

Piglet nutrition – cost effectively reducing piglet scour with enzymes

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Enzymes can be used in feed to enhance the digestibility of feed raw materials and, in doing so, reduce bacterial multiplication by ‘starving’ them of nutrients. Enzymes can therefore play an important role in promoting pig health through reducing the incidence and/or severity of diarrhoea in piglets.

This article looks at the gut health challenges piglets face and how enzymes can help provide a dietary solution.

Nutritional challenges

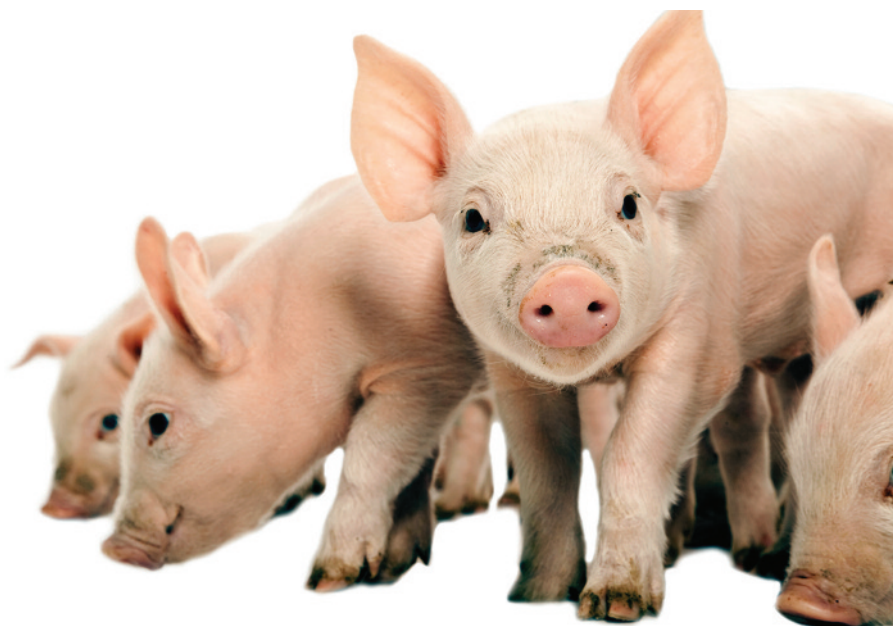
Piglets are vulnerable to intestinal bacterial infections or overgrowth following weaning, the cause of which is multifactorial, but is closely associated with a loss in digestive ability caused by dietary change.

Commercial weaning practice accelerates the gradual nutritional transition observed in naturally weaned piglets from a wholly milk to a wholly non-milk diet into a single episode. Weaning therefore precedes full establishment of the digestive apparatus (or tools) necessary for the piglet to effectively utilise a cereal based diet.

The switch from highly digestible and nutrient-rich milk diet to a cereal based replacement – lower in fat, higher in fibre and containing less available energy and protein sources – necessitates changes in the structure and function of the gut. These changes are complex but include a major revamp of enzyme secretions and significant modification in the intestinal surface, particularly the finger-like structures (villi) that line the small intestine and are critical to the digestion and absorption of nutrients.

These necessary adaptations are initiated within 24 hours of weaning, but take a little time to complete fully. It takes, for example, between four and seven days for normal competency in starch digestion to become established following weaning.

The presence of non-starch polysaccharides (NSPs) in the cereal feed raw materials can also greatly impact piglet digestion. NSPs form structural components which are



essentially indigestible, even to adult pigs. The extent of this impact on digestibility is affected by the proportion and composition of NSPs in the feed and varies across different raw materials.

The NSP most present in cereals are arabinoxylans. In simple terms NSPs can be differentiated based on whether they are soluble or insoluble. Both pose unique and substantial digestive challenges and can influence piglet performance and well being.

● Soluble NSPs:

Soluble NSPs cause a change in viscosity in the digestive tract by increasing the water retention capacity in the intestinal content. This viscosity can be problematic as it has the potential to change the piglet's intestinal ecosystem. In turn, such changes modify the digestibility and absorption of nutrients and, ultimately, mediate piglet performance.

● Insoluble NSPs:

Insoluble NSPs also interfere with the digestive process and can have anti-nutritive effects. By virtue of being insoluble any nutrients (starch, fats and proteins) ‘caged’ or encapsulated within the NSP matrix are effectively unavailable to the pig. Insoluble NSPs thus reduce feed nutrient digestibility and absorption solely by preventing the pig's

own enzyme secretions from accessing the nutrients.

As well as compromising piglet absorption of essential nutrients, the presence of insoluble and soluble NSPs can have a negative effect on intestinal health. Nutrients that escape digestion and absorption in the small intestine pass into the large intestine and are utilised for growth by resident microflora. Left unmanaged, bacterial overgrowth and expansion into the upper intestine follows.

