

# Comparative safety of PCV2 vaccines under field conditions

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## Introduction

Porcine Circovirus type 2 (PCV2) vaccines have been reported to be highly effective at reducing mortality due to Porcine Circovirus Associated Disease (PCVAD).<sup>1</sup> However, several of them may also induce significant lesions following injection. In one Canadian study, over 16% of pigs (5,900 of 35,108 pigs) developed injection site lesions up to 3cm in diameter following injection according to label directions.<sup>2</sup> Reactivity of certain PCV2 vaccines has also been reported from the United States.<sup>3</sup> In a laboratory experiment conducted as a pilot project to assess the comparative severity of lesions induced by various commercially available PCV2 vaccines, the Fort Dodge and Intervet PCV2 vaccines were found to induce significantly more severe lesions than saline control injection sites and Boehringer Ingelheim (BI) PCV2 vaccine. BI vaccine injection site lesion scores were not significantly different from saline controls.<sup>4,5</sup> This second study was conducted to compare the reactivity to vaccination with the same vaccines under typical commercial pig production conditions in the field.

## Materials and methods

This field study applied vaccines using typical commercial vaccination methodology. A total of 300 pigs per treatment group were randomly assigned to one of three treatments (900 total pigs). Pigs were injected with the various vaccines intramuscularly on the right side of the neck at approximately 21 days of age (BI Ingelvac CircoFLEX<sup>®</sup> = 1mL dose; Fort Dodge Suvaxyn<sup>®</sup> PCV2 One Dose = 2mL dose, Intervet Circumvent PCV vaccine = 2mL doses). Pigs of the Intervet group received a second injection of 2 mL two weeks after first injection, i.e. about 35 days of age. A saline injection of equal volume was made on the left side of the neck to serve as a paired control. All injections were made with multiple-use injectors with 20 pigs injected per needle. Pigs were crowded to one end of a pen and injected while standing.

A subset of twenty pigs per group were individually examined at 14 days post final injection. Injection sites were palpated and examined grossly prior to humane

euthanasia and injection sites were harvested and preserved in formalin. Histological lesions were blindly scored at the Iowa State University Veterinary Diagnostic Laboratory on a 1-5 scale.<sup>5</sup>

The null hypothesis was there would be no differences in post-vaccination reactivity or injection site lesion scores between treatments. Statistical analyses were made on normal, continuously distributed variables by ANOVA with Tukey's HSD utilized to identify which groups were significantly different from one another (JMP, Cary, North Carolina). Student's t-tests were used for pair-wise comparisons (JMP, Cary, North Carolina). Proportions were analyzed by Pearson's Chi Square tests (Statistix 8.0, Tallahassee, Florida).

## Results and discussion

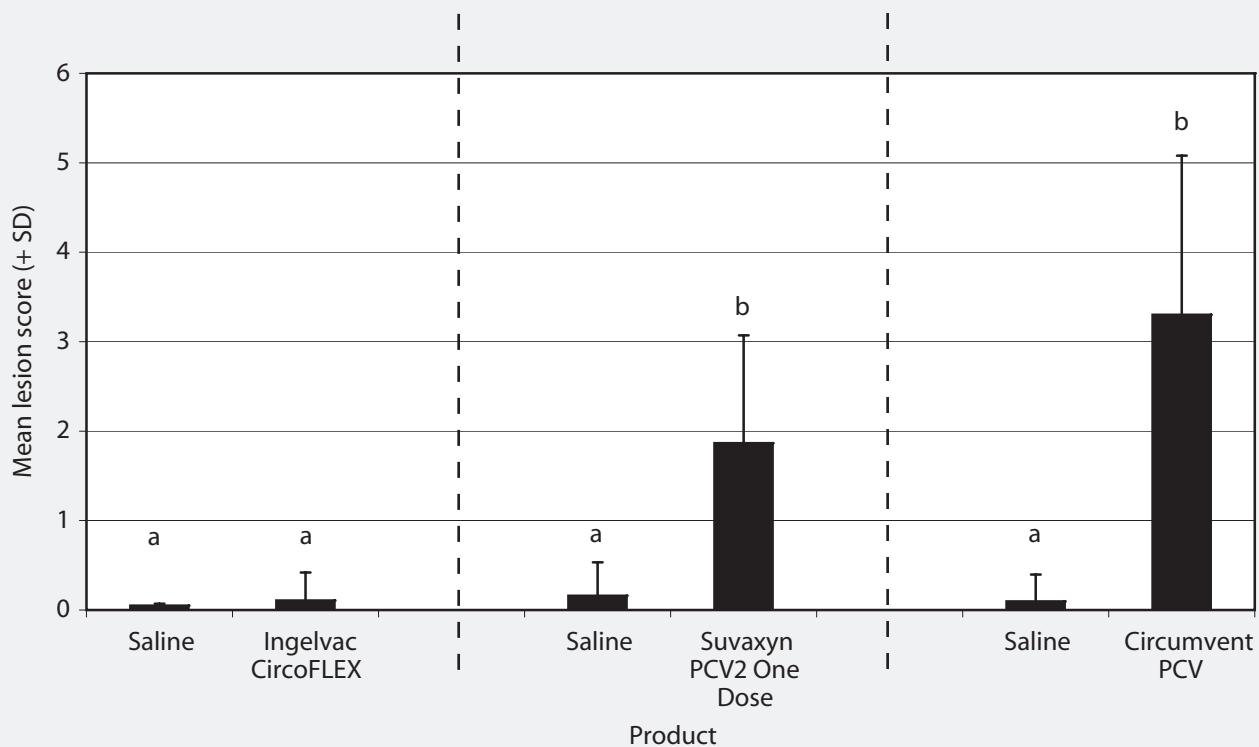
Five of 300 (5/300) pigs died within the first 24 hours post-injection in the Fort Dodge vaccine group, with the deaths attributed to anaphylactic reaction to vaccination. No pigs from other treatment groups died during this timeframe.

