Optimising dietary protein for better pig performance

Optimising dietary protein intake in swine has long been recognised as a challenging balancing act, where failure risks a potential decline in performance, health and behaviour. But this looks set to change thanks to an emerging approach to animal nutrition and health which is providing valuable new insights.

by Rachael Hardy,
DuPont Industrial Biosciences.
www.dupont.com

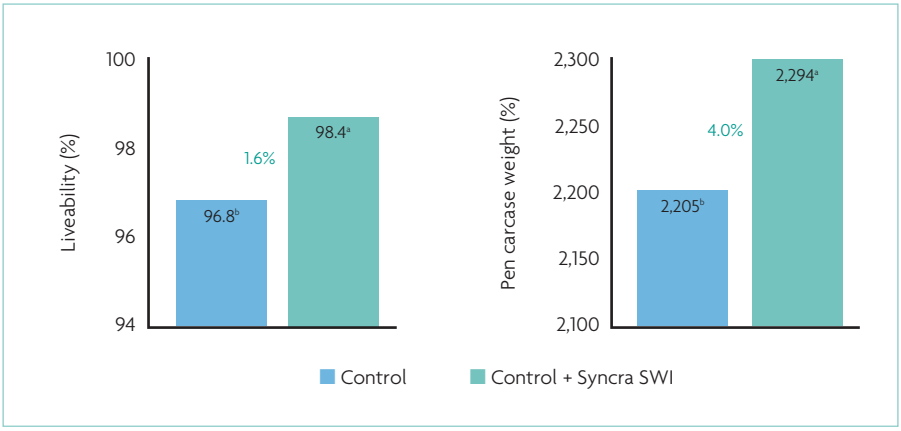

Fig. 1. Syncra SWI has been shown to consistently deliver positive results in terms of liveability and pen carcase weight in pigs (28-116kg).

Unlocking the full nutritive potential in feed is one of the most important issues facing pig producers today, but it must be achieved within an increasingly complex operating environment.

As the single greatest expense in pig production feed is, unsurprisingly, often a focus for cost reduction measures. Yet cheaper ingredients can be more difficult for the pigs to digest; so negatively impact feed efficiency, growth consistency and commercial return.

This is particularly true when low cost, high fibre substitutes are added to feed compositions as this also increases the amount of fibre-bound protein present, which is known to be difficult for pigs to breakdown in order to liberate the nutrients. Corn distillers dried grains with solubles (DDGS), for example, have 13.6% of their protein bound to fibre.

Further complications

The situation has been further complicated by recent steps to remove antibiotics from the food chain in many countries around the word.

While this may satisfy certain stakeholders, for producers it has created a new set of problems. This is because antibiotics have historically played a key role in reducing disease and environmental pathogens in livestock. Without this defence, not only is the animal's health affected, but also its ability to digest dietary protein.

Despite a flood of 'antibiotic replacement solutions' appearing on the market, producers have yet to find a 'silver bullet' which works at every level. Many are also sceptical of feed additives, other than phytase, due to disappointing results from previous trials.

As a result of these developments, a new scientific approach is emerging which aims to open the 'black box' of nutrition and gut health. It seeks to build a greater understanding of the interactions between feed components and animal health.

Cutting-edge research

A key focus for this research is to establish the full impact of synergistic feed additives on energy and amino digestibility, as well as wider performance parameters in pig production.

It builds on the premise that providing more digestible amino acids to the small intestine, the site of greatest absorption, can provide pigs with the tools to simultaneously support immune function and optimise growth.

Ongoing activity has identified an adaptive probiotic/enzyme combination (Syncra SWI) that has been shown to consistently deliver positive results in terms of amino acid digestibility, while also improving growth and liveability rates.

The solution combines a protease enzyme and a multi-strain Bacillus species probiotic (a direct-fed-microbial; DFM). It has been the subject of a growing number of studies which support its positive mode of action on complex feed ingredients. For example:

- **Screening studies:**
A number of enzyme and probiotic screening studies were conducted to search for a solution to improve the solubilisation of the fibre-protein complex in the small intestine in grower pigs. While improvements in performance and digestibility of nitrogen and energy were seen with some enzymes, probiotics, and combinations of the two, it was evident that the protease/multi-strain probiotic combination was the best.

- **Six-trial analysis:**
A combined analysis of six individual grower-finisher pig trials found that the addition of a three-strain Bacillus probiotic and protease to the control diet led to significant increases in average daily gain (ADG) and feed conversion ratio (FCR) of 3% and 4% respectively.

- **Five-trial analysis:**
Improvements in liveability of between 1-2% were seen across five individual trials involving over 5,000 pigs reared under commercial conditions.

- **Meta-analysis:**
The same increase of 1-2% in liveability was

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also found following a meta-analysis of four trials involving 4,376 pigs starting at 25kg (approximately) and finishing at around 120kg. Carried out in a commercial setting, the findings showed that the adaptive combination numerically increased liveability, significantly improved feed conversion ratio (FCR) – with a clear reduction indicating greater efficiency – while average daily gain (ADG) was numerically increased.

This growing body of evidence suggests that the synergistic effect of the feed additive is derived from the adaptability and complementary action of in situ produced enzymes from the probiotic, together with the exogenous protease that degrades the fibre-protein matrix; so releasing nutrients that remain unavailable when either additive is used alone.

The Bacillus strains are delivered as a heat and pH-stable spore and then germinate in the small intestine where they produce the substrate-specific enzyme; a mode of action that allows Bacillus-derived enzymes to bypass the challenge of delivering reliable and stable enzymes to the gastrointestinal tract for nutrient release.

This is particularly important for the application of some highly efficacious feed enzymes which are not commercially available due to their lack of stability. It delivers a number of important potential benefits in terms of the growth and health of the animals which include:

- Enhanced energy and amino acid digestibility; vital for growth and supporting an effective immune defence.

- Consistent performance across multiple substrates due to its adaption in the digestive tract.

- Reduced ammonia emissions; resulting from increased protein absorption in the small intestine and corresponding reduction in protein fermentation in the hind gut. These lower ammonia concentrations reduce the incidence of bacterial growth; creating a healthier environment for livestock – both in terms of respiratory function and gut health – which has a positive effect on health and growth.

- The potential to positively shift the microbiota towards, for example, highly beneficial Lactobacillus populations, which can help the animal digest and absorb nutrients and help to defend against pathogens.

- Helping to enhance and strengthen the gut barrier; one of the animal's defence mechanisms against pathogens.

- Stimulating short chain fatty acid production in the hind gut, which provides an additional energy source and can further benefit gut health.

- Increasing liveability rate by up to 2% in grower-finisher pigs; an improvement which can lead to an average financial saving of around US$1 per head, according to the calculations of some commercial producers.

Greater understanding of gut health

With budgets increasingly strained and producers under pressure to deliver maximum return despite fundamental changes to established feed strategies, this drive to fully explore the impact of nutritional intervention on performance is well-timed.

By embracing the latest advances in scientific technologies, including omics technology and microbiome, research into this dynamic area is already delivering promising results.

It marks the start of a new way of thinking about the relationship between animal feed composition and a healthy gut function.

By providing new insights, backed by proven data, this research will equip producers with the knowledge to make strategic feed decisions – and so maximise gut health, wellness and profitability. ■