Acid based eubiotic provides a new tool in biosecurity programmes

Viral challenges faced by pig producers are not new but are constantly evolving and therefore continue to be an ever-present challenge. Currently, transmission of African Swine Fever (ASF) is of particular concern, with the World Organisation for Animal Health estimating that it could infect over a quarter of the world's pig population.

by Lucy Brimble,
Anpario plc.
www.anpario.com

In addition to the highly topical ASF virus, viruses such as Porcine Reproductive and Respiratory Syndrome (PRRS), Porcine Epidemic Diarrhoea virus (PEDv) and Seneca Valley A (SVA) are all too common and can be detrimental to the economic success and profitability of pig producers globally.

Route of transmission

The way in which viruses are transmitted and pigs are infected is variable, however, it was not until a 2014 PEDv and PRRS outbreak in the United States that worldwide feed and pork industries began to recognise that feed ingredients were providing a route of transmission. The scale of the risk posed from this route has since been confirmed with further studies and research.

Virus survival times in feed materials are variable, ranging from seven to more than 180 days, with environmental conditions, such as temperature and humidity playing a crucial role, as well as the type of virus and whether it is enveloped or non-enveloped.

Non-enveloped viruses tend to be more resistant to action of disinfectants than enveloped viruses.

Several studies have indicated that certain individual feed ingredients are more likely to support survival and thus transmission of viruses, such as PEDv. High-risk feed ingredients included soybean meal (both organic and non-organic), distillers dried grains with solubles (DDGS), lysine, methionine and vitamin D.

As with most diseases, prevention is more effective than cure. This is especially true for viruses, with many having no known cure or fully effective vaccination. High-level biosecurity measures applied throughout the supply chain are the first line of defence in reducing viral transmission.

However, even with the strictest of biosecurity measures in place, if the proven risk associated with viral transmission in contaminated feed is not considered, the unit is still susceptible to a virus outbreak.

Therefore, the recently established link of viral transmission via feed material provides an additional area for producers to incorporate into existing biosecurity measures, thus effectively protecting pig herds from future virus outbreaks.

Treating the feed with an effective acid based eubiotic (ABE) with proven anti-viral action can help mitigate the adverse effects of in-feed viruses. Organic acids used in ABEs can directly inhibit virus activity, with action on suppressing gene expression and preventing viruses from attaching to the surface of host cells.

Formic acid has been shown to be effective in inactivating certain types of enveloped viruses on fomites, such as equipment. Additionally, when used in high-risk feed material, such as animal by-products, formic acid has been shown to inactivate these viruses within 24 hours.

Testing anti-viral efficacy

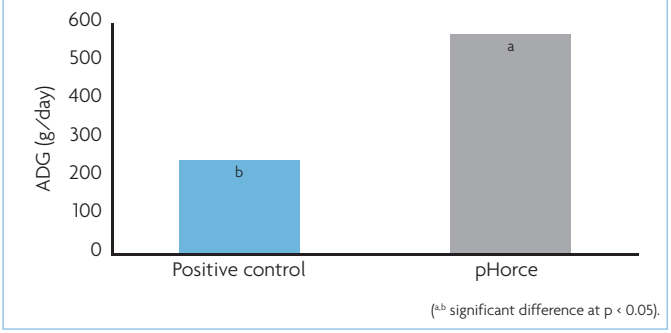
A recent study, conducted by Dr Scott Dee, was undertaken at Pipestone Applied Research Facility in the Unites States.

Having concluded in a 2018 paper that 'contaminated feed ingredients could serve as vehicles for the transport of viral pathogens between regions, countries or even across continents', this new trial was undertaken to test the anti-viral efficacy of widely available feed additives on excessive viral loads of PRRS, PEDv and SVA in the feed.

Pigs were selected for body weight (15kg) and originated from a naïve herd documented to be free of all three viral pathogens by monthly testing and clinical history. The trial was carried out over a 15-day period with 100 pigs per room (six pens per room) and a designated feed bin per room.

