Nutritional concepts to formulate piglet diets without ZnO

R. Davin, A. Huting, F. Molist
Schothorst Feed Research, Lelystad, Netherlands

Introduction: The European swine sector is facing big challenges due to the growing pressure to minimize the use of antimicrobials and high levels of ZnO in weaning diets. Several nutritional strategies, including the use of feed additives, are currently being used. However, a holistic approach including diet characteristics and composition, animal management, genetics and welfare should be considered.

This paper aims to describe the importance of main dietary nutrient (i.e. use of fiber, protein and fat) to improve gut health of piglets and that can serve as tools to minimize the impact of removing high ZnO in post-weaning piglet diets.

Fiber: Inclusion of fiber in post-weaning diets is considered controversial. From a functional point of view, fiber can be classified as inert or fermentable. Inert fiber include those carbohydrates that are not digested nor fermentable; ingredients like wheat bran, oat hulls or sunflower hulls are good sources of inert fiber. Fermentable fiber include those carbohydrates that are not well digested but are fermented in the gastro-intestinal tract (**GIT**); ingredients like sugar beet pulp, soy hulls and inulin are good sources of fermentable fiber.

The inclusion of inert fiber sources in piglet diets is associated with a reduced retention time in the GIT that reduces the proliferation of pathogenic bacteria. Gerritsen et al. (2012) showed that by adding 12.8% of inert fiber (50 g of wheat straw and 100 g of oat hulls per kg diet) to a cereal-based diet for the first 14 days post-weaning led to an increased feed consumption when compared with the cereal-based diet or the positive control diet which was rich in milk-derived sub-products and crystalline amino acids. Moreover, in this study the inert fiber diet was associated with a greater stomach weight and amylase activity in the intestinal brush border enzymes next to lower counts of *E. coli* in the ileum and colon digesta.

Fermentable fiber stimulates GIT microbiota to generate short-chain fatty acids (SCFA),and increases water retention in the digesta. However, Molist et al. (2009) observed that piglet's GIT needs at least 2 weeks to mature and to increase the fermentation capacity after weaning.

Proteins: Reduction of dietary crude protein (**CP**) is needed to stimulate piglet's gut health, as undigested protein in the small intestine serves as substrate for pathogenic bacteria. In the Netherlands CP levels of 16.5-17.5% are common in pre-starter diets.

Digestibility in piglets is reduced by 10-15% compared with growing-finishing pigs. This can be explained by the reduced stomach acidification in piglets that in turn will reduce the protection against pathogens and reduces protein digestion. Moreover, ZnO and CP sources have a larger buffer capacity than cereals. A recent study at SFR showed that the reduction of the buffer capacity in weaner feed by 200 mEq led to 8% greater body weight at d 35 post-weaning.

Fat: fat is the first nutrient to show a decreased digestibility during gut health alterations due to the degradation of bile acids by pathogenic bacteria. There is less information available about the effect of different fat sources and fat levels on piglet's gut health. However, it seems interesting to use highly digestible fat sources (rich in medium chain fatty acids (MCFA), e.g. coconut or palm kernel oil) to promote gut health. The ratio between unsaturated and saturated fatty acids is an important factor in post-weaning diets, and should be around 3-4.

Conclusions: Nutritional strategies in weaning diets without high ZnO should aim to reduce the amount of non-digestible substrates in the GIT that can become available to bacteria and impair gut health.

The use of inert fiber to stimulate GIT functionality, the reduction of CP by using highly digestible sources and synthetic amino acids, the reduction of dietary buffer capacity and the use of ingredients rich in MCFA seem to be of great help to overcome the withdrawal of ZnO in weaning diets.

References:

Molist et al., 2009. Effects of the insoluble and soluble dietary fibre on the physicochemical properties of digesta and the microbial activity in early weaned piglets. Anim. Feed Sci. Technol. 149:346-353.

Gerritsen et al., 2012. Insoluble nonstarch polysaccharides in diets for weaned piglets. J. Animal Sci. 90:318-320.