Do fattening pigs need non-starch polysaccharide degrading enzymes?

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The use of non-starch polysaccharide (NSP) degrading enzymes is very common in poultry diets, although in pig nutrition they are not yet recognised as a standard feed value improving feed additive. Despite the academic discussion regarding the mode of action of the NSP degrading enzymes in pigs, more and more studies show the beneficial effect of adding NSP enzymes to the pig's diet. However, it looks like, depending on the type, the microbial origin and the specific characteristics of the NSP enzymes, that the outcome measured by improving zootechnical performance of pigs is not always consistent.

Degradation of fibre

The difference between enzymes and their response in different diets and production conditions is remarkable and relies most of the time on the enzymatic complex present in the NSP degrading enzymes and their effectiveness in degrading fibre. Fibre, especially the NSP fraction in it, is by far the most important dietary factor influencing the flow of nutrients from small to large intestine in growing pigs.

In the large intestine, the rate and overall degree of degradation of fibre polysaccharides is influenced by the chemical nature of the fibre, the solubility and the degree of lignification.

Thus, β-glucans, soluble arabinoxylans and pectins are all rapidly degraded in the caecum and proximal colon, whilst the insoluble arabinoxylans and cellulose are degraded more slowly at more distal locations of the colon.

Scientific data show that the digestibility in pigs of NSPs in the small intestine is low (Table 1).

Additionally, it is known that some NSPs cause a reduced gastrointestinal transit time and also an increased stool output, which is explained by the fact that the carbohydrates escaping digestion in the small intestine act as the main substrate for the colonic microbial fermentation.

This stimulates microbial growth and increases bacterial cell mass which generates fermentation end-products such as short chain fatty acids (SCFA) and gases like CO2 and CH4.

The SCFA end-products are of particular interest for the pig's nutrition because they interact with several metabolic processes in the host. The SCFA produced by the microbial gut flora are rapidly absorbed from the gut lumen and subsequently utilised by the animal providing a substantial amount of metabolisable energy. The use of NSP enzymes will alter/influence these processes significantly both by increasing digestibility of NSP in the small intestine and by formation of (a specific combination of) oligosaccharides available for fermentation by the microbial gut flora in the large intestine. These newly formed fermentable oligosaccharides are as variable as the fibre structure present in the feed, and depend on the exogenous NSP degrading enzyme being used and the animal health status.

A: 70% W + 15% SBM + 10% SFM
B: 35% W + 40% B + 15% SBM + 5% RSM
C: 10% W + 70% B + 5% SBM + 10% RSM
D: 20% W + 45% Tt + 10% R + 15% SBM
E: 70% Tt + 10% B + 10% SBM + 5% RSM

W = Wheat, B = Barley, SBM = Soya bean meal, RSM = Rape seed meal, Tt = Triticale, R = Rye.

Base diet compositon (A-E) as used in Tables 2 and 3 and in Fig. 1.

Hostazym X concept

Products that will be newly formed after the breakdown of NSPs by the Hostazym X enzymatic complex have a positive influence on the gut microflora and promote a positive fermentation process leading towards an additional uptake of energy by the pig. This effect will contribute to better zootechnical performances and/or production efficiency.

Five different trials were conducted to evaluate the efficacy of Hostazym X regarding improving the zootechnical performance of fattening pigs. Table 2 summarises each trial set up. The results of the five trials clearly show that Hostazym X has a very consistent positive impact in reducing FCR. This effect was obtained in all types of diets, from simple to high complex fibre structures. Results are shown in Fig. 1.

The FCR improvement is supported by a significant improvement in body weight gain, which ranged

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Table 1. Coefficient of digestibility of NSP in the small intestine and total tract of piglets and growing pigs (Laerke et al (2003) and Hopwood (2004); Gdala et al (1997), Jansen et al (1998) and Pluske et al (2007); Knudsen et al (2008)).

	Small intestine	Total tract
Piglets 0-10 days post-weaning	0.03	0.57
Piglets 14-28 days post-weaning	0.14	0.67
Growing pigs	0.21	0.70

Table 2. Summary of trial set up.

Country	Fattening period (kg)	Base diet composition	No. of animals
Spain	34-93	A	520
Spain	30-88	B	420
Spain	37-93	C	560
Poland	30-110	D	~300
Poland	31-110	E	300

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from +0.5 to +3.0kg at the end of each trial. Results are shown in Table 3.

The efficacy of Hostazym X in improving the zootechnical performance of fattening pigs can be explained and supported by the release of extra nutrients from the diet at small intestine level.

The results of nutrient digestibility improvement are shown in Table 4.

All the information in this article clearly shows that growing pigs can definitely profit from the use of a good NSP enzyme in their feed.

Additionally, results can support the hypothesis that the product has influence over hindgut fermentation processes, through promotion of positive microflora growth and the additional uptake of energy by the animal.

Hostazym X has proven to be such an NSP enzyme and due to its unique characteristics it is able to improve both FCR and growth of fattening pigs held under practical conditions.

Furthermore, even when the diet is changing in raw material formulation, the product maintains its benefits, and makes it much easier to shift the feed formulation from one raw material to another. ■

References are available on request from natalia.soares@huvepharma.com

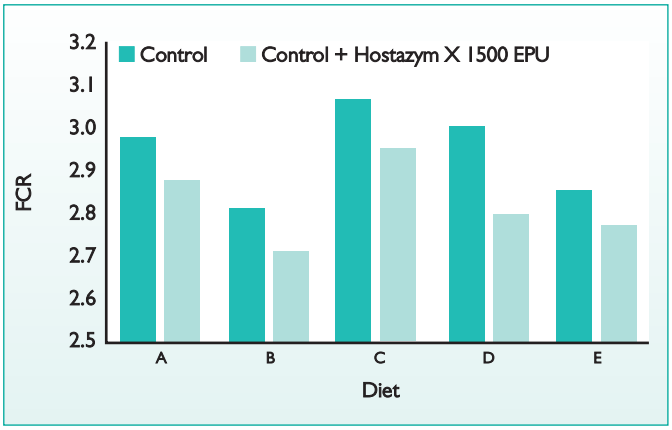

Fig. 1. Overall FCR of five different trials using significantly different diets.

Table 3. Average weight gain of five different trials using significantly different diets.

Diet	Average weight gain (kg)			
	Control	Control + Hostazym X 1500 EPU	Improvement (kg)	Fattening period (kg)
A	58.3	58.8	0.5	34-93
B	55.9	58.2	2.3	30-88
C	55.5	56.2	0.7	37-93
D	79.2	82.2	3.0	30-110
E	76.3	78.6	2.3	31-110

Table 4. Nutrient digestibility improvement (%).

Item	Control	Control + Hostazym X 1500 EPU	P value
Dry matter	81.50	83.17	0.038
Crude protein	77.03	78.89	0.039
Crude fat	45.29	64.90	0.006
Crude fibre	32.55	37.86	0.043
N free extract	89.78	90.41	0.516
Organic matter	83.42	85.17	0.009
Gross energy	80.97	82.29	0.097