

## Fostera™ PRRS: Challenge Study<sup>1</sup>

**Doug King, DVM**  
**Zoetis Inc.**

Porcine reproductive and respiratory syndrome virus (PRRSV) is a highly infectious RNA virus, which is endemic in almost all pork-producing areas of the world. A recent study shows that this economically important disease costs the U.S. pork industry \$664 million annually or \$1.8 million per day in production-related losses. Add \$478 million in veterinary, biosecurity and other outbreak-related costs for a cumulative price tag of more than \$1 billion per year.<sup>2</sup>

A 2010 survey revealed that 28 percent of sows and gilts used for breeding were PRRSV-free. With an estimated 5.8 million sows in the U.S., this means that 1.6 million sows and gilts are PRRSV-free. The same survey found that 60 percent of weaned pigs were PRRSV-negative at placement. Of the 60 percent that were negative at weaning, 58 percent of them became infected before they were marketed.<sup>2</sup>

The survey illustrates that advancements made at the sow farm have left more than half of the PRRS-negative weaned pig population at risk for disease because they are naïve to PRRSV. Vaccination should be considered for these pigs in order to minimize the adverse impact of exposure to PRRS field viruses during the grow/finish period. Also consider vaccinating another at-risk growing pig population – those from PRRSV stable farms, which are virus negative at weaning although the sows are ELISA positive. These pigs are also at risk for clinical PRRS during the grow/finish phase.

**PRRS costs the  
U.S. pork industry  
\$1.8 million per  
day in production-  
related losses.**

Vaccinating grow/finish pigs may be beneficial to PRRSV area control efforts. A recent study demonstrated that the use of PRRSV vaccine post-infection reduced the amount of time PRRSV was shed from a group of field challenged pigs.<sup>3</sup> A shorter shedding time equates to lower risk of viral transmission to adjacent sites.

The U.S. swine industry is severely impacted because of PRRSV – 9.9 million fewer pigs are sold per year and 2.41 billion fewer pounds of pork are produced annually.<sup>2</sup> Implementing measures that will help the growing pig better deal with a PRRSV challenge can help provide significant benefit in terms of pig performance and economic return.

To help with that challenge, Zoetis developed Fostera™ PRRS, a new modified-live PRRS vaccine that was created from a U.S. field strain by utilizing a unique cell line. The field virus was attenuated through 52 passages on a non-simian cell line and did not revert to virulence in a study conducted.

Zoetis conducted a challenge study to demonstrate the efficacy of new Fostera PRRS vaccine against a virulent, heterologous PRRSV challenge. The study established that Fostera PRRS helped protect pigs challenged with heterologous PRRSV in such a manner as to earn the label claim *aid in prevention of respiratory disease*. Vaccinates had significantly reduced lung lesions (P = 0.0001) and reduced clinical signs of respiratory disease associated with PRRSV compared

# Vaccination with Fosterera PRRS reduced lung lesions by 84 percent.

**Table 1 – Challenge study design**

	Number of Pigs	Vaccine	Vaccination Day	Challenge	Challenge Day	Necropsy Day
Placebo	24	Placebo	0 (3 weeks old)	PRRSV	27 (7 weeks old)	39 (9 weeks old)
Vaccinates	24	Fosterera PRRS	0 (3 weeks old)	PRRSV	27 (7 weeks old)	39 (9 weeks old)

to non-vaccinates. Additionally, vaccinates had heavier body weights post-challenge.

### Trial Design

An immunogenicity study was conducted using four potency levels of the vaccine candidate and a negative control group for comparison. For the purposes of this report, we will be presenting data from the negative control group and the vaccinate group that represents the minimum-dose selected for use in the new Fosterera PRRS vaccine.

