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Potential association of PCV2 infection with light market weight pigs

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Routine use of PCV2 vaccines is common throughout the North American swine industry. The commercial vaccines have been very effective at reducing mortality and clinical signs associated with PCV2 infection. While commercial vaccines have improved rate of gain compared to nonvaccinated pigs, some farms still have subpopulations of pigs that have reduced gains beyond expected normal variation. A preliminary study was designed to determine the potential association between late finishing phase viremia and weight gain. A second study was conducted to determine if there were differences in viremia and weight gain between the three available commercial vaccines.

Trial 1: Materials and methods

Seven different finishing farms that routinely used a commercial PCV2 vaccine and were experiencing no evident PCV2 associated clinical disease were selected. Within 2 weeks before the marketing on each farm, 30 lightest and 30 heaviest pigs in a group were identified visually by each farm manager, and blood samples from these 60 pigs in each farm were collected. PCV2 IFA titer was tested by a protocol used routinely in our laboratory. A differential nested PCR assay for PCV2a and 2b was conducted as the method previously described,[1] For PCV2b specific real-time PCR, a PCV2b specific primer set was used, and the assay was performed using PerfeCTa SYBR Green SuperMix and Mx3005P. One-way repeated measure ANOVA and Studentt-test was used to *test* for statistical significant differences. Table 1 describes the farms' vaccination histories and approximate weights of the selected pigs.

Trial 1: Results

The light pigs in all seven farms had numerically higher IFA titres compared to the heavy pigs, but only the increased titers on 3 of the 7 farms were statistically significant (Figure 1). The percentage of pigs with PCV2b viremia were higher in the light pigs compared to the heaviest pigs.(Table 2) Also, the lightest pigs in 6 of the 7 farms had higher amounts of genomic PCV2b than light pigs by real time PCR (Table 3).

Trial 1: Discussion

The results indicate a potential association between PCV2b viremia and average daily gain when looking at light weight vs heavy weight pig subpopulations within a group of finishing pigs. While this trial was not designed to determine age of PCV2 exposure and subsequent viremia, the results suggest a late finishing phase timing. This timing may suggest a duration of immunity issue or a timing of vaccination study is warranted on some farms.

Trial 2: Materials and methods

At a commercial farm in Minnesota, 4 pigs of similar body weight were selected from each of 20 litters and ear tagged. Three pigs from each litter were inoculated intramuscularly at 3 weeks of age with PCV2 vaccine A,

Table 1:

Farm	Site population	PCV2 vaccination	Pig age at sampling
A	4000	BI (6 wks)*	21 wks
B	4000	IV (3 & 5 wks)**	20 wks
C	3000	IV (3 & 5 wks)	22-23 wks
D	4000	IV (3 & 5 wks)	23 wks
E	5000	BI (4 wks)	22 wks
F	Unknown	BI (3 wks)	Unknown
G	2400	IV (3 & 5 wks)	23 wks

Figure 1:

