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SDEC Partners Research Update

Project Update: Farrowing room transmission of PCV2 from sows to piglets

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Background

- Porcine circovirus 2 (PCV2), the cause of porcine circovirus-associated disease (PCVAD), is widespread in swine farms throughout the United States.
- Vaccination of pigs, frequently around the time of weaning, is effective in preventing PCVAD and reducing the level of PCV2 in serum, but it does not eliminate infection.
- Infection in finishers appears to occur at 10-15 weeks of age, when they become viremic and nearly all finishing pigs are infected with PCV2 suggesting that gilts and sows are also infected.
- PCV2 DNA can be detected in breeding sows, newborn piglets and piglets less than 10 weeks of age with no signs of disease.
- Shedding has been shown to occur in colostrum, milk, feces, and in nasal and oral swabs, and it is stable in the environment.

Objective

The objective of this study was to examine the PCV2 virological and immunological status of sows, pre-suckling piglets, and the farrowing environment of midwestern US sow farms to determine PCV2 exposure risks, transmission dynamics, and immunological impacts at the time of farrowing.

Results

- PCV2 DNA was widely distributed on all 6 farms examined with 73% of sows being viremic. Viremia levels were highly variable among sows and among farms and neither parity nor sow vaccination status was correlated with viremia levels. Even though serum DNA levels were negative in some sows, PCV2 DNA was still observed in 58 of 59 sows in at least one tested sample, such as oral fluids, colostrum, or feces. (Figure 1).
- Pre-suckling piglet serum was PCV2 DNA-positive in 63% of 281 piglets, indicating widespread in utero infection. Piglets from non-viremic sows usually had low or undetectable levels of viremia, whereas piglets from viremic sows gave a full range of viral DNA levels, suggesting that sows with low level infection are less likely to pass virus to piglets in utero. Interestingly, axillary skin swabs from pre-suckling piglets were highly positive with PCV2 levels correlating to viral levels in sow serum and uterine fluid.

Results continued

- All sows, regardless of PCV2 viremia status, had high levels of PCV2-specific IgG, with the farms practicing sow vaccination showing high levels of antibodies in all animals. However, there was no significant correlation between viremia and antibody level in serum. PCV2-specific IgG levels in colostrum were present at high levels, especially in vaccinated sows, and were correlated with serum antibody levels. Anti-PCV2 antibodies were also observed in oral fluids, but at lower levels. (Figure 2)
- The large amount of PCV2 shedding from sow secretory and excretory compartments suggests that the piglet-rearing environment was heavily contaminated. Not surprisingly, PCV2 DNA was readily detected throughout the piglet environment irrespective of sow vaccination status. High levels of PCV2 DNA were readily detected with or without high pressure washing, and were decreased but not eliminated after disinfection. However, even though PCV2 DNA was found in the environment, no live virus was able to be grown from these samples.

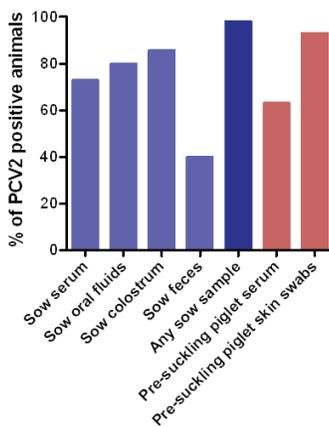


Figure 1. Percent of PCV2 DNA positive animals.

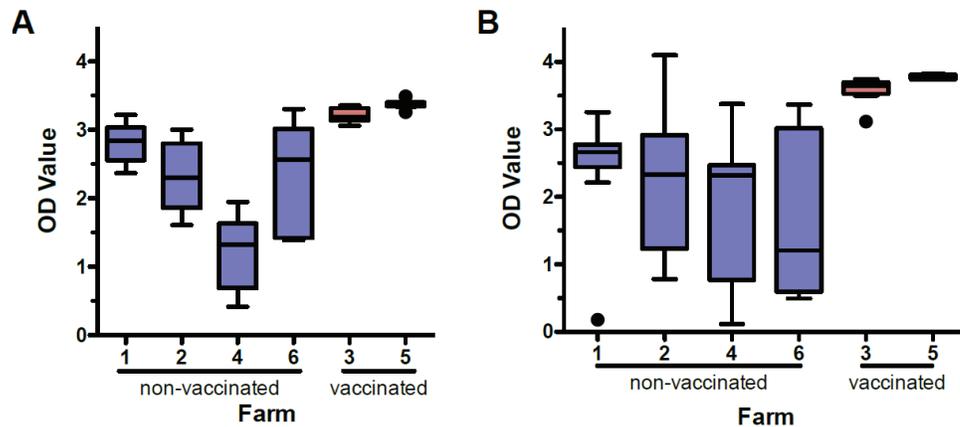


Figure 2. PCV2-specific IgG antibody levels measured by ELISA in (A) sow serum and (B) colostrum. Sow serum samples are diluted 1:50 and colostrum samples are diluted 1:5000

Conclusions

- PCV2 infection persists in the presence of a robust antibody response.
- Live virus is often present in tissues, even in non-viremic sows.
- Piglets are readily infected with PCV2 in utero and are under constant challenge by PCV2 through contact with infected sows and a contaminated farrowing environment.
- Anti-PCV2 antibodies are present in colostrum and oral fluids, but they do not affect transmission to piglets or the viral load in sows.
- Overall, the majority of sows are PCV2 positive and piglets are born PCV2 positive, but maternal antibodies are able to control infection, thus disease is not manifest.

Implications

- PCV2 infection is persistent and the majority of animals are infected in utero.
- Vaccine administration, which almost always occurs after birth around the time of weaning, is occurring after previous exposure to the virus and perhaps even in the face of an active infection.
- Knowledge about the onset of natural infection will facilitate development of experimental immunity models that reflect PCV2 infection dynamics in swine populations and enable future vaccine development.