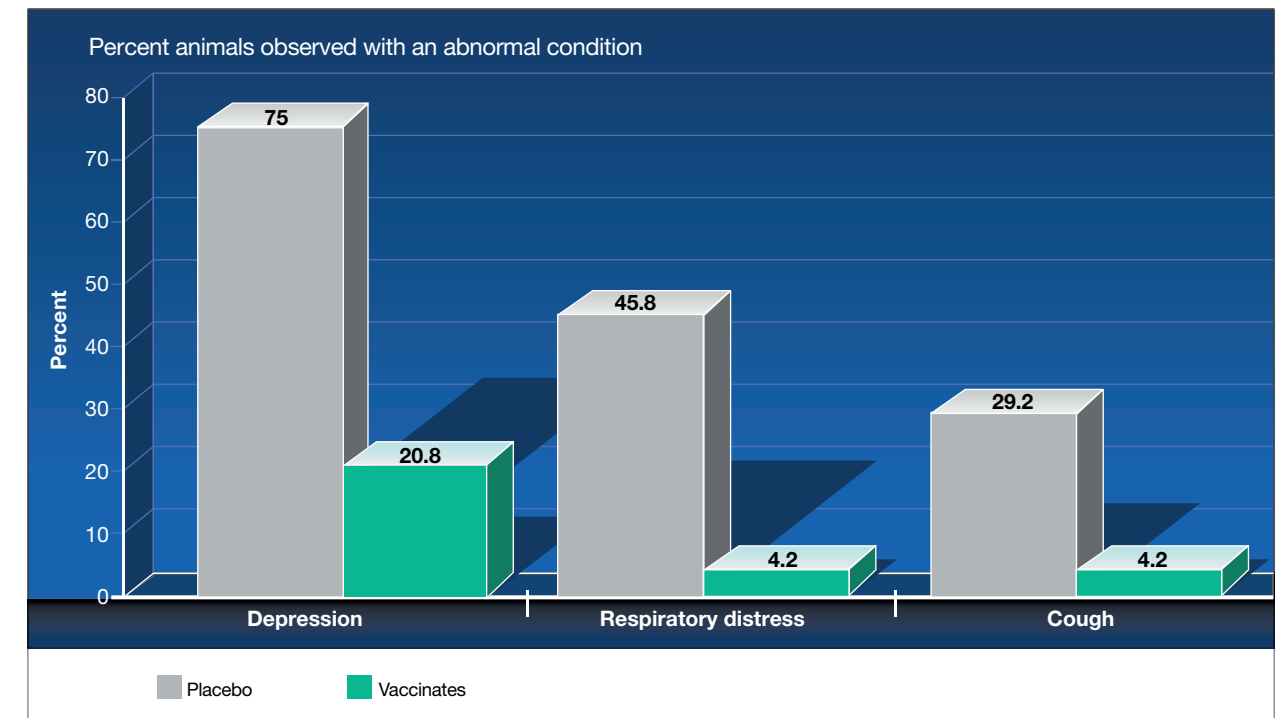
Forty-eight healthy, weaned, crossbred pigs, approximately 3 weeks of age, were randomly assigned to a placebo group or vaccinate group. See Table 1. The pigs were not vaccinated against any other diseases, were free of symptoms of respiratory disease, and were prescreened and determined to be PRRSV negative by ELISA and PCV2 negative by PCR.

Pigs in the vaccinate group received one dose – 2 mL, intramuscularly – of Fosterera PRRS vaccine. Pigs in the placebo group received a 2-mL dose of the vaccine diluent. Both groups were challenged intramuscularly and intranasally with virulent, heterologous PRRSV approximately 4 weeks (27 days) after vaccination. Pigs were necropsied 12 days post-challenge. The challenge virus was the NADC20 strain, which is 94.5 percent identical to the vaccine strain at the amino acid level for ORF 5.

Clinical observations – depression, respiratory distress and cough – were monitored during the challenge phase. Body weights were also collected prior to challenge and prior to necropsy. Upon necropsy, lung lesions were scored to determine the percentage of consolidation for each lobe (left cranial, left middle, left caudal, right cranial, right middle, right caudal, and accessory).

This study was valid as all animals were seronegative on Day 0 and all control animals remained PRRSV negative until day of challenge. No confounding disease factors were detected.

