Focusing on early life piglet performance is critical for success

The holy grail of sow units is to maximise sow reproductive performance without compromising piglet viability. The industry is taking steps in this direction, with litter sizes of hyperprolific breeds increasing to approximately 18 piglets per litter in Denmark in the last 10 years.

However, the observed trends also show that litter size has been increasing to the detriment of birth weight and, consequently, weaning weight. In Denmark, for instance, the number of piglets born alive has increased by 2.3 piglets since 2007, while weaning weight has decreased by almost 1kg (Fig. 1). Roughly 16 out of 18 piglets are born alive, but the surviving piglets are more fragile and have a higher risk of being exposed to life-threatening circumstances.

The energy requirements of newborn piglets are high, as maintenance of body temperature is extremely demanding. Indeed, the amount of energy required for activities often overwhelms the reserves that piglets are born with. Such energy deficiency becomes more dramatic with an increasing litter size due to the higher within-litter competition for nutrition and energy from the sow.

This often leads to hunger, which is one of the main causes of piglet mortality in the first five days of life. During this suckling phase, piglets entirely rely on sow milk for nutrients, and a weak piglet is not efficient in the intake of colostrum and maximising its conversion into energy.

However, piglet performance during the suckling period can be improved by stimulating the development of the gastrointestinal tract, particularly the establishment of a stable and properly balanced gut microbiota, which will ultimately improve nutrient utilisation and decrease mortality. Weaning is a critical stage in pig production, with various studies showing that weaning weight is positively associated with later growth performance in the weaner and the finisher unit. Any damaging consequences during the early-life stage of piglets carry over a tremendous impact on nursery and grower-finisher performance, probably because weaning of small and fragile piglets postpones the challenge of ensuring high performance in the subsequent fattening stage.

Improving the development of the gut functionality is, therefore, crucial to fully succeed in exploiting the growth potential of piglets in early life.

The untapped growth potential of piglets

The suckling period is short but critical. Seven to ten days after farrowing, the milk production becomes limiting to the piglets. Even though the piglets have an enormous growth potential during this stage, it is restricted by both the yield and the composition of the milk. Nutrient supplementation through creep feed is among the most successful strategies to improve the piglet’s survival, condition, and growth performance. However, research has traditionally shown that suckling piglets have a very low intake of creep feed during this phase, and only start consuming feed in significant amounts after three weeks of age. Although offering creep feed is a practice that has mainly been done to enhance post-weaning performance, this strategy can be better exploited to improve the growth potential of suckling piglets.

Suckling piglets digest the nutrients in sow’s milk very efficiently, but their digestive system is still too immature to take full advantage of creep feed. The suckling piglet’s digestive system is only capable of breaking down a limited fraction of feed ingredients because their pancreatic enzymes at this stage are naturally designed to process nutrients from sow milk.

For instance, the enzyme trypsin, which digests proteins, is present in considerable low levels at birth, and remains constantly low during the entire suckling period (Fig. 2). Lipase is also a digestive enzyme that helps to process dietary lipids. Although its activity level is higher than trypsin before weaning because it is needed to process milk fat, lipase levels notably increase after weaning. This notable variation in the activity of digestive enzymes early in life illustrates that piglets are only able to partially digest ingredients other than sow milk. This might have dramatic performance and health consequences, as undigested nutrients in the intestines can promote bacterial growth and osmotic changes that often result in diarrhoea. Moreover, this can lead to anorexia and a more susceptible gut to diseases, and will ultimately have negative carry-over effects for the remaining grow-out period.

Recent findings have shown that supplementing piglets at an early stage with creep feed can be beneficial, especially in large litters. Creep feed can enhance growth performance and reduce piglet mortality during the suckling period. Ultimately, the use of creep feed before weaning is expected to facilitate the transition at weaning from milk to solid feed by making the digestive system adapt to a feed source other than sow milk, which will better equip piglets to digest the feed given after weaning.

The use of creep feed also benefits the sow. There is compelling evidence that providing creep feed to piglets improves the sow’s body condition through a reduction in piglet dependence on sow’s milk. Moreover, piglets with a longer reliance on sow’s milk will negatively affect the sow’s condition.
Promotion of performance and livability during early life

Probiotics are live micro-organisms that improve the health of the host animal when administered in adequate amounts. When provided to pigs, probiotics usually help to prevent disorders caused by gastrointestinal pathogens, thereby improving performance and productivity.

Even though there are approximately 400 different species of micro-organisms in the gut microbiota of a four week old pig, some of which are beneficial and others pathogenic, a more stable and diversified gut microbiota can be achieved by probiotic supplementation.

Beneficial bacteria in pig microbiota are extremely important because they excrete exoenzymes into their environment, which are biological catalysts that convert nutrients, such as sugars and proteins, into smaller molecules that can be easily absorbed by the host animal.

Supplementation of probiotics as an alternative to antibiotics is one of the most promising approaches to improve animal health and production.

Probiotics have rapidly been accepted as an alternative to antibiotics due to their ‘friendly bacteria’ status, and the general public welcomed their use in sustainable pig production strategies. Probiotics improve the health of gut microbiota, while simultaneously enhancing digestive processes and stimulating the immune system of the gastrointestinal tract.

Specifically, probiotic bacteria inhibit the adhesion of pathogenic microbes to the intestinal epithelial surface in the pig gut, while simultaneously producing antimicrobial metabolites that hinder the growth of pathogens. This decreases the load of pathogenic bacteria, such as Escherichia coli that can multiply rapidly under favourable conditions, exploiting nutrients available in the gut environment. By increasing enzyme activity and improving nutrient digestion, probiotics limit the amount of undigested nutrients and concomitantly decrease the risk of pathogen growth.

Several microbial species have been used as probiotics in pig production, namely Enterococcus faecium, Bacillus spp., Lactobacillus spp., Saccharomyces cerevisiae, Bifidobacterium bifidum, among others. Probiotics containing naturally occurring strains of Bacillus subtilis and Bacillus licheniformis are particularly interesting because they increase enzyme activity of both lipase and trypsin in the small intestine of piglets (Fig. 3).

This improves nutrient absorption and feed conversion, and ensures optimal weaning weight at the end of the suckling period.

Several studies have shown that supplementation of probiotics with creep feed significantly increases feed intake of suckling piglets. This is particularly observed for Bacillus-based probiotics supplemented in feed, which result in robust piglets at weaning.

Clear benefits arise from investing in early life piglet nutrition to produce healthy and robust weaned piglets, guarantee its future performance, and increase the revenue in the long run.

A great deal of work has been broadly conducted on the efficacy of probiotics improving the growth and health of suckling piglets. However, there is also increasing evidence that supplementing probiotics to suckling piglets minimises the consequences of post-weaning stress, particularly diarrhoea and poor growth performance, which often cause severe economic losses to pig producers.

Thus, as piglets’ early life experiences notably influence their subsequent performance, focus on early life piglet performance is critical for success.

Fig. 3. Lipase and trypsin activity in vivo in the small intestine of piglets supplemented with probiotics (red) and non-supplemented piglets (blue) (*a combination of B. subtilis and B. licheniformis).

Fig. 4. Average daily gain of suckling piglets supplemented with a probiotic in creep feed versus a control diet without probiotic additive (meta-analysis based on 12 different trials) (*a combination of B. subtilis and B. licheniformis).

Fig. 5. Number of piglets per litter at birth and at weaning (day 28 post-farrowing). The red line represents piglets supplemented with probiotics in creep feed and the blue line represents piglets without probiotic supplementation (*a combination of B. subtilis and B. licheniformis).