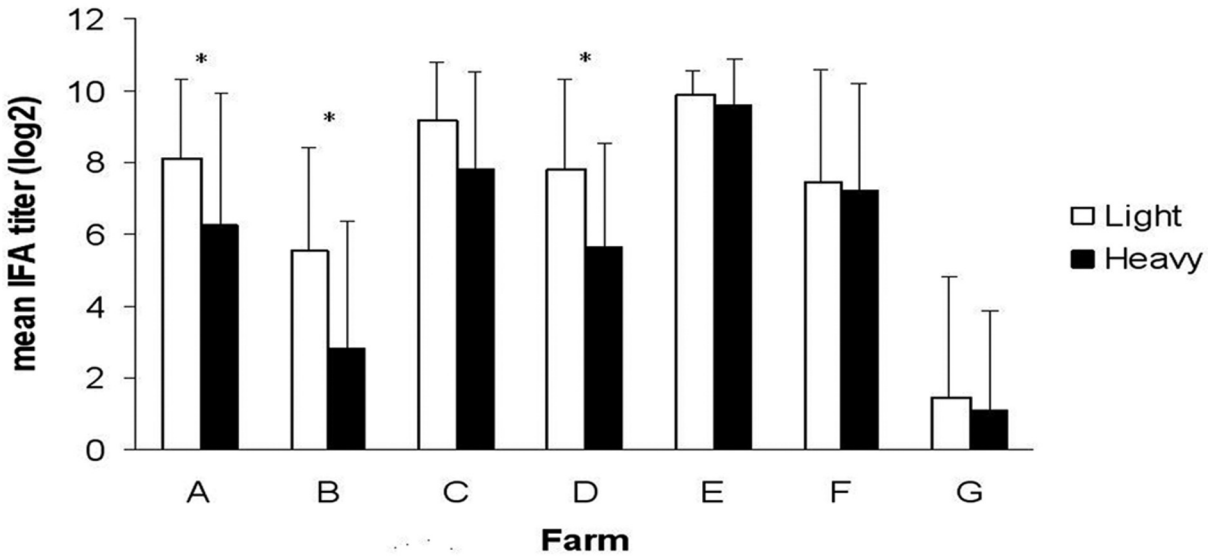


Table 2:

	PCV2a genotype viremic			PCV2b genotype viremic		
Farm	**Light weight pigs**	**Heavy weight pigs**	***P*-value**	**Light weight pigs**	**Heavy weight pigs**	***P*-value**
A	3 (10)/30	5 (17)/30	0.157	8 (27)/30	2 (7)/30	0.014
B	1 (3)/30	1 (3)/30	1.0	10 (33)/30	7 (23)/30	0.083
C	3 (10)/30	4 (13)/30	0.317	28 (93)/30	28 (93)/30	1.0
D	3 (10)/28	0 (0)/28	0.083	27 (96)/28	16 (57)/28	0.001
E	2 (7)/29	0 (0)/29	0.157	28 (97)/29	3 (10)/29	0.001
F	2 (7)/28	2 (7)/28	1.0	16 (57)/28	12 (43)/28	0.046
G	0 (0)/30	0 (0)/30	1.0	6 (20)/30	4 (13)/30	0.157
Total	14 (7)/205	12 (6)/205	0.157	123 (60)/205	72 (35)/205	0.001

B, and C, respectively. The fourth pig from each litter remained unvaccinated controls. All 80 pigs were moved into one pen of a wean-to-finish barn together with 520 pigs housed in other pens. The 20 pigs inoculated with vaccine A were revaccinated at 6 weeks of age (3 weeks after the first vaccination) according to the manufacturer's recommendation. All pigs in the barn were monitored daily for clinical abnormalities by the farm manager. Blood samples from each pig were collected at 3 weeks intervals. All pigs were individually weighed at 3 weeks and 24 weeks of age. Antibody responses of each pig were measured by indirect fluorescent antibody (lFA) test. Serum samples were also tested for viremia. The mean antibody titers, viral load, and body weight between the groups were analyzed by student t-test.

Trial 2: Results

There were no clinical signs of PCV2 throughout the growing period. The ADG of pigs in groups A (0.81 kg ± 0.03, $P < 0.016$) and B(0.80kg ± 0.05, $P < 0.048$) were significantly higher than ADG of the control group (0.7 4kg ± 0.05). The ADG of pigs of the group C (0.78kg ± 0.05) did not differ significantly from the controls ($P = 0.132$) or the other vaccinated groups ($P > 0.173$). (Table 4 and Figure 2)

Trial 2: Discussion

Average daily gain differences were demonstrated between all three commercial vaccine vs. the control. Two of the groups were statistically significant. The third

vaccinated group had numerical improvement in ADG compared to the control group, but was not significantly different than the control or the other two vaccine groups. The degree of ADG differences were associated with viremia differences compared to the control group at beyond 12 weeks of age.