**Figure 2. Percent of animals ever observed with clinical signs following a PRRSV challenge**



This study was conducted in accordance with Zoetis Animal Health’s Kalamazoo Institutional Animal Care and Use Committee.

### Results

Following vaccination, titers indicated pigs in the vaccinate group were sero-positive by Day 24, three days prior to challenge.

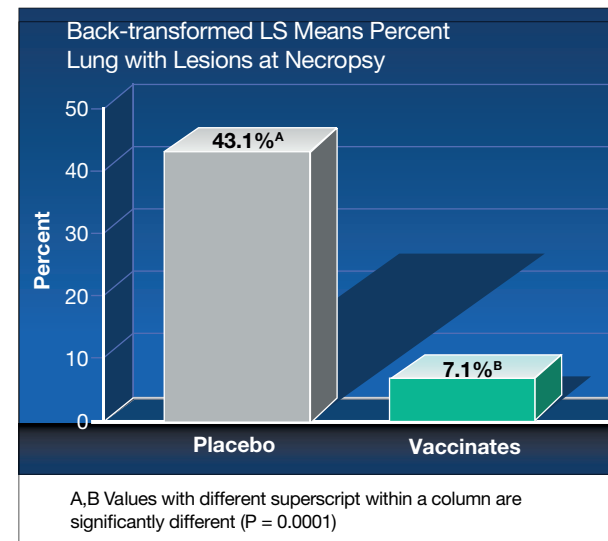
After challenge with virulent, heterologous PRRSV, pigs vaccinated with Fosterera PRRS showed:

**Reduced lung lesions.** Figure 1 demonstrates that vaccinates showed a significant reduction in lungs with lesions compared to the placebo group (P = 0.0001). Vaccination with Fosterera PRRS reduced lung lesions by 84 percent.

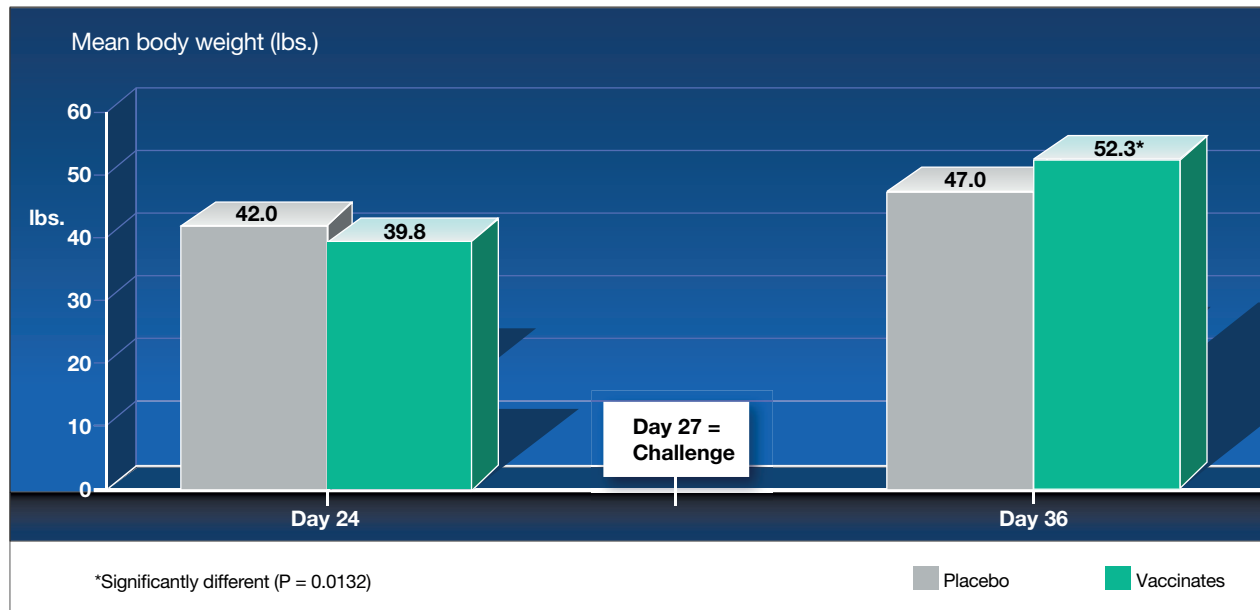
**Reduced clinical signs.** Clinical signs most representative of respiratory disease – depression, respiratory distress and cough – were reduced by 72 percent, 91 percent and 86 percent respectively in pigs given the Fosterera PRRS vaccine compared to pigs in the placebo group. See Figure 2. Overall, there was an 80 percent reduction in respiratory clinical signs in pigs vaccinated with Fosterera PRRS compared to pigs in the placebo group.



