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PRODUCING HIGH QUALITY PIGLETS

4. Heat stress: when your profit melts away...

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Heat stress not only affects the profitability of pig farms in tropical or sub-tropical regions: even in temperate climate zones, unfavourable climatic conditions lead to impaired performance and cause production losses.

However, these losses are only the tip of the iceberg: the underlying health impairments are manifold – but a sophisticated feeding concept including products based on wood can compensate for impaired production performance.

Put simply, the risk of suffering from heat stress can be described as a combination of ambient temperature and relative humidity. Using sows as an example, an ambient temperature of 24°C at 75% relative humidity is already sufficient to detect performance losses.

The farmer may notice the consequences in lower incomes, however, the animal experiences them much more drastically: heat stress impairs the welfare of farm animals and puts a strain on their state of health, with the negative effects being directly as well as indirectly interrelated (summarised in Fig. 1).

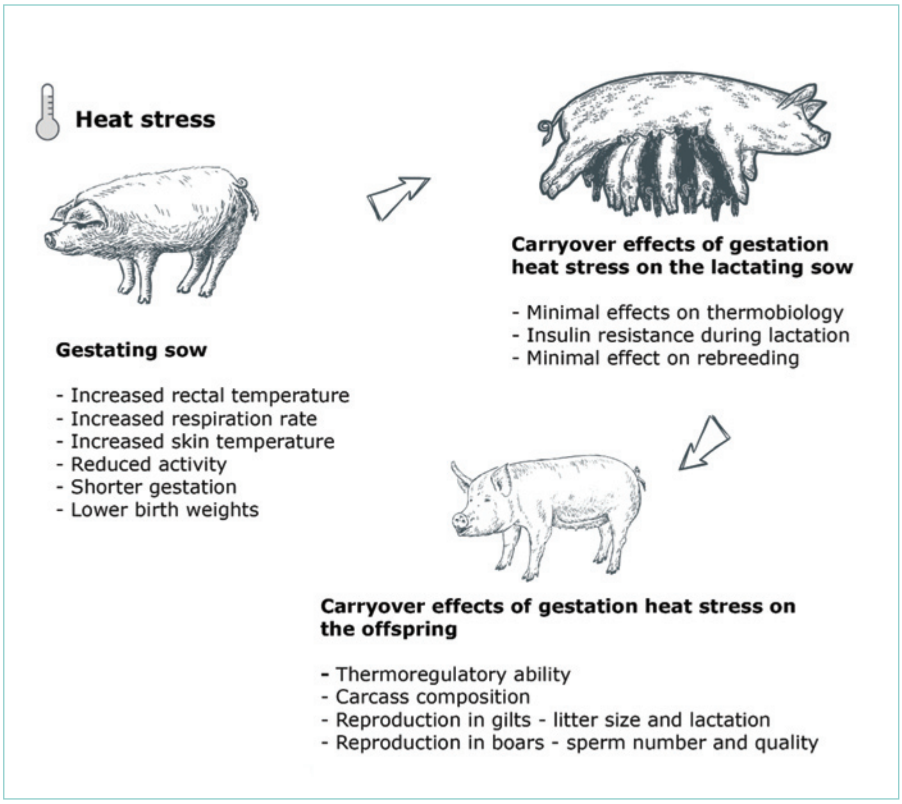

Fig. 1. Heat stress related effects on sow performance (adapted from Lucy & Safranski 2017).

BEHAVIOURAL CHANGES

Under heat stress, animals change their behaviour in order to dissipate heat and lower their body temperature, which translates into reduced feed intake and exercise during the day, as well as increased water consumption and heavy panting. In growing pigs, reduced daily weight gain and poorer product quality are the result.

PHYSIOLOGICAL ADAPTATIONS

In terms of thermoregulation, blood circulation is altered so that extremities and body parts in the periphery are supplied with more blood to dissipate body heat to the environment in a targeted manner. A process that is energy-intensive for the animal and therefore again detrimental to production performance.

Moreover, heat-induced increased oxidative stress leads to an increased risk of infection.

IMMUNE DEFENCE

Finally, the above-mentioned reasons for a high susceptibility to infections and a high risk of infection cause a strong strain on the immune system.

This defence against infections and inflammations is extremely energy-intensive – the more energy that must be used for the immune defence, the less energy is available for growth or reproduction.

IMPAIRED INTESTINAL FUNCTION

Intestinal integrity is reduced by unfavourable climatic conditions, so that pathogens and endotoxins can penetrate more easily and cause inflammation in the intestinal tract.

In addition, heat stress leads to a shortening of the intestinal villi and thus reduces nutrient absorption, and consequently represents another factor in reduced performance.

