Using fibre to improve performance at key moments in the sow

The cost of pig production can still be challenged regarding the productivity of sows. Hyperprolific sows have a huge economic potential impact, but we still have to transform the potential into reality!

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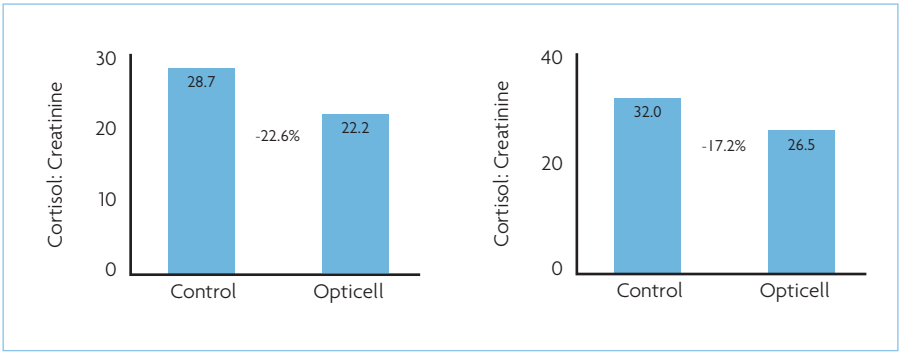

Fig. 1. Lower urinary excretion of the stress hormone cortisol. Left, a field trial, undertaken in Niedersachsen, Germany, and right, a university trial, University of Timisoara.

The objective in preparing for tomorrow's challenges in pig production is to be able to adapt globally to achieve the best performance and get closer to the sow's potential.

Management, housing, health and feeds are all tools that can be combined together to reach the ideal.

By 1970, with the intensification of pig production and genetic selection, the sow's profile had changed a lot. Those changes mostly concerned body storage capacity (fat, muscle), body weight, milk production, ovulation rate and feed intake.

In order to influence performance, feed should not only be considered as a way to cover nutritional needs.

Feed can also influence welfare, health and immunity. It means that nutritionists and veterinarians share a common objective. Thus, focusing on the sow's diet, we can influence piglet quality, including immunity and maturity, while simultaneously increasing the productivity of the sow.

Feed has to be accurate and the choice of raw materials is central; the regularity of quality control inside a planning program is the only way to ensure accurate feeds.

The close link between raw materials and the capacity to meet the requirements of the pig is fundamental: net energy, fibre, protein digestibility and others are ways to succeed with accurate and regular feeds.

Other considerations include:

- Contamination by bacteria or mycotoxins should be checked and controlled as a minimum.

- Particle size is also a great tool in order to valorise the digestive tract at its best.

- Some functional ingredients are described as tools to improve sow performance. Some of them are becoming more and more important, including antioxidants (vitamin E, polyphenols, Se, SOD), probiotics (yeast for monogastric application), methyl donor groups, prebiotics, fibre and many others.

The use of fibre is a specific way to achieve energy production and gut health improvement. The yield of energy production coming from gut fermentation will be correlated to the age of the animal.

The mature sow is a perfect 'digester' of fibre. Thanks to a huge caecum and the great length and high volume of the colon, fermentation can be run with a good yield. More than 25% of net energy can be provided by the hindgut.

This fermentation is due to a specific metabolic cross feeding done in the colon. Coming from plant cell wall degradation done by fibrobacter and ruminococcus, the production of succinate and formate will be generated.

Those two substrates can then be available for acetogens, butyrivibrio and other specific bacterias to produce propionate, acetate and butyrate. This acid production has functional properties directly acting on the gut health and immunity.

The population of cellulolytic flora is very weak and shows a high sensibility to any stresses (oxygen, increasing pH, antibiotics) affecting gut conditions.

More than quality of acidification, feeding the sows with a regular amount of well-balanced fibre content, will also improve the quantity of short chain fatty acid production, increasing the cellulolytic population development.

This natural acidification of the colon will play a role in maintaining the equilibrium of the microbiota, helping to keep a good variety in the population and keeping proteolytic and pathogen bacteria under control.

The sow cycle can be divided into five main parts.

- **Gilt preparation:**

Gilts are an investment and accurate preparation is the only way to achieve the best economical return from productivity (number of litters and numbers of weaned piglets). Fibre is used to control body growth evolution in order both to achieve body composition and weight at first insemination. The preparation of the gastrointestinal tract with fibre is also a good tool to increase feed intake and gut health.

- **The first month of gestation:**

First we have to recover losses of protein and fat due to the previous lactation. This period should lead to a complete recovery of the body's storage.

Control during this first month helps to prevent heterogeneity of animals, by using both specific feeds and/or individual and grouped quantities of feed.

This first month is critical when it comes

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to the quality of the maternal link. Oxidative stress is a threat to good maternal links. It causes loss of embryos and can also create conditions for the so-called Intra-Uterine Growth Retardation (IUGR) phenomenon.

Antioxidants, methyl donor groups, arginine, probiotics and fibre can be activated in order to decrease oxidative stress and ameliorate the vascularisation quality ensuring the nutrients flow from the sow to the embryo.

Fibre is an effective tool to decrease the stress indicator, such as cortisol (Fig. 1).

