Biologic and economic benefits of controlling subclinical PCVAD with vaccination

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Introduction

Porcine circovirus associated disease (PCVAD) is associated with porcine circovirus type 2 (PCV2) infections and has been reported to mainly affect pigs between approximately 6 and 18 weeks of age.[1] Pigs affected with PCVAD show any of a variety of clinical signs, including growth retardation, palpable lymphadenopathy, diarrhea, pallor, dyspnea and death. At necropsy, non-collapsed lungs, interstitial pulmonary edema, mesocolonic edema and nephritis may be observed.[2] Primary histopathological lesions are lymphocyte depletion together with granulomatous inflammation.[2] A mild clinical presentation or subclinical form of PCVAD has been reported.[1] In these cases growth performance, not mortality, is the primary factor affecting profitability.[2] The objective of this study was to confirm the efficacy of Ingelvac CircoFLEX® (Boehringer Ingelheim Vetmedica, Inc., St Joseph, MO) in pigs vaccinated at 3 weeks of age in a production system with a subclinical presentation of PCVAD.

Materials and methods

The 3-site production system was negative for PRRS and positive for *Mycoplasma hyopneumoniae* and PCV2. Peak PCV2 viremia occurred around 10 weeks of age without clinical expression of PCVAD. Pigs weaned at approximately 21 days of age from multiple sow herds were commingled at the nursery and used as study animals. Sow farm offspring from 3 geographic areas were utilized. Pigs from each geographic area were represented in individual barns at two nursery sites. A total of 1200 pigs were placed on test (600 vaccinates and 600 controls). Like pens of pigs (same sex, same size) with either 25 or 50 pigs per pen were designated as study pens. Within the study pens, every other pig was vaccinated or injected with placebo, double ear-tagged (color coded by treatment group), and individually weighed. Vaccinates and controls were commingled within study pens contained in barns where the rest of the pigs (non-study pigs) were not vaccinated. Vaccinates received a single 1 mL IM dose of Ingelvac CircoFLEX®. Controls received a single 1 mL IM injection of sterile water placebo. Pigs were individually weighed on the day of vaccination (day 0), day 41 prior to being moved to a finishing barn, and again on day 131 at the end of the study. In addition, two pigs (one vaccinated, one control) from half of the pens were ear-tagged with a red tag; and blood samples were collected at 6, 9, 13, 17 and 21 weeks of age and submitted to the Boehringer Ingelheim Vetmedica Health Management Center for serologic and PCR testing. Finally, 509 vaccinated and 474 control pigs were evaluated at the slaughter plant for various carcass measures. Necropsies and tissue diagnostics were performed on a subset of mortalities.

The experimental unit was the individual pig and performance data were analyzed using ANCOVA (JMP) with starting weight used as a covariate. One-way ANOVA was used to analyze the PCV2 quantitative PCR (qPCR) geometric values. Comparisons in both models were made to the non-vaccinated controls using Student's t-test. An arbitrary cut-off weight of 180 pounds on day 131was utilized to reflect finishing cull rates. Carcass data were analyzed using ANOVA having treatment and date of marketing as main effects. Comparisons were made using Student's t-test.

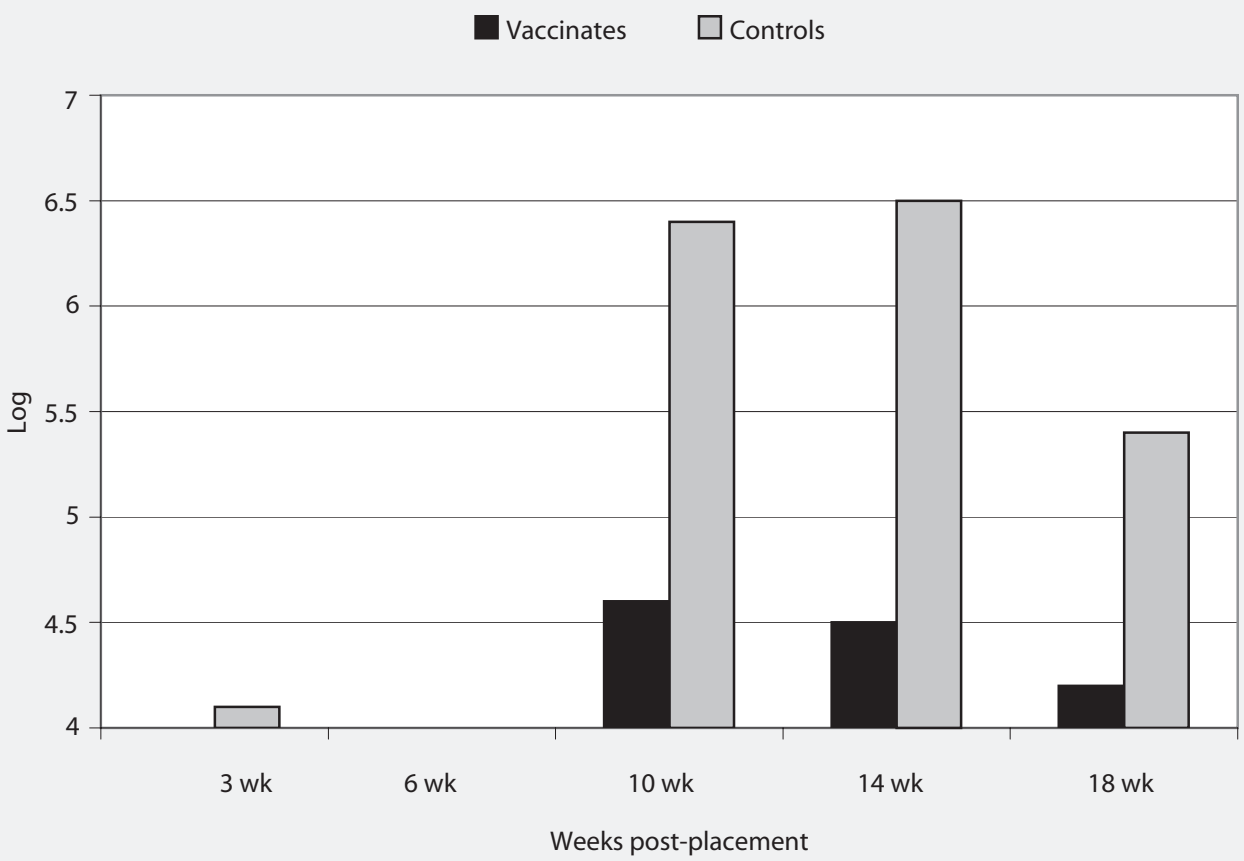
Economic benefits were calculated based primarily upon the total live weight delivered to slaughter and the relative market value of pig weight classes. Pigs exceeding 255 lbs live weight were valued at $51.00 per hundred pounds while lighter pigs were valued at $31.00 per hundred pounds.

