

PCVAD Vaccine Results in Grower-Finisher Units: Practical Evaluation and Considerations

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■ Introduction

A severe epizootic of Porcine Circovirus Associated Disease (PCVAD) struck swine herds in Eastern Canada towards the end of 2004. Even though better management practices were implemented by many herds, PCVAD continued to cause severe economic losses for swine producers. During 2006, Circovac® from Merial, Intervet PCV2 vaccine (no trade name), and Ingelvac® CircoFLEX™ from Boehringer Ingelheim became available in Canada. Despite its approval in Canada in 2007, Suvaxyn® PCV2 One Dose was not yet available at the time this paper was written.

This article will focus primarily on those vaccines that are currently available in Canada (Merial® Circovac®, Intervet PCV2 vaccine and Ingelvac® CircoFLEX™) and use the following conventions to describe dosing protocols for these products:

- Sow Vaccine = Merial® Circovac®. Initial vaccination with two 2mL intramuscular (IM) injections 3 to 4 weeks apart, the last dose being given two to three weeks prior to farrowing. After initial vaccination, one 2 ML IM injection administered two to three weeks prior to farrowing
- Intervet PCV2 Full = Two 2 mL IM injections 2 to 3 weeks apart, the first dose given within 3 weeks postweaning.
- Intervet PCV2 Half = Two 1 mL IM injections 2 to 3 weeks apart, the first dose given within 3 weeks postweaning.

- Intervet PCV2 Once = One 2 mL IM injection, within 3 weeks postweaning.
- Ingelvac® CircoFLEX™ = One 1 mL IM injection, given at 16-24 days of age.

■ Assessments of PCVAD Vaccines

The first reports on the efficacy of piglet vaccines were very positive. De Grau et al. (2007) (**Table 1**) reported significant reductions in mortality in 4 independent farm trials using PCV2 Intervet vaccine.

Table 1. Field trials to assess the performance of Intervet PCV2 vaccine in Canada (adapted from De Grau et al., 2007).

		Vaccinated (Intervet PCV 2 Full)	Non-vaccinated
System 1	Mortality	0.8 %	5.8 %
	ADG	840	720
	FC	2.6	2.7
System 2	Mortality	0.6 %	4.6 %
	ADG	870	660
	FC	2.6	3.0
System 3	Mortality	2.0 %	7.6 %
	ADG	913	793
	FC	2.6	3.0
System 4	Mortality	1.1 %	9.0 %
	Culls	2.4 %	12.8 %

Desrosiers et al. (2007) also reported similar improvement with Ingelvac® CircoFLEX™. In a controlled trial done in 4 finisher barns in Quebec in 2006, mortality was 2.4% in vaccinated pigs compared to 9.5% for non-vaccinated pigs.

It is obvious looking at these results that piglet vaccination for PCVAD in the finisher stage significantly reduces the impact of this disease on the herd. However, in the initial stages of the outbreak, the supply of piglet PCV2 vaccines was insufficient to meet demand. As a result, many swine production systems used all of the available commercial products concurrently in order to

vaccinate as many piglets as possible. Also, off-label use (e.g. half dosing or administering a single injection of vaccines labelled for use as 2 dose vaccines) became a common practice in an attempt to “stretch” vaccine stores and provide protection to the largest possible number of pigs.

Table 2 summarizes the results for one production system for batches of pigs placed between October 2006 and March 2007 with various piglet vaccination protocols. Again, all the piglet vaccination protocols improved mortality rates in the finisher stage. In this system, Intervet PCV2 vaccine administered 1 time only gave intermediate results, compared to results for full and half dosing which were similar to each other.

Table 2. Finishing mortality rates for one production system with various piglet PCV2 vaccination protocols for groups placed between October 2006 and March 2007.

Vaccine	Number of groups	Pigs placed	Mortality
No Vaccine	11	10,987	9.7%
Intervet PCV2 Once	6	7,585	5.7%
Intervet PCV2 Half dose	6	7,964	3.6%
Intervet PCV2 Full dose	38	42,832	3.9%
Ingelvac Circoflex	22	22,098	3.3%

Based on the above data it is tempting to launch into full scale implementation of fractional (off label) dosing schemes, but it is important to focus first on what the considerations for vaccine implementation need to be. In addition, much of the data presented in this paper are derived from fieldwork as opposed to controlled studies and therefore results must be interpreted with caution.

■ What is the impact of fractional dosing?

This question deserves careful study. Field experience so far suggests that fractional (half) dosing CAN deliver equivalent mortality rates equivalent to full dose schemes BUT there may be differences in key economic drivers, such as feed conversion (F/C) and Average Daily Gain (ADG). In an attempt to further examine this question the PigCHAMP data from a 3-site production system were analyzed.

Table 3 summarizes the results of batches from another system placed between May 2006 and April 2007 using Intervet PCV 2 vaccine full dose or

half dose. Based on these data, and within this system, there appeared to be little difference in performance between full vs. ½ dose Intervet PCV2 vaccinated pigs. However, these data were collected in the field rather than under controlled conditions and represent a relatively small number of groups. Clearly what is needed to clarify this picture is information from case-control studies.

Table 3. Production results for one production system with sow (Circovac, Merial) or full/half dose Intervet PCV2 vaccination protocols for groups placed between May 2006 and April 2007.