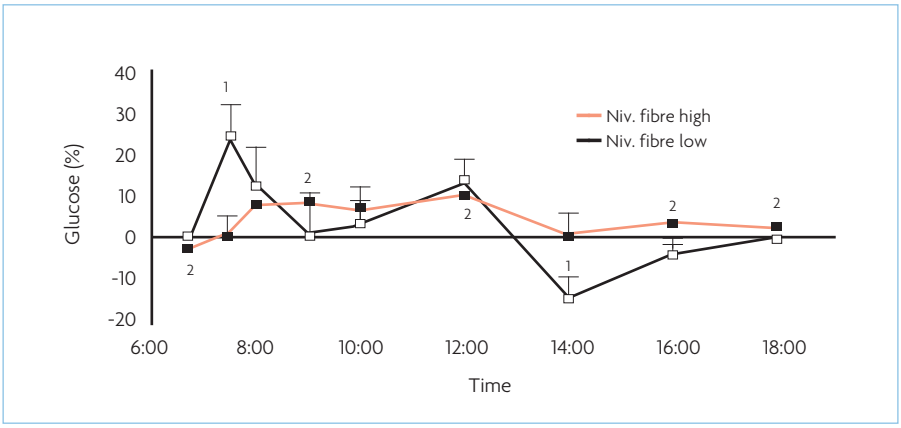

Fig. 2. Fibre and behaviour during gestation (Dr Leeuw et al, 2005).

● The second month of gestation:
After achieving the body composition recovery objectives of the first month, we can then focus on the behaviour and maintenance requirements of the gestating sow. Most of the time, feed concentration and quantity can be lowered.

To help to calm the sow, especially with housing, we can use the glycaemic impact of fibre diets. Using fibres, glucose concentration in the blood will be more stable. This will help to increase the sensation of satiety.

The welfare of the sow will be better and the nutritional requirements will decrease with lower activity (Fig. 2).

● The last month of gestation:
During the last month the foetal needs will increase very fast. Protein needs will become important.

To avoid catabolism of muscle to cover the litter needs the combination of quantity and quality of feed should cover the protein need increase. If not, litter weight potential, lactation potential and reproductive capacity will be reduced.

The last period before parturition is critical for piglet vitality (from length of parturition) and immunity (from colostrum immunoglobulin concentration).

In many areas, the feed given prior to farrowing is lactating feed.

In order to limit stomach pains and nervous sows, fibre has to be used. It will help with consistency of the faeces and avoid constipation. Limiting constipation will play a key role in avoiding MMA and PHS syndrome.

Using fibre will provide better conditions for the sow, and the parturition length will be reduced (Fig. 3).

At the same time, the first gut contamination of the piglet coming from the bacterial environment of the pen (wall, floor, skin, faeces) will be ameliorated by the quality of the sow's faeces.

The colostrum intake and concentration is probably one of the more important tools for success with hyperprolific sows.

The immunoglobulin production process is specific. The sow's inflammatory status at the end of gestation will play a role in the availability and concentration of IgA and IgM. The use of fibre combined with other functional tools can increase the colostrum concentration. It is valuable to use two or three different feeds to cover the specific requirements of these three periods.

This is a way to invest in the first and last part of gestation, and save money in the middle.

The total cost will remain the same and efficiency will be much better. The main difficulty is always feed distribution.

● The lactation period:
The lactation period is a key period for both piglet quality and reproductive capacity. The first objective is to provide high milk production.

The palatability of the feed is important, especially in tropical contexts, and a prerequisite for high feed intake. Most of the time the nutritional requirements are not fully covered by the feed intake.

We have to avoid excessive breakdown of body deposits, especially muscle.

Fibre has to be taken into account in lactation feeds as a major nutrient. The use of fibre and antioxidants can help to provide a better ovocyte maturity, especially with hyperprolific sows.

When the maturity of ovocyte is regular, we can expect more homogeneity in the next litter and probably less embryo losses.

Limits in using fibre

Using fibre is important but poses new difficulties for the feed mill industry. The high variability of fibre composition of classical raw materials increases the need for regular checking of all deliveries at the plant.

At the same time, in order to predict short chain fatty acid (SCFA) production, the matrix description should be as accurate as possible. A description of crude fibre is not enough. The variability of the fibre content can decrease digestibility when in excess, and offer no beneficial aspects when in deficit.

Different parts of fibre provide different fermentation products. Raw materials with a high fibre content are mostly associated with a high risk of contamination. Mycotoxins, such as DON, can limit all fibre associated benefits.

Pig production is facing many challenges almost everywhere in the world. On one hand, increasing pig meat production with lower production costs pushed the genetic selection companies to produce more prolific sows, possibly leading to more sensitive piglets.

On the other hand, the rise of antibiotic resistance and welfare considerations demands drastic adaptations of our organisation. These two trends will force us to adopt new strategies in which feeding will mean accurate nutrition for immunity and welfare.

From the feed industry's point of view, fibre expertise could be one component of the necessary adaptation and an important one. With good control of the fibre content we are able to achieve both nutritional and immune benefits.

As the safe use of classical fibre raw materials is not that easy or possible, a specific source can be helpful. OptiCell combines both fermentable and insoluble fibres in a non-contaminated form and is a perfect first answer to the 'fibre inside' diet trend. ■
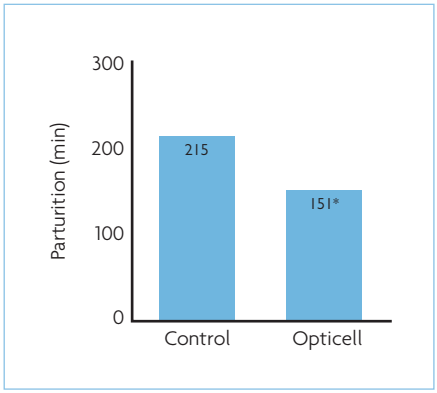
Fig. 3. Length of parturition. Shorter parturition reduces the stress for both the sow and the piglets (Agricultural College, St. Florian, Australia, 2009).