For the subset of 20 pigs per group that were examined and necropsied 14-days post-injection:

Ingelvac CircoFLEX<sup>®</sup> intramuscular injection site lesion scores were not different than paired saline injection sites ( $0.105 \pm 0.315$  standard deviation vs  $0.048 \pm 0.218$  respectively,  $P > 0.10$ , Figure 1). Significant lesions were noted in the Fort Dodge pigs with mean lesion scores of  $1.864 \pm 1.207$  versus paired saline control lesions scores of  $0.158 \pm 0.375$  ( $P < 0.0001$ , Figure 1). The most severe lesions were observed in pigs receiving two doses of Intervet vaccine with mean scores of  $3.300 \pm 1.780$  versus paired saline control lesions scores of  $0.095 \pm 0.301$  ( $P < 0.0001$ , Figure 1). The saline injection site scores were not different between groups ( $P > 0.10$ ).

Severity of lesions induced by the vaccines were compared to each other by first subtracting their respective paired saline lesions scores, and comparing the resulting "net lesion scores". The Fort Dodge vaccine induced a significantly more severe net lesion score than Ingelvac CircoFLEX ( $1.71$  vs  $0.57$ ,  $P < 0.0001$ , Figure 2). The

**Figure 1:** Intramuscular injection site mean lesion scores, pair-wise comparisons to saline



a,b within matched pairs:  $P < 0.0001$

Intervet vaccine induced a net lesion score that was significantly more severe than both Ingelvac CircoFLEX (3.21 vs 0.57 respectively,  $P < 0.0001$ , Figure 2) and the Fort Dodge vaccine ( $P < 0.0001$ , Figure 2).

Palpable lesions were noted when detected on post-mortem examination 14 days post-injection. Palpable lesion frequency for Ingelvac CircoFLEX pigs did not differ from saline controls (10% vs 0%,  $P > 0.10$  Figure 3). Fort Dodge vaccinated pigs had a 55% lesion rate versus 0% for saline ( $P = 0.0016$ , Figure 3), while two doses of Intervet vaccine resulted in a 90% lesion rate versus 5% for saline ( $P < 0.0001$ , Figure 3).

Palpable lesions were detected more frequently in both Fort Dodge and Intervet vaccinates compared to Ingelvac CircoFLEX vaccinates ( $P = 0.028$  and  $P < 0.0001$  respectively, Figure 4) while Intervet vaccinates also had more frequent palpable lesion frequency than Fort Dodge vaccinates ( $P = 0.0009$ , Figure 4).

The results of this study, and its laboratory predecessor, illustrate the comparative differences in local and systemic reactivity of commercially available PCV2

