

PIGLET FEEDING BEYOND NUTRITIONAL HORIZONS

(Nutrición de Lechones)

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More piglets every day

Modern pig farming is an economic activity that in most countries does not enjoy strong protective policies. Pork is shipped all over the world and pig producers have to compete on an open world market. There is a worldwide trend of consolidation in the pig industry and farms are managed in a professional way guided by key performance indicators derived from management programmes like Pig Champ.

One of the most important key performance indicators is litter size. The number of piglets weaned per sow per year is the most important economic parameter of a sow farm. Since about 10 years there is a strong genetic trend, supported by BLUP selection techniques, towards an increased total number of piglets born. Modern hybrid parent stock have a genetic capacity of more than 30 piglets per sow per year already and quite a few well managed commercial farms approach this figure.

This strong economic impetus towards increased litter sizes does come with a downside. Large litters come inevitably with a reduction in birth weight and with a higher within-litter variability. The larger the litter, the more small piglets are born and the more attention should be given to the quality of management in the farrowing pen and in the nursery. Also the nutrition of small piglets from such large litters should be reviewed and one should be prepared to explore new feeding strategies.

Multidimensional approach

From our research it becomes more and more obvious that optimal nutrition depends on a good understanding and mutual adjustment of the feed, feeding management and feed intake behaviour of the piglet. Where traditionally feed formulation was mainly guided by physiological and biochemical considerations, especially understanding of the feed intake behaviour of piglets appears more and more critical in the feeding of small piglets.

The nursing behaviour of young piglets is influenced a lot by the sow, which plays an active role in initiating or terminating a suckling bout. Of course, weaning is a gradual process in nature and step by step the young piglet takes more initiative to explore the environment and to search for food. In an industrial environment, weaning is an abrupt event rather than a gradual process. After weaning, piglets still need time to explore, find and identify food and it takes quite some time before they show their typical pattern of feed intake behaviour. As a consequence, the average feed intake of piglets after weaning is very low and it takes almost two weeks to reach again the pre-weaning energy intake. Some piglets with a less mature behavioural development are completely out of balance and don't eat or drink for several days.

Consequence of starvation

It is a known fact that the integrity of the intestinal mucosa is seriously jeopardized after weaning. The most important causal factor appeared to be the post-weaning starvation. Enteral nutrition is an important source of nutrients for the intestinal epithelium. Starvation of the piglet will rapidly induce degeneration of the villi and paracellular permeability of the epithelium. The latter might at least partially be explained by proliferation of mucolytic bacteria in starved animals.

Atrophy of the villi induces rapid growth of juvenile epithelial cells, which are sensitive to adhesion of pathogens like ETEC. These processes take place within one or two days after weaning and serious proliferation of pathogens will occur in the same timeframe.

The secretion of brush border enzymes, like amyloglucosidase and peptidases, is seriously hampered by the post-weaning damage to these membranes. However, the dysbacteriosis that occurs within a few days also has a negative effect on enzyme activity. A number of pathogenic and commensal bacteria are known to deconjugate bile acids, resulting in a dramatic reduction of fat digestion in case of intestinal overgrowth by these bacteria. However, also proteases are affected. The amylases seem to be the least sensitive to bacterial overgrowth.

In conclusion, weaning results in abnormalities in piglet behaviour, low feed intake or complete starvation for several days, serious damage to the gut wall, overgrowth of pathogenic bacteria and reduction of secretion and activity of intestinal enzymes. As a consequence, serious intestinal disorders and immune responses occur in most piglets.

Adjusting feed or behaviour?

Of course feed composition is extremely important. The viscosity of the digesta is known to have an immediate effect on the gut flora. Feeds containing viscous NSP aggravate bacterial overgrowth. On the other hand, low viscous fibres appear to have a positive effect on gut health and diarrhoea incidence, possibly via an effect on gut peristalsis as well as modified feed intake behaviour of the piglets.

One more critical factor in the feed is the dietary protein level. Many piglet feeds do contain more protein and amino acids than required by the piglet. Especially in the first two weeks after weaning, the energy intake of the piglets is so low that dietary protein supply is not a limiting factor for protein accretion. If digestion and absorption of protein is hampered in the post-weaning piglet, more undigested protein will flow into the hindgut and be degraded by the intestinal micro-flora into ammonia, amines, phenols and other toxic molecules. Our research demonstrates consistently that pre-starters should not contain more than 18% crude protein. Higher levels don't benefit growth performance, but do increase diarrhoea incidence in post-weaning piglets.

