Technical Literature

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R2™ for mitigating the risk of PEDV, PRRSV and SVA -contaminated feed using an animal challenge model

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Introduction

The porcine epidemic diarrhea virus (PEDV) epidemic in 2013 – 2014 caused high morbidity and mortality for hog farmers throughout North America. Animal feed was identified at that time as a risk factor and one of the potential vehicles to spread the viral disease. Feed Energy's R2 line of products delivers essential nutrients to the animal through the feed source and has proven to mitigate the risk of pathogens in the feed. Our field trials proved R2 was effective in helping to mitigate several pathogens in the feed source including; E. coli, Salmonella, Campylobacter, Listeria and Clostridium.

Objective

The objective of this study was to evaluate the efficacy of Feed Energy-R2 nutrients at reducing the risk of infection following consumption of feed contaminated with PRRSV, PEDV and SVA using a novel, highly robust challenge model, employing controlled field conditions and multiple metrics.

Methods

The study was conducted in the Pipestone Applied Research Biosafety level 2 research facility. One hundred pigs (15kg) per room during a 15-day period (6 pens/room) and a designated feed bin/room. The treatments consisted of feeds formulated with 3% added lipids to produce 2 dietary treatments including, 1) Control: Basal Diet + Corn oil, 2) Basal Diet + Feed Energy-R2 product. Viral challenge involved a 454g "Ice Block Model", consisting of 100 mL SVA (5 logs TCID50/mL), 100 mL PRRSV 174 (5 logs TCID50/mL), 100 mL PEDV (5 logs TCID50/mL) and balanced with 154 mL MEM. The Blocks (-80C) were dropped into each feed bin on days 0 and 6 of the study.

Ante-mortem samples, including oral fluids and Swiffer samples of feeders, were collected across the 6 pens from each of the 3 rooms at 0, 6- and 15-days post-inoculation (DPI) of feed. Post-mortem samples were collected from 30 pigs from each room at 15 DPI. Samples collected included tonsil for SVA, serum for PRRSV and rectal swabs for PEDV. Samples were evaluated for the presence of viral nucleic acid by PCR and nucleic acid sequencing of the ORF 5 was performed on select samples, as needed. In addition, start and end weights were collected from all pigs (0 and 15 DPI). Differences in growth performance between groups were analyzed for significance ($p < 0.05$) using ANOVA. In addition, pigs were scored daily for the presence of the following clinical signs: Lameness/vesicles (SVA), Dyspnea/weight loss/rough hair coat (PRRSV), Diarrhea (PEDV).

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Results

Table 1 shows none of the pigs fed Feed Energy R2 were infected with any of the three viruses nor did the rooms themselves test positive. The Average Daily Gain (ADG) for the Feed Energy R2 fed pigs was a remarkable 380% increase over that of the control pigs.

Table 1. Postmortem and growth performance measures (30 pigs/room; 15 DPI)

Treatment	PRRSV	PEDV	SVA	PRRSV	PEDV	SVA	ADG
Feed Energy	0%	0%	47%	0%	0%	0%	1.18[a]
(+) control	100%	100%	30%	100%	100%	100%	0.31[b]

Infection: PRRSv: Serum; PEDv: Rectal Swab; SVA: Tonsil

Disease: PRRSv: Dyspnea/weight loss/rough hair coat; PEDv: Diarrhea; SVA: Lameness

a, b: Differences in growth rate determined to be significant at $p < 0.05$

Conclusions and Discussion

The data provided in this study support the risk of contaminated feed as a means of viral entry to farms. Pre-treatment of feed with the Feed Energy-R2 product can effectively render PEDV, PRRSV and SVA, subsequently introduced into feed, non-infectious.