



Impact of Sal CURB® ASF Liquid Antimicrobial in Swine Diets

Introduction

The safety and biosecurity of complete feed and feed ingredients continues to be an important part of livestock and poultry pathogen control programs. Feed has been shown to transmit pathogens¹ and a formaldehyde based ingredient has been shown to reduce this risk.² Sal CURB® ASF liquid antimicrobial (Sal CURB) contains formaldehyde and is labeled to maintain feed and feed ingredients *Salmonella*-negative for up to 21 days. Formaldehyde is known to denature proteins via cross-linking.³ The amine group of an amino acid is more vulnerable to formaldehyde,⁴ thus causing concerns over reducing lysine availability. Various experiments have been conducted to determine the effect of Sal CURB on lysine availability, as well as pig performance.

Lysine Availability

To measure the impact of Sal CURB on lysine and other amino acids, two distinct assays were utilized. First, a free lysine assay, where Sal CURB was added to a mixture of ground corn and lysine. The mixture was chosen to reduce the background level of lysine from other protein ingredients potentially found in complete feeds. The mixture was treated with and without Sal CURB, in combination with 4 levels of L-Lysine HCl (0.0, 0.3, 0.45 and 0.60%). The samples were then stored for 0, 10, or 20 days post mixing and analyzed for free lysine content. As shown in Figure 1, no interaction between Sal CURB application, storage time, or Sal CURB x storage time on free lysine was observed.

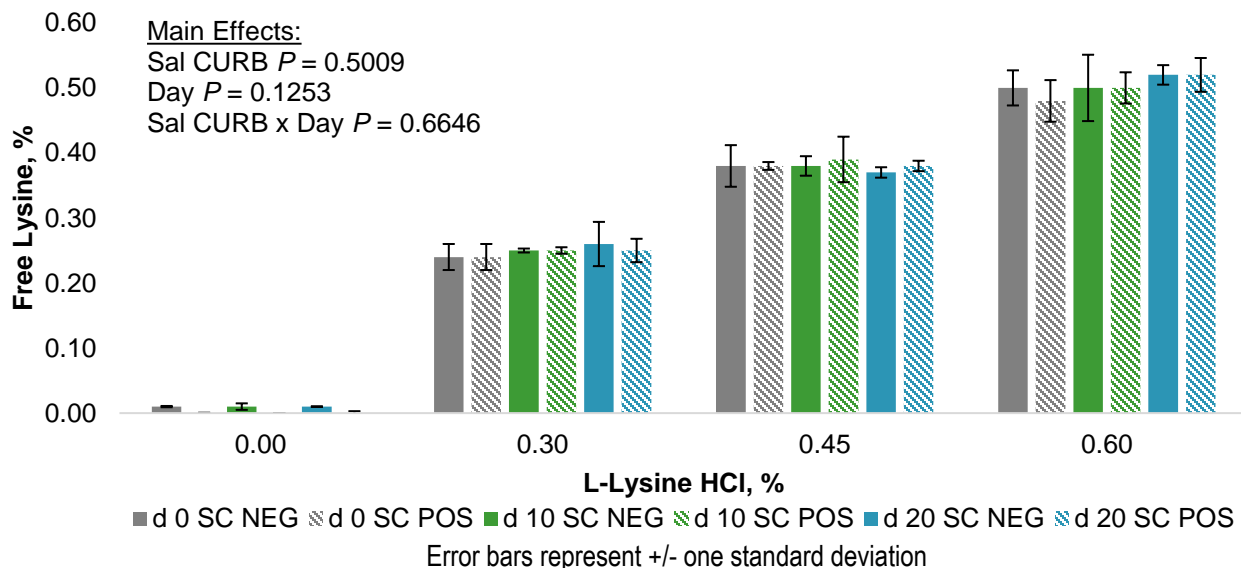


Figure 1. Average free lysine recovered from corn lysine mixture over all time points⁵

Second, a digestibility assay was conducted to determine the effect of Sal CURB on the digestibility of amino acids. A nursery base mix was treated with Sal CURB or saline and incorporated into a complete feed at 32.5%. Eight growing pigs were equipped with a T-cannula at the distal ileum. Fecal samples and ileal digesta were collected over time and used to calculate an apparent ileal digestibility (AID). As shown in Table 1, no significant decrease in AID for any indispensable or dispensable amino acids was measured.

