Supporting sows and piglets with proper fibre nutrition

The recent genetic progress achieved in sows poses a major challenge to management. On farms struggling with increased litter size, often resulting in low piglet birth weights and increased piglet mortality, the theoretically possible performance of this genetic development is attainable when all potential factors involved in such growth are known and finely tuned.

by Dr Christine Potthast, Agromed GmbH, Austria. www.agromed.at

Nutrition may be one of these management tools which plays a special role in solving these challenges. Current developments in sow genetics show increasing litter sizes. This can pose a risk in regards to the increasing occurrence of stillbirths, as reported from Denmark (Fig. 1).

Achieving more than 30 piglets per sow each year has become a recognised measure of production efficiency around the world.

Producing large litters of live pigs is possible, with well-balanced management and nutrition.

Farrowing time is crucial

Large litters are closely related to a prolonged parturition. A long parturition means stress for the sow and also for the piglets and is connected with several negative consequences.

A prolonged farrowing time increases the proportion of stillborn piglets (Fig. 2). According to Theil (2015), a birth time extended by 100 minutes means the loss of two piglets and more.

Peltoniemi and Oliviero (2015) demonstrated the negative impact of prolonged farrowing time on fertility. Sows that did not become pregnant at first insemination taking 100 minutes longer to complete farrowing than those who became pregnant after the first insemination (Fig. 3).

The impaired fertility resulted from a delayed placenta expulsion which negatively influences post-partum uterine health and is also related to the development of post-partum dysgalactia syndrome (PDS), which is characterised by insufficient colostrum and milk production during the first days after farrowing.

This offers additional risk to the piglets even further during the critical neonatal phase because the selection programs indirectly decreased birth weight of piglets and because increased litter size has increased the competition between littermates. Pigs born after a prolonged farrowing are more likely to experience a higher death loss associated with hypoxia.

Supplementing the sow's diet with fermentable fibre offers the opportunity of regulatory action in the context of reducing the farrowing time.

Fermentable fibre

Adding fibre to gestation diets prior to farrowing has the potential to prevent constipation, to increase water intake of the sow around parturition and to increase colostrum intake and performance of the piglets. In general, fibre is considered in the context of avoiding constipation, but offers potential for an additional energy supply, provided that the fibre is fermentable.

Fig. 2. Relationship between farrowing time and stillbirths (Theil 2015).

The sow can cover up to 25% of its maintenance energy requirement from the fermentation of dietary fibre in the colon. Bacteria in the large intestine metabolise dietary fibre to volatile fatty acids and lactic acid. These are absorbed by the animal and serve as additional energy sources. The big advantage is the time delay with which the energy from the fermentation is provided. The energy from the enzymatic digestion in the small intestine is available up to five hours after ingestion, while the fermentation products from the colon are provided over a period of 24 hours.

For the sow this extra energy means the reduction of hunger, stress and, above all, the provision of energy for the birthing process.

The energy supply has a strong influence on the duration of the farrowing time which significantly impacts the number of stillborn and weak piglets. To select an adequate fibre, it is essential to focus on an affordable and highly concentrated fibre source, so as not to dilute the diet. Lignocellulose produced from fresh wood offers a great potential for this purpose.

Lignocellulose

The lignocellulose products have to be differentiated into the first and second generation. Lignocellulose of the first generation (LC 1st gen.) consists of 100% insoluble and non-fermentable fibres. It only has a 'physical' effect in the gastro-intestinal tract. The micronisation (average particle size 50-120µm) ensures a high number of insoluble, inert particles with a large surface area, which regulate the intestinal transit. This prevents the rising of pathogens into the small intestine and accelerates their excretion. The microbial fermentation of fibre is shifted to the colon, leading to a greater production of short chain fatty acids which provide extra energy. The lignocellulose of the second generation (LC 2nd gen.) is a synergistic combination of insoluble

Continued on page 9

Fig. 1. Litter size and piglet mortality in Denmark between 1997 and 2011; pre-weaning mortality includes pre-natal mortality (Rutherford et al. 2013).

