BRIEF COMMUNICATION

Effect of dexamethasone treatment on PRRSV isolation and serum antibody titers in convalescent swine

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Summary: *Weaned pigs free of porcine reproductive and respiratory syndrome virus (PRRSV) antibodies were challenged intranasally with PRRSV. After challenge, blood and nasal swabs were collected until the pigs reached market weight. Samples were evaluated for the presence of PRRSV and PRRSV antibodies. Once the pigs reached market weight (110 days postchallenge), they were injected daily for 5 days with dexamethasone. After challenge, virus was isolated from nasal swabs and plasma and pigs developed PRRSV antibodies. Virus was not isolated from nasal swabs or plasmas after dexamethasone administration and serum antibodies did not increase.*

Porcine reproductive and respiratory syndrome (PRRS) was first recognized in 1987 and 1988 in swine herds in North Carolina, Iowa, and Minnesota.[1] Since 1990, PRRSV infection in swine has been reported in many parts of Europe, North America, and Asia.[2–4] The significant features of the disease have been comprehensively and thoroughly discussed in a recent review article.[5]

One of the remarkable characteristics of PRRSV has been the speed with which it has spread. For example, it was shown that PRRSV probably was not present in Iowa in 1980, but spread rapidly after it was introduced into the state in the mid-1980s.[6] The mechanisms of transmission are not well understood at the present time, but probably include a number of factors, including a low minimum infectious dose, a prolonged shedding period, and, in some cases, shedding in semen with sexual transmission.[7–9]

In viral infections, stress may affect the pattern of shedding and transmission. Perhaps the most familiar example of this phenomenon is pseudorabies virus (PRV), which subclinically infected pigs can shed when stressed.[10–12] The effect of stress on PRRSV shedding patterns and transmission is currently an area of interest. A recent study reported the failure of prednisolone-stressed pigs to transmit PRRSV 4 and 6 weeks after virus inoculation.[13] In a separate experiment, it was found that movement stress and administration of prednisolone resulted in the virus being transmitted by animals that had seroconverted to PRRSV 15 weeks earlier.[14] Other workers have looked at chemical immunosuppression of the closely related arterivirus, lactate-dehydrogenase elevating virus (LDV) of mice. In LDV-infected mice, it was found that treatment with either dexamethasone or cyclophosphamide caused an increase in the titer of LDV in the blood that lasted for up to 40 days without any apparent changes in serologic antibody responses.[15] The experiment reported here was modeled on the work done with LDV in mice. Specifically, the objectives were to determine whether administering dexamethasone to pigs several months post-exposure to PRRSV would result in changes in viral excretion, serum virus titers, or serum antibody titers.

Materials and methods

Three 5- to 6-week old pigs were obtained from a herd determined to be free of PRRSV infection by ongoing periodic serological monitoring. In addition, each pig was seronegative for PRRSV antibodies by the indirect-fluorescent antibody (IFA) test at the time of challenge. Two pigs (numbers 85 and 88) were inoculated intranasally with PRRSV (ISU-P) grown on swine alveolar macrophages. A third pig (number 96) was inoculated intranasally with PRRSV-contaminated fetal lung filtrate obtained from a pregnant gilt challenged with PRRSV (ISU-P). Isolate ISU-P was originally isolated from a swine herd undergoing clinical PRRS. It causes reproductive problems typical of PRRS when given to pregnant gilts and sows.

Dexamethasone sodium phosphate (LyphoMed, Inc., Rosemont, Illinois) was administered intramuscularly at a dose of 2 mg per kg for 5 days beginning on day 110 PC. The average weight of the pigs at the time of dexamethasone administration was 102 kg (225 lb).

Nasal swabs were collected using sterile dacron swabs (Baxter Healthcare Corporation, McGaw Park, Illinois). Swabs were pre-

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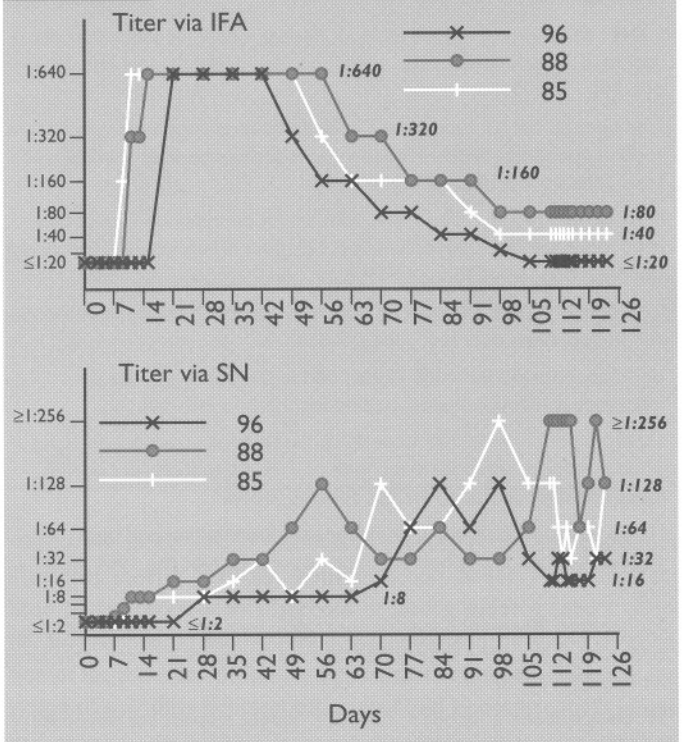
Figure 1



