KEMIN

InfoLink

1900 Scott Avenue • Des Moines, Iowa, USA 50317 • tel: 515.559.5100 • www.kemin.com/ag

Controlling African Swine Fever Virus in Feed and Feed Ingredients

OVERVIEW

Introduction of a viral pathogen to a naïve herd is a major risk for North American pig producers. Research has demonstrated that many pathogens remain stable and infective in feed and feed ingredients for long periods of time.[1,2] Recently, this work has been expanded to foreign animal diseases, including African Swine Fever Virus (ASFV).[3] The impact of ASFV on the swine industry cannot be overstated. Estimations indicate an economic impact of $15 billion if the disease is controlled and eradicated in two years following introduction or $50 billion if it is unable to be eradicated within 10 years.[4] Therefore, preventing the introduction of ASFV is of utmost concern.

Controlling pathogens in feed can be accomplished with feed mill biosecurity practices, as well as with chemical disinfectants.[5] Recent research from Kansas State University has now shown the effects of formaldehyde and medium chain fatty acids (MCFA) on ASFV in a series of studies.[6]

Evaluating Sal CURB® in a cell culture model: Initially, researchers at Kansas State University focused on understanding increasing doses of Sal CURB and a 1:1:1 blend of C6:C8:C10 medium chain fatty acids on a cell culture level. This can be a tool to predict the effectiveness of feed additives on the inactivation of ASFV in feed and identify the lowest effective inclusion rate. Researchers discovered a dose-response for both Sal CURB and the MCFA blend with no detection at 0.35% (7 lb./ton) and 0.70% (14 lb./ton), respectively.

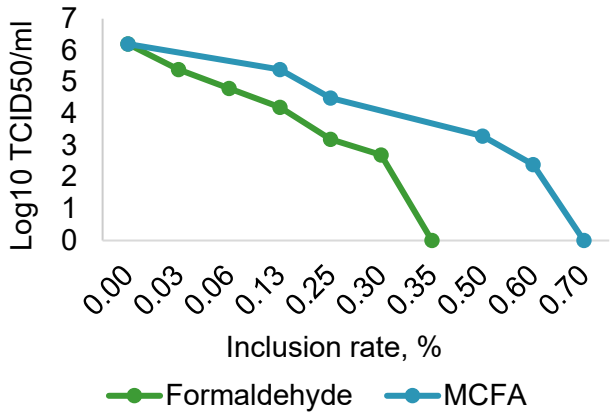

Figure 1. Inactivation curve of ASFV after exposure to formaldehyde or MCFA.

Evaluating Sal CURB in a transboundary model: In previous studies, ASFV was shown to be a risk for transboundary transmission in feed ingredients. Researchers set out to determine if treating at-risk feed ingredients with Sal CURB at d0 (prior to shipment) or d28 (upon arrival to the U.S.) would prevent infection. Both virus isolation and pig bioassay were used to determine the effect of Sal CURB or MCFA blend on ASFV in the transboundary model.

1900 Scott Avenue • Des Moines, Iowa, USA 50317 • tel: 515.559.5100 • www.kemin.com/ag

Table 1. Detection of ASFV by virus isolation and bioassay following a 30-day transoceanic shipment model.

Feed Ingredient	No Treatment*	Formaldehyde 6.5 lb./ton		MCFA blend 20 lb./ton	
		Trt on d0	Trt on d28	Trt on d0	Trt on d28
Conventional Soybean Meal	$10^{3.0}$	Negative (-)	Negative (-)	Negative (-)	Negative (-)
Organic Soybean Meal	$10^{3.0}$	-	-	-	+
Soy Oilcake	$10^{3.1}$	-	-	-	-
Dry Dog Food	$10^{2.7}$	-	-	-	+
Moist Cat Food	$10^{3.0}$	-	-	-	-
Moist Dog Food	$10^{2.8}$	-	-	-	-
Choline	$10^{3.2}$	-	-	-	-
Pork Sausage Casings	$10^{2.9}$	-	-	-	-
Complete Feed	$10^{2.7}$	-	-	-	-
Complete Feed (Neg Control)	-	ND	ND	ND	ND

*Initial virus inoculation was 10^5 $TCID_{50}$. All treated samples collected were negative on virus isolation and were tested in a pig bioassay by intramuscular injection of feed supernatant collected at 30 dpi. Bioassay results are shown as positive (+) or negative (-). Four rounds of 6 pigs/round were utilized for bioassay (n = 24 pigs), with one pig in each round serving as the Neg control. The remaining 5 pigs/round were inoculated with either 1 or 2 feed samples. Samples were pooled based on PCR values from 30 dpi. ND, not determined.

Conclusions and next steps: This data confirms the ability of feed and feed ingredients to harbor ASFV and emphasizes the need for effective feed biosecurity practices to reduce the risk of ASFV transmission. Formaldehyde was an effective feed disinfectant at the rate of 6.5 lb./ton. In the bioassay study, MCFA at 20 lb./ton was able to mitigate the risk, but not completely prevent ASFV transmission through feed. Research continues regarding the effectiveness of Sal CURB to inactivate ASFV at varying time/temperatures.

References

1. Dee S., Clement T., Schelkopf A., Nerem J., Knudsen D., Christopher-Hennings J. and Nelson E. (2014). An evaluation of contaminated complete feed as a vehicle for porcine epidemic diarrhea virus infection of naive pigs following consumption via natural feeding behavior: proof of concept. *BMC veterinary research.* 10.1: 176.
2. Dee S., Neill C., Clement T., Singrey A., Christopher-Hennings J. and Nelson E. (2015). An evaluation of porcine epidemic diarrhea virus survival in individual feed ingredients in the presence or absence of a liquid antimicrobial. *Porcine Health Management.* 1.1: 9.
3. Niederwerder M., Stoian A., Rowland R., Dritz S., Petrovan V., Constance L., Gebhardt J., Olcha M., Jones C., Woodworth J. and Fang Y. (2019). Infectious Dose of African Swine Fever Virus When Consumed Naturally in Liquid or Feed. *Emerging infectious diseases.* 25: 5.
4. https://thepigsite.com/articles/new-economic-study-african-swine-fever-outbreak-in-the-us-could-cost-50-billion Accessed on April 3r, 2020.
5. Cochrane R., Dritz S., Woodworth J., Stark C., Huss A., Cano J., Thompson R., Fahrenholz A. and Jones C. (2016). Feed mill biosecurity plans: A systematic approach to prevent biological pathogens in swine feed. *Journal of Swine Health and Production.* 24.3: 154-164.
6. Niederwerder, M.C., Dee, S., Diel, D.G., Stoian, A.M., Constance, L.A., Olcha, M., Petrovan, V., Patterson, G., Cino-Ozuna, A.G. and Rowland, R.R. (2020), Mitigating the risk of African swine fever virus in feed with antiviral chemical additives. Transbound Emerg Dis. Accepted Author Manuscript. doi:10.1111/tbed.13699