**Figure 1. Percent lung lesions 12 days after challenge with PRRSV**



**Figure 3. Mean body weight (lbs.) following PRRSV challenge at Day 27**



**Heavier body weights post-challenge.** Pigs vaccinated with Foster PRRS weighed more post-challenge than the placebo group (Figure 3). Vaccinated pigs outgained pigs in the placebo group by 7.5 lbs. in the 12 days from Day 24 to Day 36 following challenge at Day 27. The average daily gain for vaccinates over the same period was 2.5 times greater than those in the placebo group (Figure 4). Further studies are planned to demonstrate this production advantage under field conditions.

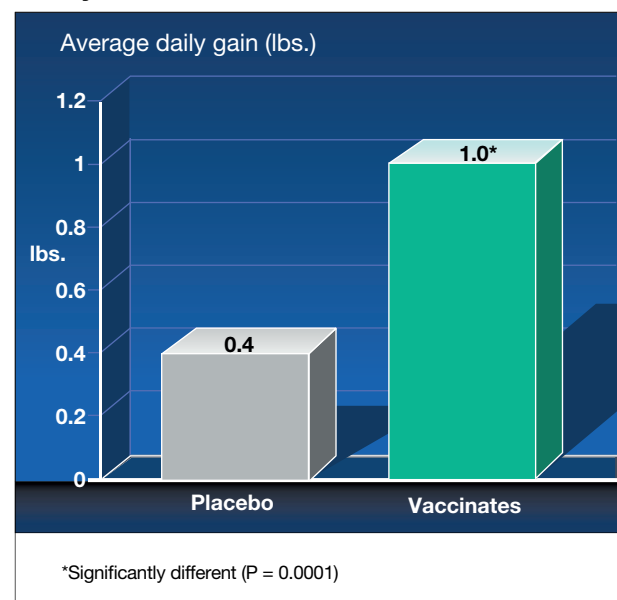
### Discussion

Based on the efficacy results of this study (lung lesions and respiratory clinical signs), Foster PRRS vaccine earned the label claim of aid in prevention of respiratory disease associated with PRRSV. After heterologous PRRSV challenge, Foster PRRS:

- Significantly reduced lung lesions by 84 percent (P = 0.0001)
- Reduced overall respiratory clinical signs by 80 percent
- Significantly improved average daily gain by 2.5 times (P = 0.0001)

These results indicate that Foster PRRS helps prevent respiratory disease associated with PRRSV and helps the growing pig perform optimally in the face of PRRSV challenge.

**Figure 4. Average daily gain over 12 days from Day 24 to Day 36 following a PRRSV challenge at Day 27**



### References

1. Data on file, Study Report No. 3127R-60-10-890, Zoetis, Inc.
2. Holtkamp DJ, Kliebenstein JB, Neumann EJ, Zimmerman JJ, Rotto H, Yoder TK, Wang C, Yeske P, Mowrer C, Haley C. 2011. Assessment of the economic impact of porcine reproductive and respiratory syndrome virus on United States pork producers. *Prev Vet Med* (Submitted 12/20/2011).
3. Linhares D, Nerem J, Torremorell M, Dee S. Evaluation of PRRS modified-live virus vaccine on viral shedding. 2011 Allen D. Leman Swine Conference Proceedings, pages 49-50.