Protecting your piglets against post-weaning challenges

For the farmer, healthy piglets are the key to success. But what if this success is threatened by health problems? The immature intestine and immune system of the piglet shortly after weaning are susceptible to germs, such as enterotoxigenic E. coli (ETEC). As a result, about 15-23% of all piglets in the EU suffer from post-weaning diarrhoea (PWD).

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If PWD occurs, antibiotics must be used to treat the piglets to avoid loss of growth or even death of the animals – economic losses are the result. Did you know that phytogenics can contribute to prevent the development of PWD through their beneficial effects?

The period post weaning means a lot of stress for the young piglet: an abrupt change from highly digestible sow milk to poorly digestible and solid dry food, a new environment and mixed litters. One consequence of this stressful period is a reduced feed intake, accompanied by a transient growth rate.

Tokach et al. (1992) showed that piglets maintaining or losing their weight during the first weeks post weaning need 6-10 days more to reach their final slaughter maturity compared to piglets which gained greater than 227g/d life weight during the same period.

According to McCracken et al. (1999), low feed intake during the post-weaning period compromises gut development and causes an increased status of inflammation.

In addition, presence of pathogens such as ETEC may further damage the intestinal epithelia, especially in the small intestine.

As the intestinal epithelium is only formed by a thin layer of epithelial cells, it is extremely vulnerable. A disruption of intestinal integrity leads to a 'leaky gut', which is determined by an increased permeability for toxic substances and/or pathogens, thus burdening the immune system and reducing performance.

Taken together, these alterations of the gut explain the increased susceptibility of the piglet to diarrhoea and growth delays in the post-weaning period.

Until the ban of antibiotic growth promoters in 2006, Colistin was frequently used to control intestinal disorders like PWD. Seeking simple alternatives to prevent PWD like high dietary levels of zinc oxide created additional environmental issues.

In many cases antibiotic treatments were necessary to cure animals from diseases caused by pathogens. Due to the increasing problem of microbial resistance, the demand for antibiotic-free animal production, and safe and natural alternatives to control intestinal disorders, is growing.

Plant derived substances, with a multi-functional approach, are coming to the fore. These phytogenic active compounds show proven effects on feed intake, even under challenging conditions.

Phytogenics to counteract post-weaning disorders

To prevent pathogenic E. coli from adhering to the mucosal epithelium, PFAs such as natural mucilages should be added to the diet post weaning. It is proposed that these plant-derived mucilages cover the mucous membrane like a thin, protective layer, reducing the opportunities for pathogenic bacteria to attach to receptors on epithelial cells. However, plant active substances can do more: they do not only reduce the adhesion, but also interfere with the pathogenicity factors of ETEC.

One hypothesised mechanism of PFA against ETEC is via Quorum sensing (QS) inhibition. QS is a way of bacterial communication.

Disturbing QS can prevent activation of virulence factors (toxins, fimbriae for adhesion), thereby reducing the pathogenicity of the bacteria.

Thus, in a study of Gärtner and Zentek (2010) it could be proven that the adhesion of E. coli to intestinal cells decreased significantly when fed phytogenic additives compared to the control group.

However, impairment of intestinal integrity is not only caused by microbial pathogens. Several in-feed antigens or products of the microbial protein metabolism (ammonia) also cause inflammatory processes in the intestines of the host as a response to its immune system.

The defensive measures taken by the intestinal cells, such as inflammation to control and destroy the toxic compounds, lead to formation of free radicals which damage the intestinal cell barrier.

As a variety of phytogenic additives have antioxidant and/or anti-inflammatory properties – either directly by intercepting free radicals or indirectly by upregulating the expression of antioxidant and anti-inflammatory genes and enzymes – the host's intestinal barrier is supported.

Accordingly, Müller et al. (2012) showed an increase of the antioxidative capacity in the jejunum and liver of piglets when essential oils from oregano, rosemary and thyme were added to the feed. To sum up, PFAs are able to induce xenobiotic enzyme systems, thus improving the body's defence against harmful free radicals, toxins and

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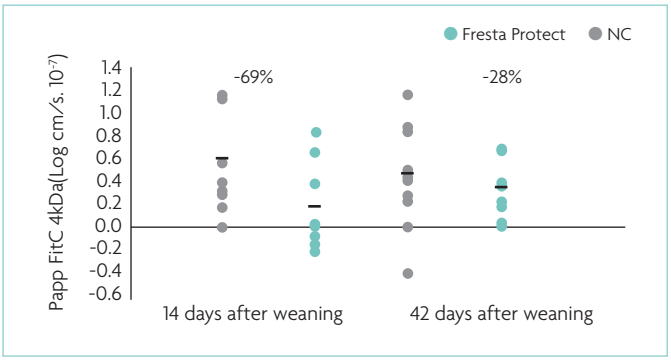
Fig. 1. Effect of Fresta Protect in piglets' diet on day 14 or day 42 (only Papp FD4) on distal small intestinal apparent permeability for the macro-molecular marker FITC-dextran 4kDA (Papp FITC4kDA, log cm/s.10^{-7}). (Aumiller et al., 14th International Symposium on Digestive Physiology of Pigs, 2018, Poster presentation).