FIBRE FOR HEAT-STRESSED SOWS

Regarding reduced feed intake and impaired nutrient absorption in heat-stressed sows, the status quo feeding strategy is to offer a high-energy diet dense in nutrients and to keep the proportion of indigestible dietary fibre as low as possible.

Quite the contrary, the fibre supply should not simply be minimised but needs to be paid extra attention to find the proper quality of fibre sources: the reason is that the usual strategy focuses only on impaired nutrient intake, whereas the fibre strategy focuses on gut integrity and health and consequently, optimises nutrient intake as a side effect.

However, the quality of the fibre source is important. Recommendations for fibre intake under heat stress conditions consider the reduction of soluble fibre, which leads to excessive fermentation. Wheat bran, soy hulls or sugar beet pulp contain high amounts of soluble fibre with additional high amounts of fibre-bound protein that supports unfavourable protein fermentation in the large intestine.

The supplementation of a concentrated fibre source, such as eubiotic lignocellulose, does not dilute the energy dense diet, provides purely insoluble fibre, but moreover acts as a fermentation management tool.

PROVING THE CONCEPT

The above-mentioned assumption is nicely validated in a feeding trial conducted recently on high prolific sows in Brazil.

A total of 164 mixed-parity sows were allocated to one of two treatments. The control group was fed on gestation and lactation diets based on corn, soybean meal and soybean hulls, whereas in the test group (LC) 2.5% of soybean hulls were substituted by eubiotic lignocellulose (OptiCell; agromed Austria GmbH) in gestation diet and 1% substitution in lactation diet, respectively.

The average minimum and maximum ambient temperatures and relative humidity were 22.2 and 31.0°C, and 73 and 97%, respectively. During the experimental period the sows were exposed to temperatures above 26°C on average 97% of the time. As for temperatures above 30°C sows were exposed 64% of the time.

Table 1 summarises the effects of soybean hulls substitution by LC on sow performance. The data reveal that LC did not negatively affect feeding behaviour or the body conditions of the sows: both groups were equal in body weight and backfat thickness at start and end of gestation as well as the feed intake was almost identical.

Quite the opposite, a better condition of sows' due to eubiotic lignocellulose inclusion is expressed in an improved farrowing performance.

Litters of sows fed on eubiotic lignocellulose were characterised by a significantly higher number of total-born piglets and a significant increase in live-born piglets.

	Control	LC	p-value
Sows (n)	60	64	–
Gestation length (d)	114. 7	114.3	0.104
Sow body weight day 1 (kg)	201.1	201.9	0.983
Sow backfat thickness day 1 (mm)	18.6	18.6	0.853
Sows body weight day 110 (kg)	251.7	250.7	0.858
Sows backfat thickness day 110 (mm)	21.9	21.7	0.931
Average daily feed intake (kg/d)	2.23	2.23	0.449
Total born piglets (n)	16.15[b]	17.83[a]	0.029
Mummified (n)	0.32	0.42	0.567
Stillborn (n)	1.0	1.3	0.623
Total piglets born alive (n)	14.83[b]	16.09[a]	0.035
Average piglet weight (g)	1,254	1,271	0.744
Average litter weight (kg)	18.6	20.5	0.188

[ab] significantly different $p<0.05$

Table 1. Effects of eubiotic lignocellulose supplementation on sow performance during gestation and farrowing.

Although the number of total and born alive piglets was increased, there is no rise of within-litter birthweight variation, which indicates that sows of the LC group were capable of increasing the number of piglets without negative impact on their birth weight.

Table 2 shows the litter performance during the lactation period. Because of the higher number of born alive piglets, the sows fed eubiotic lignocellulose had a significantly higher litter size at 48 hours and litter size at weaning tended to increase.

Sow voluntary feed intake was not influenced by the treatments, but since the sows of the LC group weaned more piglets, they were more efficient than the sows fed the standard diet (1.76 vs. 1.78kg/kg, respectively, for LC and Control).

It may be concluded that any condition improving gut health during a heat stress period helps sows to improve performance.

Eubiotic lignocellulose may kill two birds with one stone by supporting gut functionality: it delivers an adequate fibre supply to manage fermentation processes in the hind gut and avoids excessive soluble fibre. ■

Table 2. Litter performance for sows on lactation diets with and without eubiotic lignocellulose.

	Control	LC	p-value
Sows (n)	60	64	–
Litter size 48 hours (n)	13.88[a]	14.06[b]	0.004
Average litter weight 24 days (kg)	80.24	81.21	0.467
Litter size 24 days (n)	12.90	13.10	0.089
Piglet average daily gain (g/d)	210	211	0.341
Sows average daily milk yield (kg/d)	14.62	15.69	0.169

[ab] significantly different $p<0.05$