EFFECTS OF PCV2 VACCINE ON THE GROWTH PERFORMANCE OF PIGS AND MORTALITY RATE IN A PCV2-POSITIVE COMMERCIAL SWINE HERD

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Summary

A total of 1,470 pigs were used to study a commercial sow herd with a history of Porcine Circovirus Disease (PCVD). The objective was to evaluate the effect of two commercially available Porcine Circovirus Type 2 (PCV2) vaccines on growth and mortality rates. The first vaccine was administered one week after weaning (1-dose) while the second was administered at weaning and repeated three weeks later (2-dose). A third group of unvaccinated pigs served as a control group. Pigs were individually weighed at weaning (d 0), d 113, 143, and just prior to market. On d 113, pigs on the 2-dose treatment were heavier (P<0.05) than the control group, and the 1-dose treatment pigs were intermediate. At d 143, just prior to when the first pigs were marketed, both the 1-dose and the 2-dose pigs were heavier than the control pigs by 7.6 and 10.2 lb (P<0.05), respectively, and there were no significant differences in weights between the two vaccinated groups. However, differences in weights between the vaccinated and the control pigs were smaller at off-test compared to differences at d 143 due to a wider variability in on-test days as a result of multiple marketing days prior to end of the trial. Although there were no significant differences between the two vaccinated groups, ADG was greater (P<0.05) in all vaccinated pigs compared to non-vaccinated control pigs from d 0 to d 113, d 143, and at off-test. From d 113 to 143 and until the day they were taken off test, there were no differences in ADG, regardless of treatment. This suggests that the increase in growth rate in vaccinated pigs occurred during the period d 0 to 113. Barrows consistently exhibited greater ADG and heavier weights (P<0.05) than gilts throughout the trial. No significant differences in mortality rate between treatments were observed but both vaccinated groups had mortality rates that were 3% lower than the non-vaccinated control pigs. Based on these results, both commercial vaccines were effective in mitigating the effects of PCV2 virus and improving the growth performance of pigs in a PCV2 positive herd.

(Key words: health, PCVAD, PCV2.)

Introduction

Porcine Circovirus Diseases (PCVD) is considered a disease of major economic importance because of its ability to cause high death loss and poor growth performance. The disease is caused by Porcine Circovirus Type 2 (PCV2) and the condition is usually non-responsive to antibiotic treatment due to the viral cause. Clinical signs of the disease include poor body condition with varying degrees of muscle wasting, labored breathing, and enlarged lymph nodes. Death loss can be as high as 40% in severely affected herds. The

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PCV2 virus is very stable and resistant to inactivation. Preventing or minimizing the chances of infection requires exceptionally good husbandry practices. Although researchers have confirmed PCV2 as the main infectious agent to trigger the disease, PCVD may require other factors or agents for clinical signs and lesions to appear. Positive responses and initial field results with the use of recently developed vaccines have further confirmed the major role PCV2 plays in the development of the disease. These results have been very promising; however, most of these were reported in terms of mortality reduction and very little study has been done with the vaccine in terms of growth performance. Therefore, the objective of this trial was to compare the effects of two commercially available PCV2 vaccines (1- or 2-dose) on growth rate and mortality.

Procedures

The experiment was conducted in a 2,000-sow commercial farm in Northeastern Kansas with a history of PCVD. A total of 1,470 weaned pigs (825 barrows and 645 gilts) were ear-tagged for identification and randomly allotted to one of three treatments with gilts and barrows equally allocated to each treatment group. Pigs were placed on test from three different weaning groups and weaning group was considered a block. All pigs were free of any physical defect and in good body condition. The treatments included a negative control (non-vaccinated), 1-dose-vaccinated, and 2-dose vaccinated pigs. The 1-dose pigs were vaccinated one week after weaning while 2-dose pigs were vaccinated at weaning and repeated three weeks later. The vaccines were commercially available (1-dose: Fort Dodge, 2-dose: Intervet) and administered according to label instructions.