Table 1. Apparent ileal digestibility (AID) of dry matter, crude protein and amino acids (AA) in experimental diets, as-fed basis⁶

Item	Control	Sal CURB	SEM	P-value
Dry Matter, %	70.91	71.32	1.66	0.54
Crude Protein, %	73.87	73.37	1.33	0.69
Indispensable AA, %				
Arg	85.35	84.34	1.22	0.28
His	76.69	77.91	1.50	0.46
Ile	79.49	78.87	1.17	0.50
Leu	80.44	81.21	1.04	0.48
Lys	82.60	83.76	0.76	0.25
Met	88.41	89.56	0.49	<0.05
Phe	79.02	79.40	1.17	0.73
Thr	78.14	77.00	1.25	0.20
Trp	83.49	85.24	1.50	0.24
Val	75.15	75.53	1.24	0.76
Mean	80.60	80.95	1.04	0.72
Dispensable AA*, %				
Mean	75.74	75.44	1.62	0.85
All AA, %	78.13	78.16	1.33	0.98

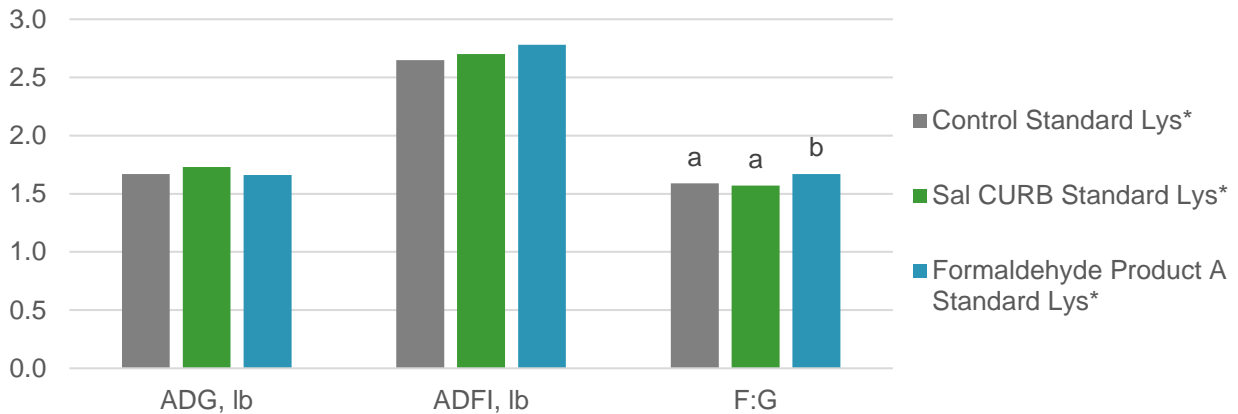
*Dispensable AA include Ala, Asp, Cys, Glu, Gly, Pro, Ser, Tyr

Pig Performance

Three nursery pig trials and 1 growing pig trial have been conducted in which Sal CURB inclusion and amino acid levels, specifically lysine, were studied for their impact on pig performance. Performance parameters measured were average daily gain (ADG), average daily feed intake (ADFI) and feed to gain ratio (F:G).

- Nursery trial 1 was a 14-day study in which a 3x2 factorial was used to determine the effect of two formaldehyde feed additives on pig performance in diets containing standard lysine levels (1.25% Standard Ileal Digestibility (SID) lysine) or low lysine levels (1.10% SID lysine).
- Nursery trial 2 was a 44-day study in which the interaction of Sal CURB with lysine, vitamin and phytase levels in feed was studied. A basil diet with standard lysine level was used as a control. This diet was then modified with the addition of Sal CURB, as well as a 15% increase in either amino acid levels, vitamin/phytase levels, or both.
- Nursery trial 3 was a 28-day study in which a 2x2 factorial was used to determine the effect of Sal CURB on lysine source. All diets were formulated at 90% of the SID lysine requirement for pigs according to the National Research Council (NRC). Lysine source included standard levels of synthetic lysine and diets containing no synthetic lysine.
- Grower trial 1 was a 36-day study in which a 2x2+1 factorial was used to evaluate the effect of Sal CURB on lysine source. An additional negative control was added at 10% lower lysine inclusion to validate the lysine response model. Treatments included diets with and without Sal CURB, as well as with or without synthetic lysine inclusion.

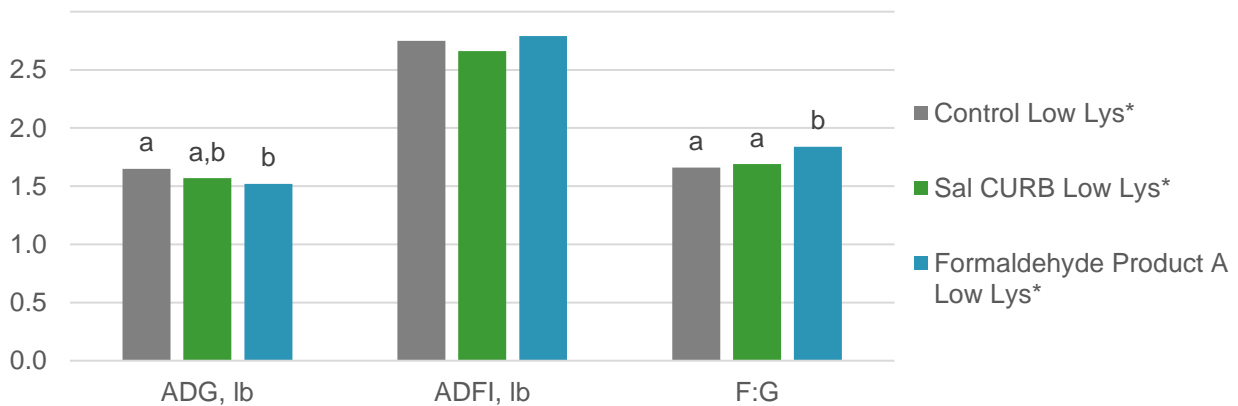
Nursery trial 1 - At the standard SID lysine level (Figure 2), Sal CURB was similar to the untreated control for all performance parameters (ADG, ADFI and F:G; $P > 0.05$). At the lower SID lysine level (Figure 3), Sal CURB did not significantly reduce performance parameters, although overall formaldehyde inclusion, including a competitive product, significantly reduced F:G by 1.1% ($P = 0.0003$) and tended to reduce ADG by 2.4% ($P = 0.096$).



