Boosting growth in young piglets with amylase based enzymes

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The use of carbohydrase feed enzymes in poultry, especially in broiler production, is a common strategy to reduce the negative effects of high viscosity in the gut and to increase the digestibility of dietary ingredients. Such enzymes also permit the use of a broader range of raw materials, many of which are more economical but harder to digest. Hence, carbohydrases offer flexibility in formulation and help to reduce feed costs.

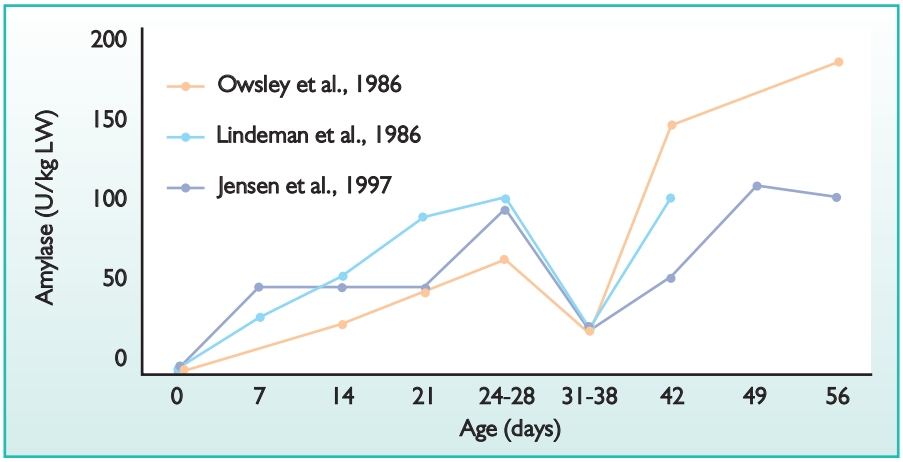

Fig. 1. Production of endogenous amylase in piglets. Note the post-weaning fall in production from ~24-35 days.

Factors for pig production

With respect to pig production, gut viscosity is not such a big concern as in poultry, although it may be important when viscose cereals (wheat, barley, rye) are used in the diets of young piglets. As pigs grow there is a rapid dilution effect on gut contents due to the relatively higher water consumption.

Nevertheless, it is important to take into consideration that high dietary concentrations of soluble non-starch polysaccharides (beta-glucans and xylans) can have a negative effect on feed digestibility by trapping essential nutrients, reducing their availability to the pig.

Besides reduction of gut viscosity, there are other reasons why exogenous feed enzymes act in different ways in pigs than broilers, some of which are listed below:

- Differences in pH of different digestive compartments.
- Differences in the retention time of digesta.
- Lack of endogenous production of enzymes.
- Differences in the gastrointestinal microflora.
- Different production cycle.

The young, growing pig is the most sensitive phase of the whole swine production cycle and responds favourably to enzyme supplementation.

Most feed enzymes used in Europe for piglets are based on NSP (non-starch polysaccharidase) enzymes, but other enzymes can also play a key role during this early stage by supplying those enzymes not produced by piglets, or with very limited production.

An enzyme such as amylase, although produced endogenously, is often severely limited in the stressful period around weaning and especially in the immediate post-wean-

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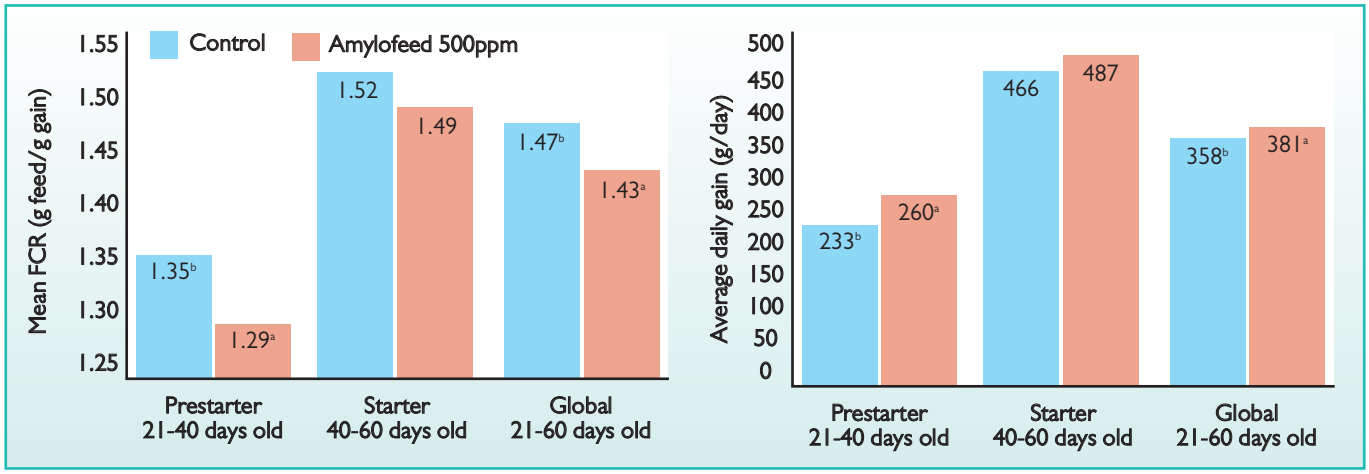
Fig. 2. Left, feed efficiency in weaned piglets (g feed/g gain) and, right, the average daily gain (g/day).