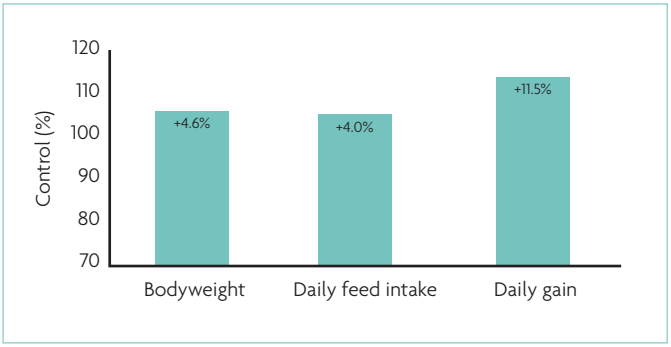


Fig. 2. Effect of a phytogenic feed additive on growth performance of post-weaning piglets.

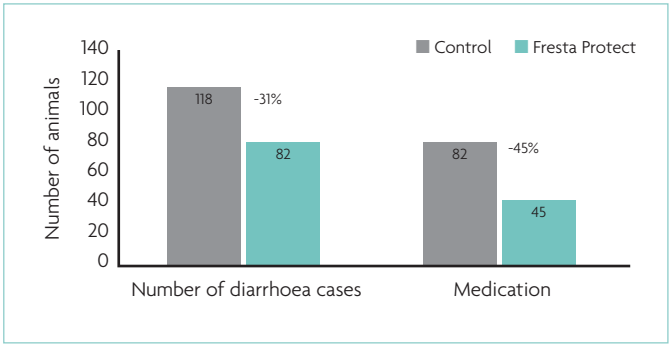


Fig. 3. Effect of a phytogenic feed additive on the incidence of diarrhoea and medication in post-weaning piglets.

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antigens and increasing the health status of the piglet.

Ultimate goal — protect the intestinal barrier

A disturbed – and thus permeable – intestinal barrier is no longer capable of preventing bacterial toxins or antigens from penetrating and inflammation, malabsorption, diarrhoea, reduced growth and limited performance are the consequences.

The first goal must be to strengthen this barrier. In this regard, a Delacon study in cooperation with Ghent University in Belgium revealed a reduced apparent permeability for the macromolecular FITC-4kDa dextran marker by 69% in the distal small intestine of piglets (60 animals/treatment) after feeding the pure, plant-based phytogenic Fresta Protect for 14 days post-weaning compared to the control diet (Fig. 1).

These study results bolster the claim of PFA beneficially influencing piglets' health by directly strengthening intestinal integrity, especially in the earlier period after weaning – one of the critical times in the piglet's life.

Although the weaning process usually begins with a decrease in feed intake, a summary of three trials shows a 4% increase in feed intake and 11.5% increase in daily gain with the addition of Fresta Protect in piglets post weaning (Fig. 2).

In addition to adequate feed intake, feed conversion and nutrient uptake are crucial to prevent intestinal disorders post weaning and thus support a healthy growth of piglets.

By promoting feed intake post weaning, damages of intestinal epithelia can be reduced, thus reducing the incidence of PWD.

A field trial in Germany supported this thesis. Here it was shown that the addition of PFAs to the diet of weaned piglets (400 animals (16 pens)/treatment) with permanent occurrence of E. coli associated diarrhoea reduced the incidence of PWD by 31% and medication by 45% compared to the control group (see Fig. 3).

For the farmer, this means considerable savings in medical costs.

Supporting intestinal integrity means maintaining performance

It is obvious that we need to implement novel strategies to support piglets in stressful and challenging post-weaning conditions, especially in antibiotic-free animal production. It has been shown that a specific PFA is a powerful option to support piglets in the critical post-weaning period, helping to enhance piglet performance.

In summary, PFAs contribute to increased post-weaning feed intake and intestinal integrity through their multiple properties. Several studies underline the importance of PFAs to promote animal health and reduce medication costs.

A good start of piglets into the post-weaning period improves their entire life performance. ■

References are available from the author on request