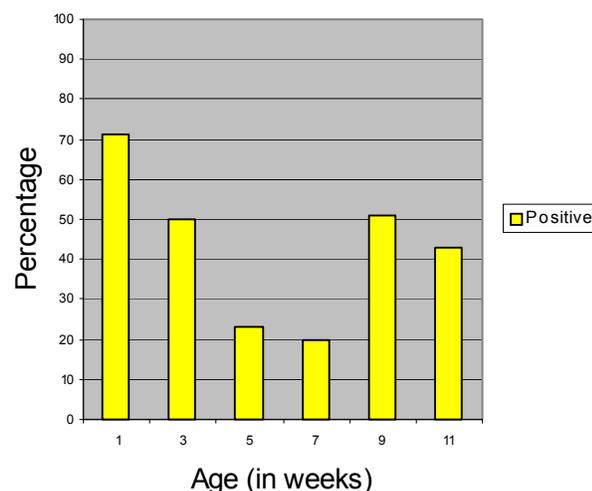
For a disease to spread from one pig to another we have to have a pig shedding the virus and we need another pig that is susceptible to infection. When these nursery pigs were 5 weeks old, 85% of them were susceptible to infection because they had no antibody against the PRRS virus. We wanted to know how fast the disease spread through the nursery pigs. From 5 weeks to 7 weeks of age, 60% of the negative pigs developed antibodies to PRRS. From then on, the disease spread very quickly through the group of nursery pigs. Between 7 weeks and 9 weeks of age, 88% of the negative pigs became positive. By the time the pigs were 11 weeks old, 99% of the pigs had antibodies against PRRS virus. This means that the disease spread rapidly through the group when the pigs were 5 to 9 weeks old. Clinically this group of pigs became ill at 4 weeks of age and the most severe illness was seen when the pigs were 7 to 8 weeks old.

Mycoplasma hyopneumonia

On farm 1, there were 52.4% of the sows positive for antibodies to M hyopneumoniae (optical density of specimen <50% of the optical density of control). When the first blood sample was taken from the piglets at an average age of 5 days, 53.7% were positive for M hyopneumoniae antibodies. When the second sample was taken at an average of 18 days of age, only 25.8% of the pigs still tested positive for M hyopneumoniae antibodies. This shows that the pigs had begun to lose their passive immunity by the time the second blood sample was taken.

On farm 2, 78% of the sows were positive for antibodies to M hyopneumonia (mycoplasma). During the first week of life, 71% of the piglets had a positive titre for mycoplasma. The piglets were vaccinated at 16 days of age. When they were five weeks of age, only 23% of the pigs were positive for mycoplasma antibodies. It seems as though the pigs were not responding to this first vaccination. It is likely that the maternal antibodies were too high at the time of vaccination. Although this was the most convenient time to give the vaccine, it was probably the wrong time for the pigs in this herd. The pigs experienced a cough beginning at four weeks of age and then becoming most severe at 6 to 8 weeks of age. It appeared that the active spread of PRRS virus in the nursery barn in combination with the in-effective mycoplasma vaccination protocol, resulted in pneumonia in these pigs. It was recommended on this farm that the pigs be vaccinated against mycoplasma when they were at least three weeks of age, so that the maternal antibody was lower at the time of vaccination. It was also suggested that when the sows and gilts were uniformly vaccinated against PRRS, there would be less PRRS shedding in the nursery. This will likely reduce the problems due to mycoplasma as well.

Mycoplasma Distribution vs. Age



Swine Influenza Virus

Swine influenza did not appear to play an important role in the clinical problems in either herd. In farm 1, 85.7% of the sows were positive for SIV (HI test titre >1:8). Although some pigs still had a positive titre at 11 weeks of age, these were pigs that were born to sows with high titres. These pigs were still losing their maternal immunity.

On farm 2, 57% of the sows had positive SIV titres. However, 82% of the sows were positive but none of the gilts were positive. Although SIV did not seem to cause a problem in this nursery barn, it is interesting to see the difference in titres between sows and gilts. Titres last a long time in adult and growing pigs.

CONCLUSIONS

Inconsistent vaccination of sows and gilts against PRRS virus can lead to active PRRS infections in both the nursing and nursery pigs. Maternal antibody against the PRRS virus only lasts a few weeks and this leaves nursery pigs prone to infection if the virus is circulating in the nursery. Mycoplasma vaccination may be ineffective if given to pigs with a high maternal antibody titre. It is important that this vaccination is not given to pigs less than three weeks of age if the sow has antibodies that are passed to the pig in the colostrum. It is expected that this will be true on most farms in Ontario. Swine influenza virus did not cause a problem in the pigs on these two farms. The antibodies received in the colostrum last a long time - even past 11 weeks of age.

Serological testing was used to understand the spread of infection in this group of nursery pigs. Although I have only presented the PRRS results, the samples collected can be tested for most infectious diseases. Examples of these would include PRRS, Mycoplasma and swine influenza virus. The samples can be collected on the same pigs over time as was done in this study, or by taking samples from at least 10 pigs from each age group all on the same day. Although following one group of pigs over time may provide more accurate information, it is very time consuming and it takes a long time to obtain the results. By sampling all pigs in one day, the producer and veterinarian will get the same information if most groups of nursery pigs have a similar disease pattern. The results of the tests can be used to establish vaccination protocols and to determine the best time to use pulse medication in the nursery barn. Serological monitoring is a cost-effective component of a herd health management program.

ACKNOWLEDGMENTS

I appreciate the financial support of Ontario Pork, Ontario Ministry of Agriculture, Food and Rural Affairs, Ontario Agri-Food Industry, Agriculture and Agri-Food Canada and the cooperation of the participating producers and veterinarians. This project involved work from many people including Dr. Robert Friendship, Beth Young, Heather Gunn, Susan Fink, Tom Rosendal, Dr. Angel deGrau, Dr. Zvonimir Poljak, Kevin Vilaca, Nicol Janecko, Karen Richardson, Olga Mizak and Bryan Bloomfield.