

## Let's Talk About Enzymes...

### Does the pH and the hardness of the drinking water affect the efficacy of OptiPhos®?

It is widely accepted that a fast phytate degradation in the gizzard/stomach can only occur when the pH is below 4, meaning that phytate is in its phytic acid form and is easily accessible by a phytase. Therefore, a good phytase, like OptiPhos®, needs to have a pH profile with a high and consistent activity in the pH range of 2 to 4.

The factors that determine the resistance of feed towards acidification by hydrochloric acid in the gizzard/stomach are mainly the level of limestone (calcium carbonate,  $\text{CaCO}_3$ ) and protein in the feed (the so called 'buffer capacity of the feed'). High levels of limestone and protein require more HCl to be excreted in the gizzard/stomach in order to lower the pH to levels below 4.

As a result, the quantity of limestone and protein in the feed may have an impact on the performance of a phytase and avoiding an excess of protein and calcium (Ca) in feed can therefore boost the performance of OptiPhos®. For this reason, it is strongly advised that when using OptiPhos® in the feed to also use the recommended Ca matrix values in the diet reformulation.

The question if water quality (pH and hardness) can affect OptiPhos® efficiency by its influence on the buffer capacity of the feed is sometimes raised. The answer is, the hardness of water (high pH) has a limited impact on the performance of a phytase.

Water hardness ranges from 0 to 400 mg Ca per litre of water (normally hardness is below 200 mg Ca per liter). Birds drink on average 1.8 litres of water per kg of feed ingested, meaning that they consume a maximum of 720 mg of Ca ( $400 \text{ mg} \times 1.8 \text{ l}$ ) through the drinking water (per kg of feed ingested). Ca level in feed will range from 650 to 1000 mg Ca per kg. The Ca intake from the feed is at least 90% (and in most cases > 95 %) of total Ca intake.

Similarly, pigs drink about 2 litres of water per 1 kg of feed intake, so consuming a maximum 800mg Ca per kg of feed intake. The Ca level in feed is on average 700 mg/kg, meaning that a maximum of 12 % of the Ca intake will come from the drinking water. At this level of Ca uptake, contribution via drinking water has a minor impact on phytase efficiency.



### key facts

- The hardness of water has a minor impact on the performance of a phytase
- Reformulation of the feed taking into account the matrix value of Ca is highly recommended and will ensure that OptiPhos® will perform more efficiently and offer higher potential cost savings



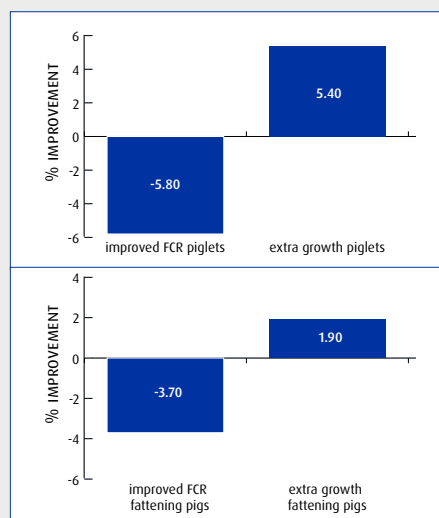
## Added value of Hostazym® X in pig performance

Scientific data shows that the digestibility of NSP (non-starch polysaccharides) in the small intestine of pigs is low; it is also known that some NSP cause a reduced gastrointestinal transit time and an increased stool output, which is explained by the colonic microbial fermentation of carbohydrates that escaped digestion in the small intestine. The short chain fatty acids produced by the microbial gut flora fermentation are rapidly absorbed from the gut lumen and subsequently utilised by the animal providing a substantial amount of metabolizable energy.

In pig nutrition more and more studies show the beneficial effect of adding NSP degrading enzymes to the pig's diet. Nevertheless, the differences between enzymes and their response in different diets and production conditions are remarkable and the explanation for the variation in results requires a multi-factor analysis including: animal breed and age, animal health status, gut microflora, production conditions, diet, fibre content and type, soluble and insoluble NSP content and last but not least, NSP degrading enzyme used.

### FIGURE 1

Average performance improvement (%) of Hostazym® X supplementation at 1500 EPU/kg feed on weaned piglets and fattening pigs over various diets



Huvepharma has done a significant amount of research to validate Hostazym® X enzymatic complex on its consistent results in increasing pig performance (average improvement results summarized in Figure 1).

Moreover, research has demonstrated that Hostazym® X reduces gut content viscosity and reduces inflammatory response markers (such as TNF- $\alpha$ ) as shown in Table 1. This response is explained by the reduction of anti-nutritional factors from the feed and improved intestinal transit time reducing lumen cells erosion and minimizing inflammation metabolic reactions.

Overall, Hostazym® X will influence the digestive process by increasing digestibility of NSP in the small intestine resulting in better performance and by formation of a specific combination of oligosaccharides, which will be available for fermentation by the microbial gut flora in the large intestine, supporting a healthier gut environment and a better health status of the pig.



**TABLE 1**  
Hostazym® X improves piglet gut health status

Tested parameter	Control	Control +Hostazym® X (1500 EPU/kg)
ADG (g/day)	616 <sup>a</sup>	660 <sup>b</sup>
Jejunal viscosity (cP)	2.27 <sup>a</sup>	1.96 <sup>b</sup>
Plasma TNF- $\alpha$ (ng/ml)*	108.45 <sup>a</sup>	69.87 <sup>b</sup>

<sup>a,b</sup> significantly different at  $P < 0.05$

\* Tumor Necrosis Factor- $\alpha$  (TNF- $\alpha$ ) = pro-inflammatory cytokine (increases inflammation), overreaction of immune system (can lead to cell death and fever)

## key facts

- Hostazym® X shows consistent results in improving pig performance and supporting a healthier gut environment
- The positive effect of Hostazym® X on pig performance is explained by its influence on nutrient digestibility, on the gut microflora and on the promotion of positive fermentation processes, leading to additional uptake of energy by the pig and consequently enhancing production efficiency