	# of groups	Pigs placed	F.C.	A.D.G.	Mortality
No Vaccine	9	12,984	2.66	865	5.9%
Sow Vaccine (Circovac, Merial)	6	7,798	2.65	900	4.5%
Intervet PCV2 Full	8	12,860	2.66	888	2.7%
Intervet PCV2 Half	12	15,508	2.62	882	2.8%

Additionally, we must not forget that the majority of the vaccine results obtained so far come from herds where better than average management practices and disease control strategies were in place. What are the potential impacts of decreased compliance with poor management practices and disease control efforts? These questions assume even greater importance when half-dosing is used.

Therefore, the decision to embark on the use of off label dosing must be made with due consideration for individual herd factors that may influence the results. Ideally, all farms should have an information system in place to collect objective production information that can be used to both benchmark current performance and analyze the impact of management changes (including vaccine regimens). Our industry can always use more people asking hard questions.

■ What is the impact of other concurrent infections on vaccine performance?

Given the pivotal role that immune stimulation has been demonstrated to play in the expression of PCVAD (Krakowka et al., 2001), it is critical to take the degree of control of other pathogens into account when designing a PCV2 control program. The question - What impact will concurrent diseases have

on the response to PCV2 vaccination? Like many of the questions surrounding PCV2, is a difficult one to answer. Stratifying the data from Table 3 on the basis of whether pigs had seroconverted to PRRS virus by the end of the nursery phase (5 pigs sampled by PRRS virus ELISA 6-7 weeks post placement) yielded some interesting results, as shown in **Table 4**.

Table 4. Data from Table 3 stratified on the basis of PRRS virus status

	Number of groups	Pigs placed	F.C.	A.D.G.	Mortality
PRRSv Positive					
No Vaccine	4	5213	2.65	865	6.2%
Sow (Circovac)	2	2625	2.61	895	5.6%
Intervet PCV2 2 doses	3	5145	2.71	840	3.4%
Intervet PCV2 2 half-doses	4	5166	2.58	900	2.5%
PRRSv Negative					
No Vaccine	5	7771	2.66	865	5.8%
Sow (Circovac)	4	5173	2.67	902	4.0%
Intervet PCV2 2 doses	5	7715	2.62	920	2.3%
Intervet PCV2 2 half-doses	8	10342	2.65	873	3.0%

These data seem puzzling. In PRRSv positive groups, the half-dose regimen had the lowest mortality and FC and higher ADG, whereas in PRRSv negative groups, the full dose regimen had the lowest mortality and FC and highest ADG. Why would PRRSv positive pigs receiving only a half dose of vaccine perform better than full dose pigs, and the reverse happen when pigs were PRRSv negative?

Unfortunately, because these data come from uncontrolled studies gathered in the field and the sample size was limited, it's impossible to draw any conclusions at this time but further research aimed at better defining these impacts would clearly be helpful. The complications introduced by circulating PRRS virus also serves to remind us of the importance of controlling circulating primary pathogens. The system in question is currently engaged in actively managing PRRS virus with the goal of eliminating virus circulation.

■ When to administer vaccine?

Data to support clear conclusions on this topic are difficult/impossible to find but some recent work by Dr. Steve Henry (personal communication) has begun to shed some light on the topic. Dr. Henry's work suggests that the passive antibody titres of piglets at the point they are vaccinated with PCV2 piglet vaccines influences subsequent seroconversion to PCV2 i.e. there may be maternal interference. Thus far Dr. Henry and his group *"have tried in 3 trials to equate titres at vaccination to performance such as growth – and so far cannot say there is an association"*. He did however conclude that *"the number of pigs and weighings it takes to sort this out just hasn't happened"*. These findings have serious implications for protocols that involve concurrent sow and piglet vaccination and for determining 'optimum' timing for PCV2 vaccination schedules. Add to this the potential impact of other circulating pathogens within a herd or system, and the choice of timing becomes complicated indeed.

■ Conclusion

In the opinion of the authors, PCV2 vaccines are the single most effective tool currently available for the control PCVAD. However, some researchers have already started to raise questions about the *"immunological cross-protective capability of single-strain commercial vaccines"* (Horlen et al., 2007) and to date our understanding of why PCVAD suddenly became a problem within North America is far from complete. We must not allow the effectiveness of PCV2 vaccines to substitute for good management and long term industry wide strategic planning. The next 'new' pig disease may be just around the corner and effective vaccines and control strategies may well be a lot further off.

■ References

- de Grau F, Thacker B, Francisco C, Wilson W, Schlueter R, Eggen A. 2007. Field trials to assess the performance of a conditionally licensed PCV2 vaccine in Canada. Proceedings of the 5th International Symposium on Emerging and Re-emerging Pig Diseases. Krakow, Poland. Pg. 120.
- Desrosiers R, Clark E, Tremblay D, Tremblay R, Polson D. 2007. Results obtained with a novel PCV2 vaccine to protect multiple ages of pigs against PCVD. Proceedings of the 5th International Symposium on Emerging and Re-emerging Pig Diseases. Krakow, Poland. Pg. 121.
- Henry, Steve. Personal communication. Publication of the data is pending.
- Horlen K P, Schneider P, Anderson J, Nieftfeld J C, Henry S, Tokach L M, and Rowland R. 2007. A cluster of farms experiencing severe porcine Circovirus associated disease: Clinical features and association with the PCV2b genotype. *Journal of Swine Health and Production*. 15(5):270-278.
- Krakowka S, Ellis J A, McNeilly F, Ringler S, Rings D M, and Allan G. 2001. Activation of the immune system is the pivotal event in the production of wasting disease in pigs infected with porcine circovirus-2 (PCV2). *Vet Pathol* 38:31-42.