Continued from page 7

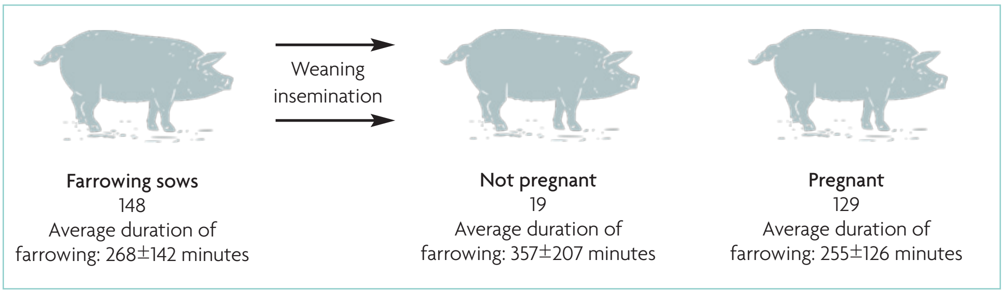

Fig. 3. Influence of the length of farrowing time on the success of the next insemination (Peltoniemi and Oliviero 2015).

fermentable and non-fermentable dietary fibres. In addition to the physical mode of action of the LC 1st gen., it also has physiological effects, due to the fermentable components, thus providing for a prebiotic effect. Fermentable parts add extra energy and furthermore, selectively promote the development of lactobacilli.

The produced lactic acid directly inhibits pathogens and is metabolised by Firmicutes bacteria. Firmicutes metabolise lactic acid to butyric acid, which is reabsorbed by the animal and develops anti-inflammatory effects. Butyric acid is the most powerful substrate for gut development, especially for growth of villi in the small intestine, thereby allowing for optimal nutrient absorption. Hindgut reabsorption of water is also improved, optimising faecal quality.

Farrowing time and piglet performance

Reyes et al. (2015) increased the fibre content of the gestating and lactating diet of sows by adding LC 2nd gen. and thereby reducing piglet mortality and improving reproductive performance of the sows by shortening the dry period.

The LC 2nd gen. has numerous benefits for the sow and thus also for the piglets. It prevents constipation while providing additional energy for farrowing from the fermented fibre. Both reduced constipation and increased energy supply effectively shorten the farrowing time and reduce the number of stillborn piglets.

The extra energy supply in the last period of gestation has a positive impact on birth weights (Table 1). Additionally, the proportion of underweight piglets (<900g birth weight) is reduced, while the weaning weight is enhanced.

Uterine inflammations (metritis), milk deficiency (agalactia) and teat infections (mastitis) – short MMA – are part of the PDS. Supplying LC 2nd gen. to the sow prevents constipation and ascension of pathogenic bacteria from the hindgut, both being important factors for MMA prophylaxis and consequently helping to protect from PDS.

An improved fibre supply to the sow increases the secretion of the milk producing hormone prolactin and improves the development of the piglets until weaning. Sow's milk is the primary source of energy and nutrients during the first weeks of a piglet's life. Therefore, it is essential that piglets receive as much milk as possible during this time.

Results from Sarandan et al. (2008) reveal that LC 2nd gen. reduces farrowing duration, mastitis and agalactia and increases milk production in sows (Table 2).

Table 1. Influence of LC 2nd gen. on farrowing duration and litter performance (Baarslag et al., 2012).

	Control	LC 2nd gen.
Farrowing time (minutes)	220	180
Number of piglets	16.0	15.9
Proportion of piglets born alive (%)	90.2	93.2
Average birth weight (kg)	1.13	1.24
Proportion of piglets <900g birth weight (%)	16.7	13.6
Average weaning weight day 27 (kg)	7.20	7.50

Conclusion

The high genetic potential of the current sow genetics should be transformed into well-developed piglets and fast-growing weaners. One important adjustment factor is the reduction in the proportion of stillborn and underweight piglets. The farrowing process, in particular the farrowing length, can be identified as an important influencing factor. A prolonged farrowing process increases the number of stillbirths and weak piglets and negatively influences the sow's health and performance. The sows are exposed to a higher risk of post-partum dysgalactia which among others, is characterised by insufficient colostrum and milk production post farrowing. Current results indicate that the sow's fertility is also impaired by a prolonged farrowing duration.

The farrowing length is closely related to the available energy supply of the sows. Fermentable fibre offers an additional energy supply for the farrowing process. So choosing the right dietary fibre can be an important factor for improving the performance of sows and piglets. Effective fibre management with the LC 2nd gen. thus effectively supports the sow and her piglets. ■

References are available from the author on request

Table 2. LC 2nd gen. in gestation and lactation diets influences MMA symptoms and milk production in sows (Sarandan et al., 2008).

	Control	LC 2nd gen.
Farrowing duration (minutes)	190	151
Sows with mastitis (%)	51.6	20.6
Sows with agalactia (%)	29.0	20.6
Average milk production; day 1-3, (kg/day)	3.3	4.4