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ing period. Exogenous amylase helps the early weaned piglet grow faster and reduces the negative effects of undigested material in the distal part of the intestine. Poorly digested contents in the lower gut is a common contributory factor in post-weaning scours.

Immature enzymatic system

At birth the digestive tract of piglets is well adapted to digest sow milk, which is rich in highly digestible fat and lactose.

One of the most challenging moments in the life of the piglet is weaning. The change from the milk of the sow to the new, solid diet rich in proteins and complex carbohydrates can generate digestive stress and diarrhoea.

Around weaning the piglet's diet contains starch as the main energy source but an insufficient secretion of alpha-amylase (Fig. 1). Additionally, the fact that starch is stored in plants locked up in complex structures may also reduce its digestion in piglets.

It follows that the piglet will need a period of adaptation after weaning, to increase its capacity to secrete hydrochloric acid, bicarbonates and, of course, digestive enzymes. In many situations, the endogenous enzymes produced by the piglet may be insufficient to digest the new diet properly.

Consequently, one of the problems in this critical post-weaning period is that high amounts of undigested nutrients arrive in the large intestine and provoke severe digestive problems, reduced nutrient absorption and diarrhoea, with subsequent economic losses. In these cases the use of feed enzymes supplying amylases and other enzymes is beneficial.

Amylofeed is a multi-enzymatic complex, developed for use in weaned piglets to reduce post-weaning digestive problems and to enhance performance. Amylofeed is produced by fermentation of a non-GMO Aspergillus niger and a non-GMO Aspergillus oryzae. The product contains high amounts of NSP enzymes (beta-glucanases and xylanases) and high amounts of amylases. This product is commercialised by Materias y Actividades SL (Pintaluba Group) from Spain.

Amylofeed was designed to cover the natural post-weaning lack in endogenous amylase production, but also provides enzymes that improve the digestibility of cereals rich in non-starch polysaccharides.

Various practical feeding trials carried out within Europe have demonstrated the economical advantages of using Amylofeed in piglet diets.

- **Meta-analysis of three studies.**

Data obtained from three different experiments were combined and analysed together. The selected parameters for the analysis were: body weight (kg) at around 40 and 60 days of age, mean daily gain (g/day), mean feed intake (g/day) and feed efficiency (feed:gain) at 21-40, 40-60 and 21-60 days of age.

- **Experimental treatments.**

In each study, two experimental treatments were used: control with no exogenous enzymes, and Amylofeed at 500g/tonne of feed in both prestarter and starter phases.

- **Statistical analysis.**

The data were analysed by GLM of SAS with Amylofeed supplementation and experiment as main effects. Initial body weight was used as a covariate. Probabilities of $P \leq 0.05$ were considered statistically significant while $0.05 < P \leq 0.10$ was considered a near-significant trend.

The results are shown in Figs 2 and 3.

Conclusions

On the basis of these results, the following conclusions can be drawn:

- In comparison with controls, piglets fed diets supplemented with Amylofeed at 500g/tonne were significantly heavier after both prestarter and starter phases ($P<0.05$).
- Amylofeed supplementation of diets at 500g/tonne improved growth by 11.6% and feed efficiency by 4.4% in the prestarter phase ($P<0.05$).

Over the whole study period, encompassing both prestarter and starter phases, piglets fed the Amylofeed diets grew 6.4% faster and converted feed 2.7% more efficiently than the controls ($P<0.05$). ■

Fig. 3. Body weight data.