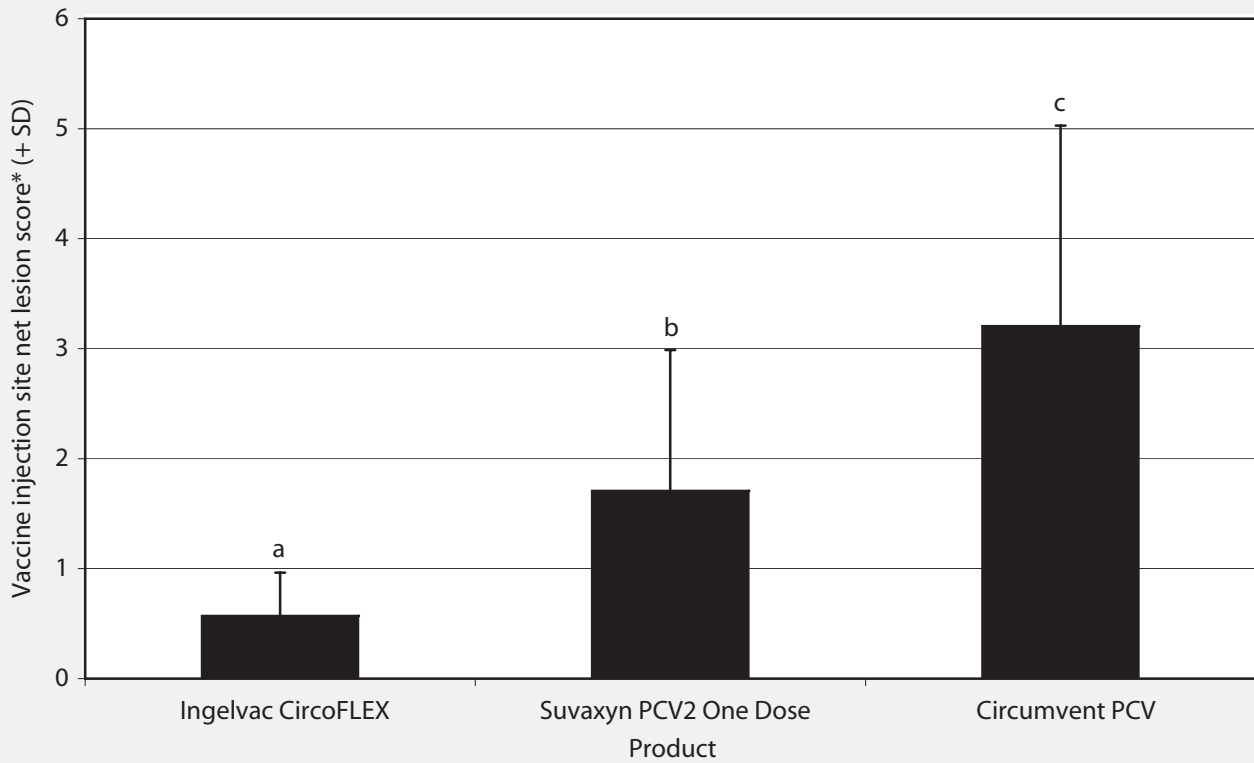
vaccines. In addition to efficacy, implications for animal welfare and pork quality assurance should be duly considered when selecting products for immunization of swine.

Ingelvac and CircoFLEX are registered trademarks of Boehringer Ingelheim Vetmedica GmbH, Ingelheim, Germany. Suvaxyn is a registered trademark of Fort Dodge Animal Health.

## References

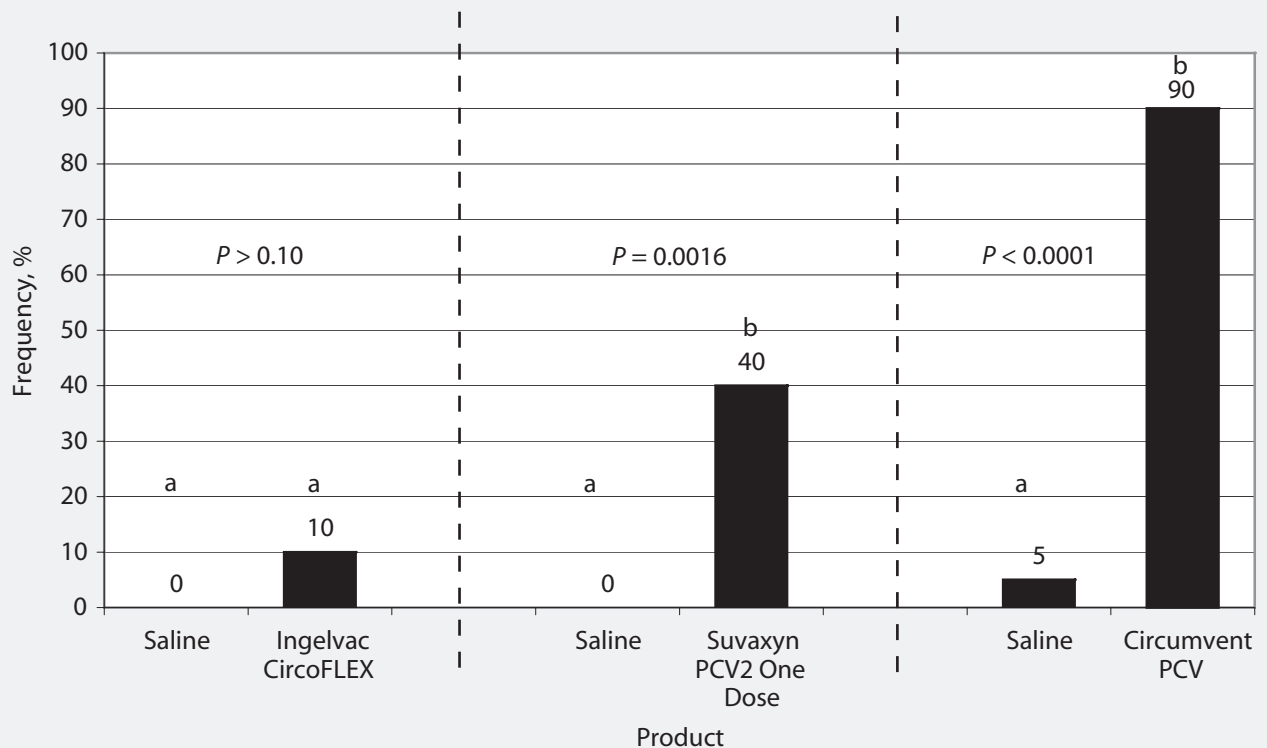
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**Figure 2: Vaccine intramuscular injection site net lesion scores\***