Results

Pig groups were considered clinically normal throughout the evaluation even though PCVAD was confirmed histologically in individual pigs in the study, thereby confirming the presence of subclinical PCVAD. No adverse local or systemic side effects attributable to vaccination were observed. Vaccinated pigs had significantly reduced PCV2 qPCR viral loads at 10, 14 and 18 weeks post-placement ($P < 0.0001$; Figure 1).

There were no differences between the two treatment groups for day 0-41 ADG during the nursery phase ($P = 0.94$, Table 1). Pigs vaccinated with Ingelvac CircoFLEX® had improved day 41-131 ADG and day

Figure 1: PCV2 quantitative PCR results for vaccinates and controls



0-131 ADG compared to non-vaccinated controls ($P < 0.0001$, Table 1).

There were no significant differences between the two treatment groups for either nursery ($P = 0.54$) or finishing ($P = 0.27$) mortality rates (Table 2). Vaccinated pigs had a significant reduction in finishing cull rate compared to non-vaccinates ($P = 0.001$, Table 2).

Pigs vaccinated with Ingelvac CircoFLEX® had heavier hot carcass weights ($P = 0.01$) and a more muscular carcass with greater depth of loin muscle ($P = 0.003$, Table 3). Vaccinate (n = 509) hot carcass weights averaged 194.23 lbs while control (n = 474 head) hot carcass weight averaged 190.76 lbs. In terms of total live weight delivered for slaughter (including culls), vaccinates produced 5,805 lbs more pounds than controls (140,784 lbs vs 134,979 lbs, respectively). The total market value (including culls) of vaccinates and controls was determined factoring in additional revenue based on the packer market grid matrix with vaccinates earning about a 1% premium in value relative to the controls. From those total values, one can conservatively estimate a $4.38 return on investment (ROI) for every dollar invested in Ingelvac CircoFLEX® vaccine in this study.

Table 1: Growth rates of vaccinated and nonvaccinated pigs.

Item	CircoFLEX	Control	*P* value
d0 starting weights, lbs	11.66	11.78	0.48
d0-41 ADG, lbs/day	0.80	0.80	0.94
d41-131 ADG, lbs/day	1.92	1.85	<0.0001
d0-131 ADG, lbs/day	1.57	1.52	<0.0001

Table 2: Mortality and cull rates for vaccinated and nonvaccinated pigs.

Item	CircoFLEX	Control	*P* value
Number of pigs placed	600	600	-
Nursery mortality rate, %	3.17	4.00	0.54
Finishing mortality rate, %	2.07	3.16	0.27
Combined nursery and finishing mortality rate, %	5.18	7.07	0.19
Finishing cull rate, %*	5.16	10.24	0.001

* Pigs less than 180 lbs on day 131

Table 3: Least square means for pig carcass measures

Item	CircoFLEX	Control	*P* value
Number of pigs	509	474	-
Hot carcass weight, lbs	194.23	190.76	0.01
Loin muscle depth, mm	58.36	56.79	0.003

Conclusions

The presence of PCV2 infection in growing pigs may have a negative impact on performance even when we do not observe clinical manifestations of the disease. Consistent with a herd diagnosis of subclinical PCVAD, mortality rate was not different between vaccinates and controls, nor were clinical signs of PCVAD evident even though PCVAD was confirmed histologically in individual pigs. The vaccinated group had significant increases in key productivity parameters which were associated with reductions in PCV2 viral load. Significant biologic and economic improvements were achieved by controlling the subclinical impact of PCVAD by vaccination with Ingelvac CircoFLEX®.

References

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