Each weaning group was initially housed in three separate mechanically ventilated nursery rooms and were then transferred to open-sided, naturally ventilated buildings during the growing to finishing phase. All on-test pigs were weighed on days 0, 113, and 143 and just prior to market to determine average daily gain. Weighing of pigs just prior to market was done in several batches for each group as part of the topping-out procedure of the farm. Thus, heavier pigs were weighed earlier than the rest of the pigs if they already weighed at least 270 lb before the scheduled weigh date for each block. Average daily gain was analyzed from only those pigs that were marketed. Only weight gains of pigs marketed were used for the calculation of ADG and weight gains of dead pigs were not used in the calculation for ADG.

On-test pigs that died were recorded and mortality rate was calculated as number of deaths divided by the initial number of pigs placed on test. A total of 15 pigs (5 nursery and 10 finishing) with clinical signs indicative of PCVD were submitted to the KSU Diagnostic Laboratory for necropsy and histopathological examination to confirm the presence of PCV2 infection.

Data were analyzed as a 3 × 2 factorial randomized complete block design using the MIXED procedure of SAS. The fixed effects were vaccine treatment (control, 1-dose, and 2-dose) and sex (barrow or gilt) with the random effect of wean group.

Results and Discussion

Histopathologic lesions associated with PCV2 infection were noted in pigs necropsied from each of the three weaning groups. Average weight of pigs given the 2-dose vaccine was greater ($P<0.05$) than the control pigs at mid-finishing (d 113 on-test) but not different from pigs that were given the 1-dose vaccine, which were intermediate. At day 143 on-test, no significant difference in average pig weight

was observed between the two vaccinated groups. However, the 1-dose vaccinated and 2-dose vaccinated groups were heavier by 7.6 and 10.2 lb ($P<0.05$), respectively, than the control groups. This is demonstrated by the greater number of pigs weighing 260 lb or more in the vaccinated groups compared to the control group at d 143 (Figure 1). Pigs on the 2-dose treatment had heavier ($P<0.05$) off-test weights than did non-vaccinated pigs, and 1-dose treated pigs were intermediate. However, weight differences between the vaccinated groups and the control group was noticeably smaller at off-test compared to differences at d 143. This may be explained by the fact that all groups were topped out several days before they were taken off test leaving the rest of the pigs within close weight range across all groups.

Also, the control group was on test longer compared to the two groups, which allowed them to gain more weight and close the weight gap. There were no sex by treatment interactions observed, but as expected, barrows were significantly heavier ($P<0.05$) than gilts on d 113 up to market.

There was no significant difference in ADG among the pigs from the 1-dose and 2-dose vaccinated groups from d 0 to 113, 143, or off-test. However, on all occasions both vaccinated groups exhibited greater ADG ($P<0.05$) compared to the control group. This explains the widening gap in average weights between the vaccinated groups and control group at d 113 and 143 on-test. All groups did not exhibit any significant difference in ADG from Day 113 to Day 143 and at off-test, which indicates that significant difference in growth rates occurs between d 0 and 113.

No differences in mortality rate were noted between any of the treatment groups. However, the two vaccinated groups had 3% lower mortality compared to the control group (7.7 and 7.8% vs. 11.0%, respectively). We believe that the absence of statistical difference among the treatments is due to the greater variability as a result of a respiratory disease outbreak during the trial. A clinical outbreak of bacterial disease due to *Haemophilus parasuis* was noted in two nursery groups. Additionally, an outbreak of respiratory disease due to *Actinobacillus pleuropneumoniae* was noted in one finisher group.

In conclusion, both commercial PCV2 vaccines were effective in improving the growth performance of pigs from weaning to finishing as shown by heavier weights and greater ADG of the vaccinated groups. There were no statistically significant differences between the two vaccines in terms of the parameters measured. However, pigs given the 2-dose vaccine were 2.6 lb heavier than those given the 1-dose vaccine at d 143 after weaning.

