

Influence of Maternal Antibodies on Efficacy of Porcine Circovirus Type 2 (PCV2) Vaccination To Protect Pigs from Experimental Infection with PCV2[∇]

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Due to the ubiquitous nature of porcine circovirus type 2 (PCV2) in the pig population and the increasing use of PCV2 vaccines in breeding herds, the majority of dams have been exposed to field PCV2 or PCV2 vaccines, resulting in piglets with varied levels of passively acquired PCV2 maternal antibodies. The objective of the current research was to investigate the influence of passively acquired anti-PCV2 antibodies on PCV2 vaccine efficacy. Sixty 26-day-old pigs were divided into four groups: vaccinated pigs with no maternal PCV2 antibodies at the time of vaccination (VAC-NEG; $n = 9$), vaccinated pigs with maternal PCV2 antibodies at the time of vaccination (VAC-POS; $n = 21$), nonvaccinated pigs with no maternal antibodies at the time of challenge (NVAC-CNEG; $n = 15$), and nonvaccinated pigs with maternal antibodies at the time of challenge (NVAC-CPOS; $n = 15$). Vaccinations and challenges were performed on trial days 0 and 28, respectively, according to group designation. The pigs were monitored for clinical signs of disease daily and weighed weekly, and blood was collected weekly. All pigs were necropsied on trial day 49, and tissues were evaluated for macroscopic and microscopic lesions. Serum was evaluated using PCV2 immunoglobulin G (IgG) and PCV2 IgM enzyme-linked immunosorbent assays, quantitative PCV2 PCR, and a serum PCV2 neutralizing antibody test. In comparison to NVAC-CPOS pigs, VAC-POS animals had significantly ($P < 0.01$) less severe microscopic PCV2-associated lymphoid lesions and significantly ($P < 0.04$) reduced PCV2 genomic copies in serum following PCV2 challenge. These results indicate that vaccination with Suvaxyn PCV2 One Dose reduces viremia and prevents microscopic lesions associated with PCV2 in the presence of maternal antibodies.

Porcine circovirus type 2 (PCV2) is a small, nonenveloped, single-stranded DNA virus that is ubiquitous in the swine population (1). PCV2 continues to have a major economic impact on the global swine industry. It has been associated with systemic infection (1), respiratory disease (7, 8), enteritis (9), reproductive failure (10, 13, 23), and porcine dermatitis and nephropathy syndrome (20, 22). In order to combat the growing problems associated with PCV2-associated disease, several vaccines were introduced into the U.S. market in 2006. Initial reports on the efficacy of these products indicated that vaccination is an effective tool to reduce PCV2-associated losses in production systems (15).

Due to the combination of vaccine usage and the ubiquitous nature of PCV2, the majority of females in breeding herds have been exposed to field PCV2 or PCV2 vaccines, and their piglets have varied levels of passively acquired PCV2 antibodies. In a previous report, sows from six U.S. breeding herds were tested for the presence of PCV2 antibodies, and 50 to 80% of dams from the herds had sample-to-positive (S/P) ratios greater than 0.6, 15 to 42% had S/P ratios between 0.2 and 0.6, and 0 to 8% were seronegative (18). This study also

indicated that maternal antibodies decay over a wide window of time (2 to 15 weeks of age) in growing pigs within a population, depending on the initial concentration of maternal antibodies (18).

Although maternal antibodies against PCV2 are present at various levels in the swine population, their ability to completely prevent infection has not been proven. In a study by McKeown et al., 12-day-old commercial pigs with various levels of maternal antibodies were infected with a PCV2 infectious clone (11). Results indicated that high levels of maternal antibodies provided some protection (reduced peak viremia levels) but did not completely prevent infection. In animals with low levels of maternal antibodies, protection was not conferred (11). These results agreed with a study by Ostanello et al. which suggested that while maternal antibody levels were related to the development of PCV2-associated disease, they were unable to prevent clinically silent PCV2 infections (19).

While vaccines have been shown to be effective when used on pigs with no or low levels of passively acquired PCV2 antibodies, the effect of high levels of maternal antibodies on PCV2 vaccination remains unknown. Veterinary practitioners have raised concerns that pigs with detectable levels of passively acquired PCV2 antibodies may not develop a protective immune response to PCV2 vaccines. The study described in this report was designed to investigate the influence of passively acquired PCV2 antibodies on PCV2 vaccine efficacy, using one of the commercial PCV2 vaccines available in the

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