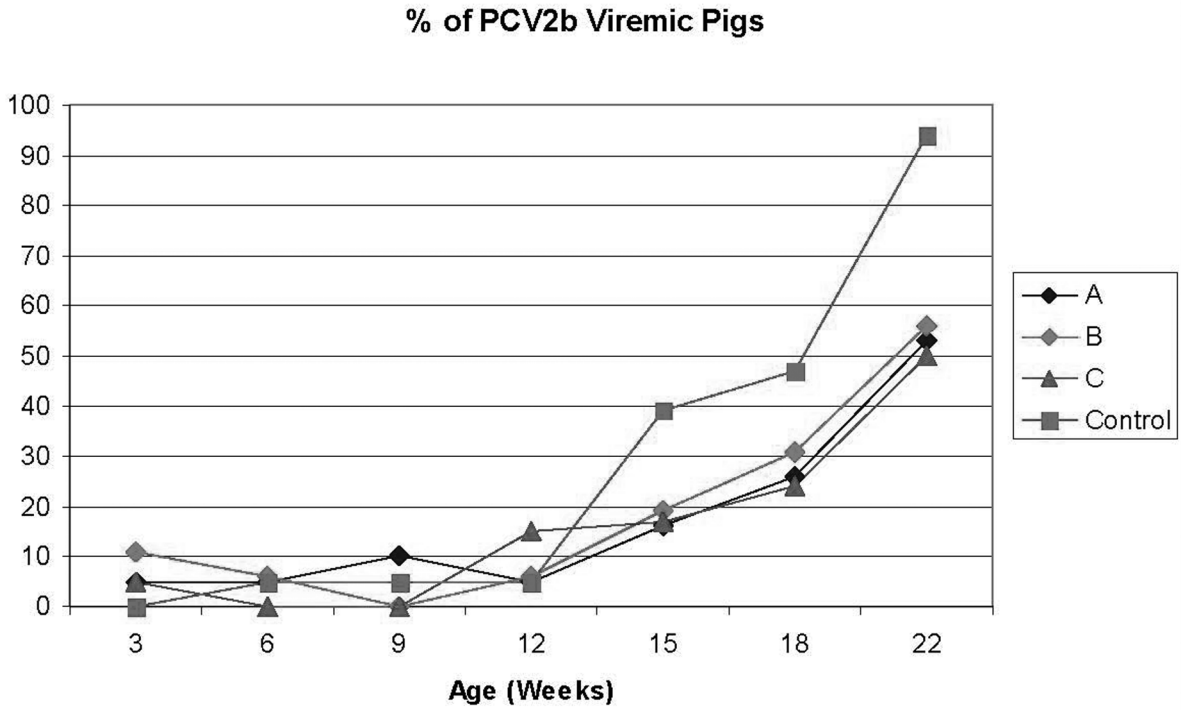
Table 3:

Farm	Light weight pig	Heavy weight pig	*P*-value ±
A	2.70 ± 1.46*	2.53 ± 1.56	0.363
B	4.28 ± 2.32	2.94 ± 2.10	0.042
C	6.05 ± 2.11	5.23 ± 2.13	0.117
D	5.04 ± 0.92	3.65 ± 1.56	0.0003
E	5.64 ± 0.75	4.12 ± 1.72	0.0004
F	2.99 ± 2.09	2.83 ± 2.36	0.446
G	1.28 ± 1.17	1.15 ± 1.03	0.473
Total	4.02 ± 2.29	3.37 ± 2.25	0.012

Table 4:

		Age (weeks)							
Group	**Genotype**	**3**	**6**	**9**	**12**	**15**	**18**	**22**	**Total**
A	PCV2a	0/20(0)[a]	0/20 (0)	1/20 (5)	1/19 (5)	1/19 (5)	2/19 (11)	4/19 (21)	9/136 (6.6)
	PCV2b	1/20(5)	1/20 (5)	2/20 (10)	1/19 (5)	3/19 (16)	5/19 (26)	10/19 (53)	23/136 (16.9)
B	PCV2a	0/19(0)	0/16 (0)	0/17 (0)	0/16 (0)	0/16 (0)	2/16 (13)	3/16 (19)	5/116(4.3)
	PCV2b	2/19(11)	1/16 (6)	0/17 (0)	1/16 (6)	3/16 (19)	5/16 (31)	9/16 (56)	21/116 (18.1)
C	PCV2a	0/20(0)	0/19 (0)	0/20 (0)	1/20 (5)	1/18 (6)	1/17 (6)	3/18 (17)	6/132 (4.5)
	PCV2b	1/20(5)	0/19 (0)	0/20 (0)	3/20 (15)	3/18 (17)	4/17 (24)	9/18 (50)	20/132 (15.2)
Control	PCV2a	0/19(0)	0/19 (0)	0/19 (0)	1/19 (5)	1/18 (6)	4/19 (21)	5/18 (28)	11/131 (8.4)
	PCV2b	0/19(0)	1/19 (5)	1/19 (5)	1/19 (5)	7/18 (39)	9/19 (47)	17/18 (94)	36/131 (27.5)

Figure 2:


% of PCV2b Viremic Pigs
100
90
80
70
60
50
40
30
20
10
0
3
6
9
12
15
18
22
Age (Weeks)
A
B
C
Control