Table 1. Effects of PCV2 Vaccine on Growth Performance and Mortality Rate[1]

Item	Vaccine Main Effect			Sex Main Effect		*P*-values	
	Control	1-dose[2]	2-dose[3]	Barrows	Gilts	Vaccine	Sex
Weight, lb							
D 0	19.1	19.6	19.3	19.3	19.4	0.24	0.50
D 113	181.8[a]	188.2[ab]	190.7[b]	190.3	183.5	0.04	<0.0001
D 143	237.3[a]	244.8[b]	247.4[b]	248.7	237.6	0.03	<0.0001
Off-test	256.7[a]	261.8[ab]	265.0[b]	265.3	257.1	0.05	<0.0001
Days On-test	153.2	151.8	151.9	151.2	153.3	0.08	<0.0001
ADG, lb							
D 0 to 113	1.44[a]	1.49[b]	1.52[b]	1.51	1.45	0.02	<0.0001
D 0 to 143	1.53[a]	1.58[b]	1.60[b]	1.61	1.53	0.02	<0.0001
D 0 to Market	1.55[a]	1.60[b]	1.62[b]	1.63	1.55	0.02	<0.0001
D 113 to D 143	1.89	1.91	1.94	2.00	1.84	0.39	<0.0001
D113 to Market	1.89	1.93	1.95	2.00	1.84	0.25	<0.0001
Mortality, %	11.0	7.8	7.7	8.7	9.0	0.42	0.86

[a,b]Means within the vaccine main effect lacking a common superscript differ $P<0.05$.

[1]A total of 1,470 pigs were randomly assigned at weaning (d 0) to one of the three vaccine treatments within barrows and gilts.

[2]1-dose was the PCV2 vaccine available from Fort Dodge administered one week after weaning .

[3]2-dose was the commercially available vaccine from Intervet administered at weaning and 3 weeks later.

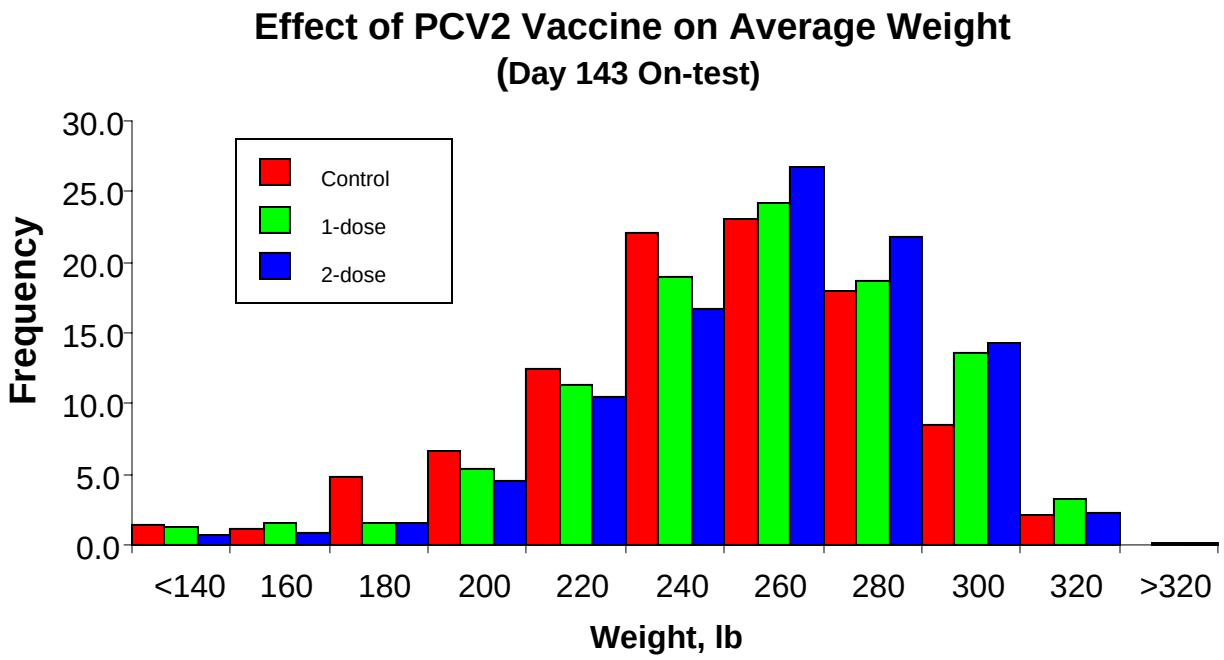

Figure 1. Comparative Weight Distribution of Treatment Groups at Day 143 on-Test.