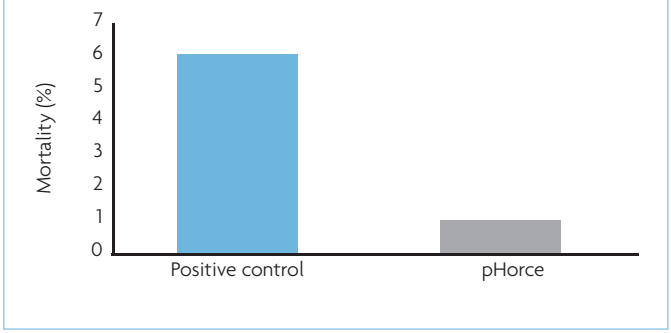
Continued on page 8

Fig. 1. Effect of treatment on average daily gain (ADG) (g/day) 15 days following initial viral challenge.



([a,b] significant difference at $p < 0.05$).

Fig. 2. Effect of treatment on group mortality (%) 15 days following initial viral challenge.



Treatment	Prevalence of clinical symptoms (%)		
	PRRS	PEDv	SVA
Positive control	100	100	100
pHorce	0	0	0

Table 1. Prevalence of clinical symptoms of disease observed in pigs fed the positive control or the ABE (pHorce at 3kg/tonne) supplemented feed (%).

Treatment	Viral infection level in post-mortem samples (%)		
	PRRS	PEDv	SVA
Positive control	100	100	20
pHorce	0	30	0

Table 2. Level of viral infection in post-mortem samples collected 15 days post-inoculation in pigs fed the positive control or the ABE (pHorce at 3kg/tonne) supplemented feed (%).

Continued from page 7

Viral challenge was administered on days 0 and 6 using the 'ice block model' whereby known volumes of SVA, PRRS and PEDv were provided in a suitable frozen media which would melt and permeate the feed before it was augured into the designated room.

In the trial the pigs were offered either a positive control which consisted of the infected feed with no additives (positive control), or the treatment which was the infected feed supplemented with the additive, one of which was an ABE comprised of a formic and propionic acid blend on a unique mineral carrier (pHorce, manufactured by Anpario) and was included at 3kg per tonne of feed.

Feeder samples were collected on days 0, 6 and 15 post-inoculation of the feed. Post-mortem samples were collected from 30 pigs (per room) selected for clinical illness (if apparent) 15 days post-inoculation and pigs were observed daily for clinical signs of infection. All samples were evaluated for viral presence by PCR and nucleic acid sequencing.

Performance parameters assessed included start and end body weight and mortality, which were analysed for significant difference ($p<0.05$) by ANOVA.

Whilst the pigs fed the infected control diets exhibited clinical symptoms of SVA, PEDv and PRRS and a high infection rate, no clinical symptoms of any of these viruses were present in the pHorce supplemented pigs (Table 1).

Post-mortem testing indicated that there was no infection of SVA and PRRS in the pHorce supplemented pigs and there was just a 30% PEDv infection level in pigs supplemented with pHorce, which was not severe enough to result in the presence of clinical symptoms, compared to 100% in the control group (Table 2).

The improved health and reduced incidence of viral infection in the pigs which were fed infected feed supplemented with pHorce provided performance benefits.

Pigs exhibited a significantly higher average daily gain (ADG) (Fig. 1) and a numerically lower mortality (Fig. 2).

These performance benefits can provide economic advantages, helping to support producer profitability.

The anti-viral properties of this formaldehyde free, low inclusion ABE solution, provides proven triple action benefit; with well-established anti-bacterial, anti-fungal and now demonstrable anti-viral properties.

The use of this additive will enable feed and pig producers to become proactive in their fight against viral challenges, helping to mitigate the effects of in-feed viruses. ABEs could become fundamentally important in protecting pig herds globally. ■