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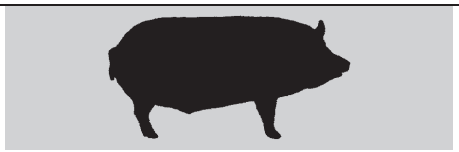

Direct comparison of commercial porcine circovirus type 2 vaccines under field conditions

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ABSTRACT

Two experiments were done to directly compare the effects of commercially available porcine circovirus type 2 (PCV2) vaccines on growth and mortality rate of pigs under field condition in a farm with a history of porcine circovirus disease. In Exp. 1 a total of 1,470 pigs were used. Pigs (initially 8.8 kg of BW) within sex (barrow or gilt) were allotted to control or 1 of 2 commercial PCV2 vaccines (1DS; Suvaxyn PCV2, Fort Dodge Animal Health, Fort Dodge, IA, or 2DS; Circumvent PCV, Intervet/Schering-Plough Animal Health, Millsboro, DE). In Exp. 2 a total of 1,993 pigs (25.2 ± 1.24 d of age; 7.4 ± 1.70 kg of BW) were allotted within litter and sex to 2 different commercial PCV2 vaccine treatments (BI; CircoFLEX, Boehringer Ingelheim Vetmedica Inc., St. Joseph, MO, or IN; Circumvent PCV, Intervet/Schering-Plough Animal Health). On d 143, the one- and 2-dose groups were 3.4 and 4.6 kg heavier ($P < 0.05$) than the control pigs, respectively, but there was no difference ($P = 0.33$) between the 2 PCV2 vaccinated groups. The 1DS and 2DS groups had greater ADG from d 0 to 143 (0.717 and 0.726 vs. 0.694 kg). Pigs vaccinated in Exp. 2 using IN vaccine had decreased ($P < 0.001$) ADG from d 0 to 73 (nursery) but tended to have increased ($P = 0.06$) ADG from d 73 to 155 (finishing) compared with pigs vaccinated using the 1-dose BI vaccine. Overall, ADG and mortality were similar ($P \geq 0.14$). In Exp. 1, the commercial PCV2 vaccines evaluated in this study were both effective at increasing ADG with no detectable differences among vaccines. Vaccinating pigs using the BI or IN vaccines resulted in similar overall ADG, but there were differences in growth pattern over time.

Key words: growth, porcine circovirus type 2, swine, vaccine

INTRODUCTION

Since it was first described in Canadian herds (Harding et al., 1998), porcine circovirus associated disease (**PCVAD**) has been recognized in swine herds throughout the world (Allan and Ellis, 2000). Porcine circovirus associated disease is of major economic importance in swine production because it can cause high death loss and poor growth performance (Segales et al., 2006). Clinical signs of the disease include poor body condition with various degrees of muscle wasting, labored breathing, and enlarged lymph nodes (Sorden, 2000; Segales et al., 2006). The disease is caused by porcine circovirus type 2 (**PCV2**), which is a circular, single-stranded DNA virus.

In the United States, reports of PCVAD cases rapidly increased in 2005. Mortality rates as high as 20% were documented (Henry and Tokach, 2006; Horlen et al., 2007). In the absence of any effective tool to control the disease, PCVAD spread readily throughout the country. In 2006, PCV2 vaccines for growing pigs became commercially available in the United States. Field studies have clearly demonstrated the effectiveness of PCV2 vaccines for reducing mortality associated with PCVAD (Horlen et al., 2008; Desrosiers et al., 2009; Shelton et al., 2012). Therefore, vaccination with PCV2 vaccines has rapidly become standard practice in United States swine production. Although PCV2 vaccines are clearly efficacious, no peer-reviewed studies to date have reported a direct comparison of commercially available PCV2 vaccines under field conditions. Because commercial vaccines vary in antigen and adjuvant composition, differences in efficacy between vaccines may exist. Therefore, the

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objective of these trials was to make direct comparisons of the effects of commercially available PCV2 vaccines on growth rate and mortality.