^{a,b}Means lacking a common superscript differ ($P < 0.05$)

*Standard lysine level = 100% of requirements (1.25% SID lysine)

Figure 2. Effect of formaldehyde on nursery pig growth performance at standard lysine level⁷



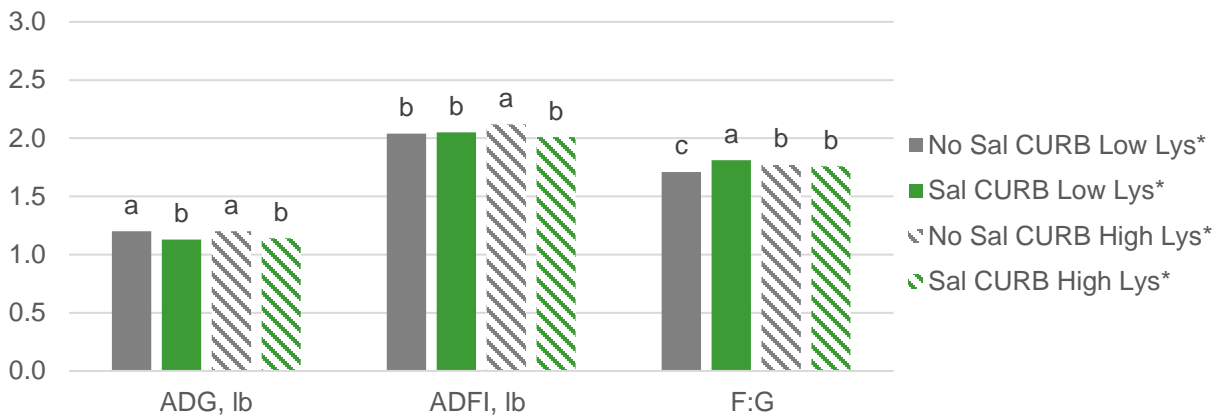
^{a,b}Means lacking a common superscript differ $P < 0.05$

*Low lysine level = 90% of requirements (1.10% SID lysine)

Figure 3. Effect of formaldehyde on nursery pig growth performance at low lysine levels⁷

Nursery trial 2 - The addition of Sal CURB to standard diets reduced ADG 3.5% ($P = 0.04$), but did not reduce ADFI or F:G ($P > 0.05$). When diets contained lysine levels at 115% of the animal's needs ADG, ADFI and F:G were similar to the control without Sal CURB ($P > 0.05$). The increase of only vitamin/phytase levels to 115% of the animal's needs revealed a similar decrease in average daily gain ($P = 0.04$) to the standard diet with Sal CURB. Therefore, the decrease in performance was attributed to the interaction with Lysine.⁸

Nursery trial 3 - The addition of Sal CURB to diets containing no added synthetic lysine resulted in a 5.8% decrease in ADG and F:G ($P < 0.05$), as shown in Figure 4. In diets containing synthetic lysine, ADG was reduced by 5.0%, whereas F:G was not effected with the addition of Sal CURB.



a,b,c Means lacking a common superscript differ ($P < 0.05$)

*All treatments were formulated to represent 90% of lysine requirements for pigs according to the NRC, low lys represents no inclusion of synthetic lysine, high lys represents standard inclusion of synthetic lysine

Figure 4. Effect of Sal CURB and amino acid level on nursery pig performance⁹

Grower trial 1 - The addition of Sal CURB to diets with and without synthetic lysine decreased F:G by around 3.5%. This decrease was similar to the decrease observed for the additional control diet, which included a 10% reduction in lysine level. Conversely, ADG and ADFI were not affected by the addition of Sal CURB regardless of lysine source.¹⁰

Conclusions

The addition of Sal CURB to swine diets did not reduce analyzed free lysine levels or amino acid levels, as measured by free lysine analysis or a digestibility assay, respectively. A reduction in performance of pigs fed Sal CURB treated feed was around 3-5%, but was not consistent between studies. In these studies diets containing intact proteins, such as from soybean meal, and lower SID lysine levels were most affected by the addition of Sal CURB. The reduction in performance was negated when lysine levels were over formulated by 10-15%. More work needs to be conducted to determine if over formulation of lysine levels less than 10% would prevent the reduction in performance, as some studies showed no reduction in performance using standard diets.

References

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