IFA and SN antibody titers after exposure to PRRS virus.

moistened in Earles medium (Grand Island Biologics Company, Grand Island, New York), supplemented with sodium bicarbonate, amphotericin B (Squibb and Sons, Incorporated, Rolling Meadow, Illinois), and gentamicin sulfate (Schering Veterinary Corporation, Omaha, Nebraska). Both nostrils were sampled with a single swab. The swab was then placed into 1 mL of the supplemented Earles medium. After centrifugation, the supernatant was stored at -70°C until isolation procedures were performed.

Nasal swabs were collected every other day from day 3 postchallenge (PC) through day 15 PC and then weekly through day 105 PC. Pigs were also swabbed daily at the time of dexa methasone treatment from day 110 PC through day 115 PC and then every other day through day 122 PC. Ten mL of blood were collected into serum tubes and into tubes containing EDTA. The blood collection schedule was the same as the schedule used for nasal swabbing. The plasma was stored at -70°C until isolation procedures were performed and the serum was stored at -20°C until the serum neutralization (SN) and IFA tests were performed. Virus isolation from nasal swabs and plasma and the SN and IFA tests were performed as previously described.[10]

Results

The PRRS virus-inoculated pigs remained clinically normal following challenge. Furthermore, no clinical signs associated with PRRSV infection were seen in the pigs following dexamethasone administration. Antibodies appeared in the serum of all three pigs within 3 weeks following exposure to PRRSV as shown by IFA (Figure 1). The IFA titers gradually declined over time and one pig became seronegative (<1:20) by day 110 PC. The IFA titers remained unchanged during and following dexamethasone treatment. The pig (number 96) that was IFA negative at the time of dexamethasone treatment remained seronegative during and after dexamethasone treatment. All three pigs developed SN antibody titers within 4 weeks of infection (Figure 1). As was seen with the IFA titers, the SN antibody titers remained relatively stable during and after dexamethasone treatment. In contrast to the IFA test, all three pigs were seropositive by the SN test at the end of the study.

The two pigs (numbers 85 and 88) that received the culture-derived virus were viremic at the time of first collection on day 3 PC and remained viremic through day 13 PC. The pig receiving the filtrate-derived virus did not become viremic until day 9 PC and remained viremic through the time of sample collection on day 15 PC. This pig was no longer viremic at the time of sample collection on day 21 PC, indicating that the viremic state disappeared sometime between days 15 and 21 PC. Virus was isolated from the nasal swab of one of the pigs receiving culture-derived virus on day 5 PC and from the pig receiving filtrate-derived virus on day 11 PC. After dexamethasone was administered, virus was not isolated from nasal swabs or the plasma of the three pigs.

Discussion

Pigs infected with PRRSV are capable of transmitting the virus long after they are initially infected. A previous study found that sentinel pigs became infected when placed in contact with sows inoculated with PRRSV 99 days earlier.[16] Other investigators described transmission of PRRSV by pigs that had seroconverted 15 weeks previously.[14] These reports suggest the possibility of a prolonged carrier state in PRRSV infection. Lactate dehydrogenase-elevating virus of mice and equine arteritis virus, viruses closely related to the PRRSV, are themselves known to produce long-term infections.[17]

This work focused on the effect of stress on PRRSV infection. The dexamethasone dose and regimen used were chosen because the protocol had been shown to induce reactivation and shedding of PRV from latently infected pigs.[10] In this study, virus was not recovered from nasal swabs or serum following dexamethasone treatment and detectable changes in serum antibody titers were not observed. The small number of pigs used in this study prevented the use of statistical analysis to evaluate the data and, therefore, no conclusions can be drawn from the results. At most, we can say that these results are compatible with an earlier study in which it was reported that prednisolone administered for 5 consecutive days to pigs previously infected with the PRRSV did not result in transmission to sentinel pigs.[13] Both of these studies conflict with a previous study in which movement stress and administration of prednisolone was associated with transmission by previously infected pigs.[14] A number of factors could be responsible for the conflicting results of these studies, including (but not limited to) the virus used in the study, the dose of virus given to the pigs, the type of stress (chemical or physical), the dose and treatment regime for chemical stress, the length of time since ex-

posure to PRRSV, and the sensitivity of the assay utilized to detect the presence or absence of virus and changes in antibody titers. In addition, if stress induces shedding in a small proportion of pigs, large numbers of pigs would need to be evaluated to detect the pigs shedding virus following stress. Until further studies are performed to assess the effects of stress on PRRSV shedding and more information becomes available regarding transmission of PRRSV, pigs from PRRSV-infected herds should be considered potential sources of PRRSV.

Implications

- The effect of stress on PRRSV-infected pigs has been an area of concern because of the potential for higher virus shedding levels by stressed pigs, such as newly purchased animals.
- Using dexamethasone treatment to model stress, this small study found no evidence of stress-induced shedding on the basis of attempted isolation of PRRSV from nasal swabs or changes in serum antibody titers.

Acknowledgements

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