MATERIALS AND METHODS

Herd History

Experimental procedures used in the experiment were approved by the Kansas State University Institutional Animal Care and Use Committee. The experiments were conducted in a commercial farrow-to-finish swine operation with previously documented cases of PCVD using criteria outlined by Sorden (2000). The swine operation used for these studies is located in northeast Kansas and is a multisite all-in-all-out pig production system. The herd had been confirmed positive for porcine reproductive and respiratory syndrome virus, *Mycoplasma hyopneumoniae*, and *Actinobacillus pleuropneumoniae* in the year before the initiation of Exp. 1. Pigs were weaned at approximately 21 to 24 d of age and transferred to nursery barns at a separate location. The nursery rooms were mechanically ventilated and had perforated plastic flooring with 25 pigs per pen. Pigs were kept in the nursery rooms for 8 wk before being transferred to the finishing site. The finishing barns were double-curtain-sided, naturally ventilated buildings with slatted flooring. Each building had 4 rooms and a total capacity of 500 pigs per room. Pigs throughout the experiments were fed similar diets based on corn or sorghum and soybean meal. Pens were observed daily to perform routine health checks and monitor the overall condition of the pigs in the barn.

Exp. 1

In Exp. 1 the 2 commercially available vaccines evaluated were administered according to label recommendations. The 1-dose vaccine was an inactivated chimeric PCV2 vaccine (**1DS**; Suvaxyn PCV2 One Dose, Fort Dodge Animal Health, Fort Dodge, IA). The second PCV2 vaccine was a killed, bacculovirus-expressed, capsid protein-derived vaccine (**2DS**; Circumvent PCV, Intervet Inc., Millsboro, DE). A total of 1,470 weaned pigs (825 barrows and 645 gilts; TR4 × PIC C22) were individually weighed and identified at weaning in groups of 3 and allotted to 1 of 3 treatments. The 3 treatments were a negative control without PCV2 vaccine and 1DS or 2DS PCV2 vaccinated. The 1DS pigs were vaccinated 1 wk after weaning; 2DS pigs were vaccinated at weaning and again 3 wk later.

At the time of weaning (d 0) and within each sex, pigs were assigned to 1 of the 3 treatments by randomly selecting 3 pigs and sequentially allocating the heavy pig to the control treatment, the medium-weight pig to the 1DS, and the lightweight pig to the 2DS treatment. The subsequent group of 3 pigs had the heaviest pigs assigned to the 1DS treatment, the medium-weight pig to the 2DS treatment, and the lightweight pig to the control treatment. The next group was then allocated as the heaviest pig assigned to the 2DS treatment, the medium-weight pig to the control treatment, and the lightweight pig assigned to the 1DS treatment. This process was then sequentially repeated for all pigs enrolled in the experiment. Thus, all the pigs were equally represented in each treatment group within sex. Barn workers that provided daily pig care were blinded to the treatments. Pigs were placed on test from 3 different weaning groups, and weaning group was considered a block. Each weaning group initially was housed in 3 separate nursery rooms and was then transferred to open-sided, naturally ventilated buildings during the growing to finishing phase. Pigs were weighed individually on d 0, 113, and 143. Average daily gain was calculated by dividing the total weight gain over the number of pig days. Only the pigs that were alive at d 143 were included in data analysis for growth rate. 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 Kansas State University Diagnostic Laboratory for necropsy and histopathological examination to confirm the presence of PCVAD-associated lesions.

Exp. 2

At birth, all pigs were individually weighed and identified by a unique numbered ear tag. At weaning (d 0), a total of 1,993 pigs (25.2 ± 1.24 d of age; 7.4 ± 1.7 kg of BW) representing 213 litters of 2 genetic backgrounds (PIC 327 × Triumph TR24 or PIC 327 × PIC 1050) were then randomly assigned to 1 of 2 different vaccination programs. Commercial PCV2/*Mycoplasma hyopneumoniae* vaccination programs used were either a 1-dose program (**BI**; CircoFLEX and MycoFlex mixed 50/50, Boehringer Ingelheim Vetmedica Inc., St. Joseph, MO) or 2-dose program (**IN**; Circumvent PCV and Myco Silencer ONCE, Intervet/Schering-Plough Animal Health, Millsboro, DE). For the BI vaccination program, a 2-mL dose was administered as a single i.m. injection on d 0. For the IN vaccination program, a 2-mL dose of Circumvent PCV and 1-mL dose of Myco Silencer ONCE were administered as single i.m. injections on d 0 and 23. Pigs were weaned twice a week and placed consecutively into pens in one of four 500-animal nursery rooms over 6 weaning days. Pigs were individually weighed on d 0 (weaning) and d 23, 45, 73, and 155. A negative control was not included in this trial because at the time the trial was conducted, the efficacy of the PCV2 vaccine had been clearly established so the objective was to evaluate efficacy between the 2 vaccines. Also, PCVAD had been routinely diagnosed in unvaccinated sentinel pigs from this farm, indicating continued exposure to PCV2 virus across groups.

Mortalities were recorded throughout the trial. Records from these pigs as well as from pigs that were unidentifiable because of lost ear tags or pigs