

# Are diet formulations in ABF programs hindering performance?

A recent study completed by Novus International Inc and PIC North America revealed that the TSAA:Lys ratio (total sulphur amino acid to lysine) may need to be adjusted to account for the immune challenges common in antibiotic-free (ABF) programs for the animal to reach its full potential.

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When formulating diets, nutritionists usually use TSAA (methionine + cysteine) because by adequately supplementing methionine, cysteine can be synthesised endogenously in the pig, rendering unnecessary any additional cysteine supplementation.

Thus, the TSAA:Lys ratio, based on the ideal protein concept recommended by the National Research Council in 2012 is often used as a reference in swine diets to calculate methionine supplementation levels.

The use of antibiotics as growth promoters, referred to as AGPs, has been a common practice in swine production for many decades worldwide. It can be theorised that, with the removal of AGPs from diets, the immune system of piglets will be stimulated to a higher degree than seen in traditional production, which may

result in changes in nutrient requirements. The current recommendation from the NRC is 55% standardised ileal digestible (SID) TSAA:Lys, but this has been determined based on experiments with low incidences of health challenges when compared to pigs in ABF programs and AGPs were likely used in most.

While lysine may be the first limiting amino acid for older pigs, methionine often becomes limiting to younger pigs depending on the ingredient composition of the diet. The amino acid recommendations from NRC were estimated taking into consideration genetics, gender and age of pigs.

However, it does not consider the immune status or any pathogenic challenges in the pigs' environment. So, methionine supplementation in challenging environments may be inadequate, which could compromise growth.

During the post-weaning period, as well as during any health challenge, pigs' bodies

divert amino acids away from growth uses to support the immune system. Because the acids are split for two functions, the overall requirement for TSAA:Lys increases in order to maintain health and growth rates.

When there is an infection, there is an increase in immune cell proliferation, and methionine is involved in the DNA methylation and polyamine synthesis that occurs as a result. In the same way, cysteine, the other sulphur amino acid, is involved in the synthesis of glutathione and is required for activation of T-lymphocytes, leukocytes, and cytokines, making it involved in immune function as well.

## Analysing the research

The research Novus International and PIC North America collaborated on aimed to determine whether pigs raised in different

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**Fig. 1. Effect of antibiotic growth promoters and TSAA:Lys on average daily gain.**



**Fig. 2. Effect of antibiotic growth promoters and TSAA:Lys on feed intake.**



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conditions (with or without dietary AGPs) would have different requirements of TSAA:Lys ratio to support optimal growth performance.

The experiment used 924 piglets weaned at 21 days of age under commercial conditions that were fed experimental diets from 14-35 days post-weaning.

The treatment structure was a 2x3 factorial, with or without AGPs included (0.0 or 1.0% Mecadox 2.5) and three levels of SID TSAA:Lys ratio: 1) 51% (low), 2) 58% (requirement) and 3) 66% (high), resulting in six experimental diets.

The source of TSAA used in this experiment was methionine hydroxy analog

(MHA, Novus International Inc). When analysing the ratio of TSAA:Lys ( $P=0.39$ ; Fig. 1) interacting with average daily gain, this study demonstrated that there was no proven interaction.

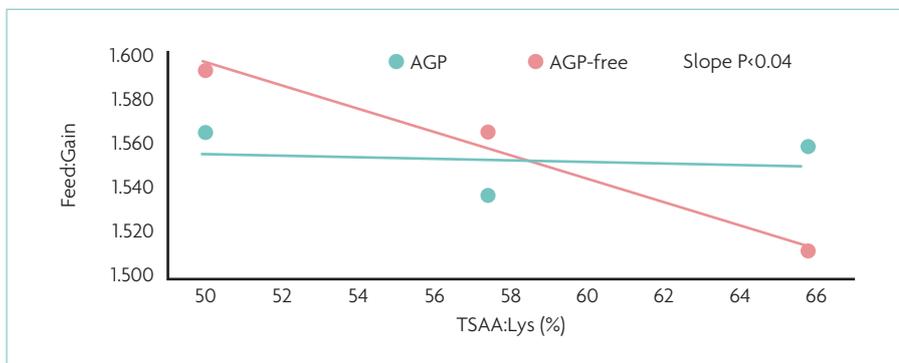
Pigs that were fed diets supplemented with AGPs had higher ( $P<0.05$ ) ADG compared with pigs receiving AGP-free diets. The ADG was increased (quadratic,  $P<0.05$ ) with increasing levels of TSAA. For average daily feed intake (ADFI), there were no effects of the ratio of TSAA:Lys nor an interaction between AGP and the ratio of TSAA:Lys (Fig. 2).

However, the ADFI was greater ( $P<0.05$ ) for pigs fed diets supplemented with AGP than

that of pigs fed AGP-free diets. However, there was a significant interaction between AGP and the ratio of TSAA:Lys ( $P<0.05$ ; Fig. 3) when analysing feed conversion rates.

As the ratio of TSAA:Lys increased from 51% (low) to 66% (high), the feed conversion of pigs fed the AGP-free diet were improved, whereas the feed conversion of pigs fed the AGP-supplemented diet was unaffected by TSAA:Lys (AGP vs. AGP-free slope,  $P<0.01$ ). The results on feed conversion indicate that the methionine requirements for pigs in AGP-free diets should be higher than the requirements for pigs fed diets supplemented with AGP in order to have more optimal feed conversion rates, directly affecting producer profitability.

**Fig. 3. Effect of antibiotic growth promoters and TSAA:Lys on feed conversion.**



### Key findings

When pigs were fed AGP-supplemented diets, they performed better compared with those fed AGP-free diets. Pigs fed AGP-free diets also appeared to respond to higher levels (compared to the current recommendation) of TSAA:Lys ratios under commercial conditions.

Further research to validate the findings of this study and estimate the optimal ratio of TSAA:Lys is expected to support the growing population of pigs raised in AGP-free programs. ■