An increase in bacterial presence in the small intestine results in further nutrient loss to the pig, driving bacterial proliferation. This expanding population inevitably includes bacteria that secrete toxins and is therefore associated with gut inflammation and diarrhoea leading to dehydration, appetite loss, depressed growth, increased morbidity and, ultimately, increased mortality.

Improving digestibility

Historically, the use of antibiotics at low levels in feed proved beneficial in promoting weaned piglet health and growth. Concerns

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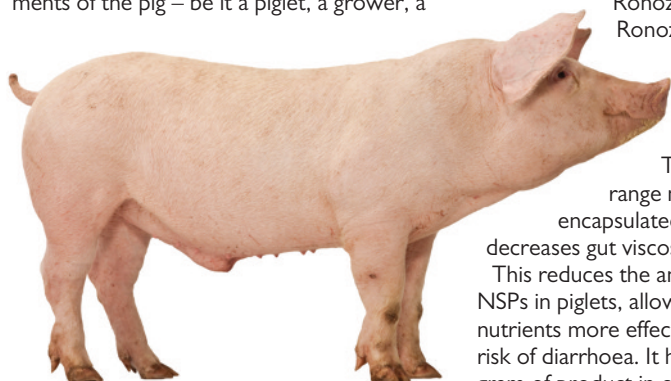
with regard to over-use of antibiotics in animal production have resulted in legislative changes and mean that this is now not an option.

Prescribed addition of high levels of zinc oxide to the diet is an effective means of control, however this strategy is not permitted in some EU countries due to concerns over increasing levels of zinc in the environment.

Another alternative is to enhance the digestibility of feed raw materials through some form of processing. Fine grinding or thermal processing ('cooking') of cereals enhances their digestibility to the pig, thereby reducing their availability to the bacteria. However, the use of processed raw materials in feed for pigs does add significant cost to the diet. For this reason, swine producers are increasingly turning to enzyme additives as a cost effective and sustainable means of managing young pig nutrition.

Support gut health

Feed is created by blending or mixing ingredients to match the nutritional requirements of the pig – be it a piglet, a grower, a



finisher or part of the breeding herd. These tailored solutions are particularly critical in the young as early nutrition and performance is known to impact significantly on the efficiency and rate of later growth.

The incorporation of supplementary enzymes in the feed formulation provides a sound means of helping to deliver on this aim of maximised early growth.

Exogenous enzymes, in particular carbohydrases, such as amylase, xylanase, and beta-glucanase, have been shown to aid in controlling piglet diarrhoea post-weaning. These enzymes hydrolyse NSPs and help release the encapsulated nutrients. By enhancing nutrient availability, the pig can exploit its feed more effectively and produce less waste, whilst simultaneously depriving bacteria of nourishment.

This is a win-win situation, as piglet health and performance is enhanced at the expense of bacterial overgrowth. The carbohydrases which most effectively degrade arabinoxylans are xylanases.

A total digestibility solution

In contrast to many commercially available xylanase products, DSM's Ronozyme WX and Ronozyme WX 2000 are active against both soluble and insoluble arabinoxylans found in feed raw materials. The Ronozyme WX range not only releases encapsulated nutrients, but also decreases gut viscosity.

This reduces the anti-nutritive effect of NSPs in piglets, allowing them to digest nutrients more effectively and reducing the risk of diarrhoea. It has more particles per gram of product in comparison to other

commercially available xylanase enzymes. The additive therefore has excellent mixing characteristics and flowability, thereby ensuring optimal distribution throughout premixes and feed. Ronozyme WX 2000 is even finer, offering more particles per gram and meaning a lower dosage is required.

Increased digestibility means greater productivity and profitability in piglets fed diets containing cereal by-products and arabinoxylan-rich cereals.

The Ronozyme range of enzymes allows piglets and pigs to use the nutrients in their diet much more effectively.

A bright future

The implications of allowing nutrients to be utilised for bacterial growth are perhaps greatest and most immediately evident following piglet weaning.

However, the benefits of carbohydrase use are not limited to this period alone. As a means of capitalising on the nutritional value of feed, either through improved conversion efficiency or by reduced costs, it is arguable that carbohydrase enzymes offer even greater economic benefits as pigs progress beyond the immediate post-weaning stage.

Maximising piglet vitality and performance and getting the best financial return on carbohydrase use requires an understanding of the interactions between NSPs and different commercial feed enzymes.

Matching enzyme application appropriately to the different stages of pig production enables producers to get the best return from their feed while promoting the health and performance of their animals.

DSM's Ronozyme WX range provides an ideal solution, combating the negative effects of NSPs, regardless of their solubility and ensuring increased nutrient availability to the pig. ■