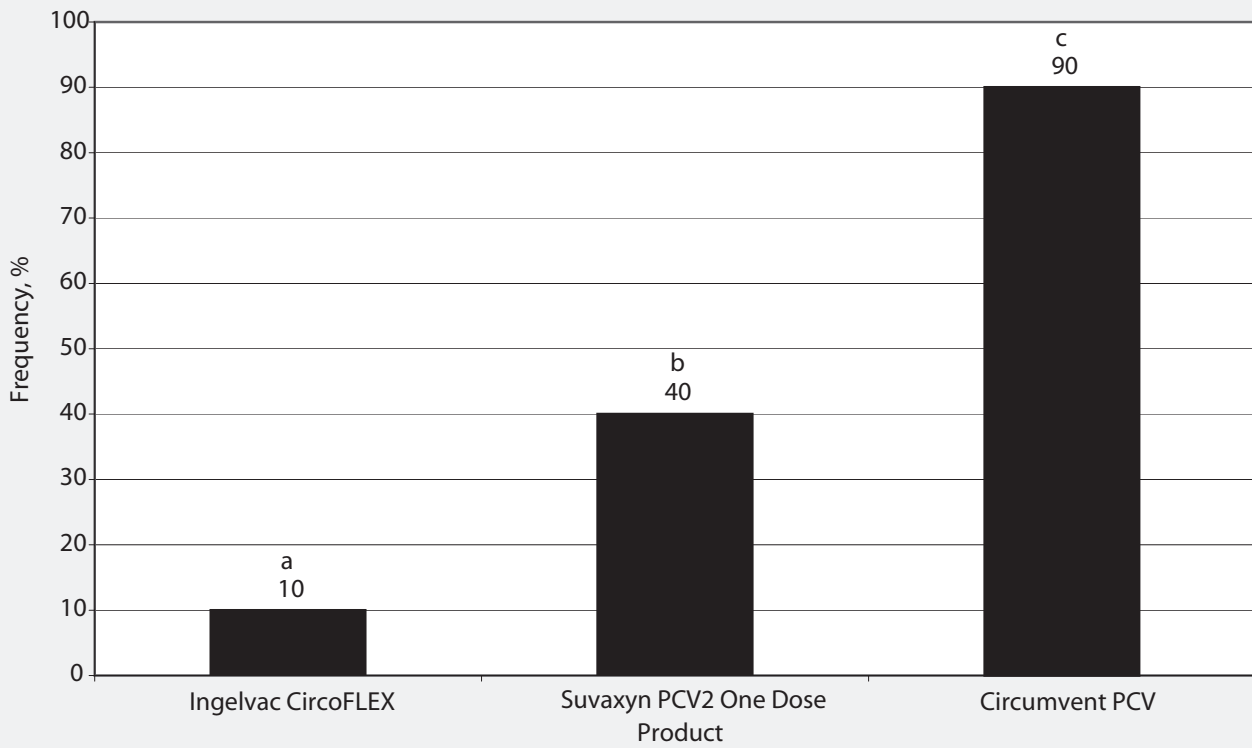


\* Net vaccine lesion score = vaccine score - saline score  
 a,b,c:  $P < 0.0001$

**Figure 3: Frequency of palpable gross lesions, pair-wise comparisons to saline**



**Figure 4:** Frequency of palpable gross lesions



a,b:  $P = 0.028$ , a,c:  $P < 0.0001$ , b,c:  $P = 0.0009$