As a matter of course, there are many feed additives and supplements that support gut health in the weaned piglet. It is, however, out of the scope of this paper to discuss all these options in detail.

Adjusting behaviour

Since the cause of many problems after weaning is the low feed intake, it sounds logical to start and improve post-weaning feed intake. The difficulty and the challenge is that many factors influence feed intake and that any change of the situation to the better requires good understanding and co-operation of all parties involved. There is, fortunately, a strong economic drive to improve post-weaning feed intake behaviour of the piglets. Strong evidence demonstrates that feed intake in the first week after weaning is directly related to post-weaning performance and, as a matter of fact, to life-time performance of the pig. The more feed piglets eat in the first week after weaning, the more money they make for the farmer.

To be successful in managing post-weaning feed intake of piglets, it is important to realise that the average piglet does not exist. Average data on feed intake and growth rate are misleading. Some piglets eat too much after weaning. They don't manage to control their own intake yet. Other piglets lack the stimulus of the sow and don't show any explorative behaviour. As a consequence, some don't eat or drink for up to three days, with all consequences for gut health described above. So, managing feed intake behaviour of piglets means managing the behaviour of individual piglets, housed in groups. This management by the farmer should be focussed at stimulating the intake of piglets that don't eat, but at the same time to avoid over-consumption by the piglets that lack self-control.

Creep feed is important

Before weaning the intake of dry feed by nursing piglets is very low. Depending on weaning age, litter size and some more factors, reported levels of energy intake derived from dry feed by the nursing piglets will range from about 1 % to a maximum of 17% of total daily energy intake. Only in case of late weaning (35 days) some authors report substantial energy intake from dry feed. Typically, only a few percent of the energy intake by nursing piglets will come from dry feed. The justification of providing creep feed to piglets is not the supplementation with energy or nutrients. The most important reason to be very strict in providing creep feed is the conditioning of the piglets to dry feed and to external stimuli that induce them to start feeding. Dutch research has shown that piglets that did consume dry feed before weaning, indeed were more quick to eat dry feed after weaning. This translated into significantly improved post-weaning performance.

Stimulating post-weaning feed intake

Other management practices that help the piglet to start eating quicker after weaning include the use of liquid feed, which is strongly preferred by piglets over dry feed. Transition of one type of feed to the next one should never be done at the day of weaning. Any change of feed or feeder will slow down the adaptation of the piglets to the new, post-weaning situation.

Since early feed intake is the consequence of explorative behaviour, such behaviour should be stimulated. The most simple management practice in this context is to keep the lights on during the first few days after weaning. This will substantially improve piglet feed intake and piglet performance.

Last but not least, hygiene and housing conditions do have a large impact on the feed intake of piglets, especially in the first week after weaning. The best feeding practice is to clean the pig unit and optimize climate control.

Preventing over-consumption

Over-consumption of feed quickly results in digestive upset, especially in young piglets which after weaning do have intestinal damage and bacterial overgrowth of the small intestine. Over-consumption results in undigested feed residues passing into the distal parts of the intestinal tract, giving rise to rapid bacterial degradation, fast formation of volatile fatty acids and nitrogenous compounds, high osmotic values and as a consequence disturbed secretion and absorption of fluids. With other words: fermentative diarrhoea.

In a research model, in which piglets are deprived of feed for 24 hours at the fifth day after weaning, up to 60% of all piglets may develop clinical diarrhoea within 8 hours after re-feeding. Re-feeding results in dramatic over-consumption within a few hours. It is conceivable that such over-consumption of the average piglet in fact is a gobbling down of massive amounts of feed by the most dominant piglets, resulting in severe disturbances of intestinal conditions and long term digestive disorders. In fact, we have observed diarrhoea problems in many piglets up to 48 hours after re-feeding.

So, next to stimulating early feed intake after weaning, all sorts of management practices should be implemented to avoid disruption of feed availability to the piglets and consequential over-consumption after re-feeding. It has been demonstrated in our trials that feed formulation, and more specific the use of fibrous raw materials, can play a part in this by modulating feed intake behaviour of piglets and preventing over-consumption.

Conclusion

As a consequence of economic drivers and developments in pig breeding, pig farmers have to prepare for the raising and feeding of small under-privileged piglets. In addition to physiological and biochemical considerations, feeding behaviour of piglets becomes a significant factor in nutritional optimisation. Piglet feeding should take account of individual variation in feed intake. However, also the functional properties of feed and feed ingredients in terms of intestinal health and feed intake behaviour should be seriously counted for and in many cases should even override traditional nutritional considerations.