How to manage heat stress to improve pig health, comfort and performance

by Laurent Roger, swine department manager, CCPA GROUP, France.

Pigs are very sensitive to heat and humidity and this may adversely affect their performance levels, health and comfort. When temperatures are above the upper critical limit, pigs are less active and their appetite is depressed. Their respiration rate increases dramatically during heat stress, because pigs cannot relieve themselves by sweating. Therefore, panting is their way to remove excess heat.

Because of their intense metabolism, lactating sows are particularly sensitive to high temperatures.

Above 22°C (71-72°F), each degree induces a reduction of 190g/d of the voluntary feed intake, which induces a reduction in the milk production.

To compensate this feed intake fall, there is an increase in body reserve mobilisation. As a consequence, the piglet weight gain during the suckling period is negatively affected and the weaning weight is impaired (Table 1).

Moreover, the reproductive performance of the sows after weaning will be affected, with an increase of infertility rate, a decrease of the subsequent litter size, and an increase of the weaning to oestrus interval.

It has also been shown that heat stress may directly affect follicle recruitment by generating alterations in the phosphatidylinositol-3 kinase pathway involved in insulin signal which plays a critical role in ovarian physiology.

Heavier pigs

Fatteners are particularly sensitive to heat stress because for each degree Celsius above the neutral ambient temperature threshold, their voluntary feed intake declines by an average of 95-100g.

Heavier pigs are even more sensitive to heat stress because their subcutaneous fat counteracts heat loss, through conduction and convection (as seen in Fig. 1).

Heat stress induces metabolic adaptations due to the reduction of feed intake and post absorptive alterations that negatively affects the carcase composition:

- Increase of the proteolysis and decrease of the protein synthesis which negatively affects the meat content of the carcase.
- Switch of energy metabolism and increase of the use of the glucose, which enhances fat deposit.

Piglets and growing pigs are also affected by heat stress in the gut.

Indeed, there is a redistribution of blood to the periphery, to maximise radiant heat dissipation, while vasoconstriction occurs in the gastrointestinal tract.

Therefore, the reduction of nutrients flow to the gut epithelium compromises the intestinal barrier integrity, which may lead to intestinal permeability and leaky gut.

As a consequence, there is an elevation of specific blood markers of endotoxaemia, a start of an immune response, and an intestinal and hepatic activation of detoxification mechanisms.

The epithelial damage increases the susceptibility to secondary infections, resulting in endotoxaemia.

Moreover, in a heat stress situation, the activity of digestive enzymes decreases and intestinal glucose transport increases (mainly a decrease in maltase and sucrose activity), which leads to a reduction of the digestibility of the feed.

Temperature (°C)	17	20	24	28
Digestible energy intake (MJ/d)	33.1	32.1	29.8	26.7
Average daily gain (g/d)	900	915	876	793

Table 1. Influence of temperature rise on piglet growth.

Management factors

What should be done in case of heat stress?

- Increase ventilation and airflow.
- Use a cooling system to cool the air (and regularly check if it is in good working order).
- Reduce stocking density.
- Maintain drinking water temperature as low as possible.
- Increase water availability (water consumption up to six times more than normal).
- Avoid feeding between 10.00am and 4.00pm (the hottest period of the day).
- Improve the digestibility of the feed.
- Increase dietary energy density, using fat instead of starch.
- Supplement electrolytes and antioxidants through the water supply or the feed.
- Minimise excess of non-essential amino acids and fibres.

To prevent the feed intake drop because of high ambient temperature, CCPA Group has designed a specific blend of feed ingredients which supports the dry matter intake.

Indeed, Axion ThermoControl contributes to improve the digestibility of the feed thanks to specific plant extracts.

These active components stimulate the activity of the key enzymes which contribute to feed digestibility (amylase, lipase, trypsin and chymotrypsin) and pancreatic secretion (bile acid).

As the digestibility of the feed is improved, sows are able to increase their feed intake.

Plant extracts are also active in the general metabolism regulation, with a reduction of the heart rate of the animals and a reduction of their body temperature.

The management of the mineral fraction of the feed via the use of Axion ThermoControl also contributes to boost the feed intake of the sows, with a better balance of the electrolyte needs.

For example, last summer, a field trial was carried out in a Hungarian farm of 300 sows (Topigs 20 sows x Danbred duroc boars).

In August 2014, the ambient temperature was on average 26.7°C and Axion ThermoControl was incorporated into lactation feed. Table 2 illustrates the results of this field trial on sow and piglet performance levels.

Axion ThermoControl is also effective during the fattening period where heat stress also induces a fall of feed intake, and a reorientation of

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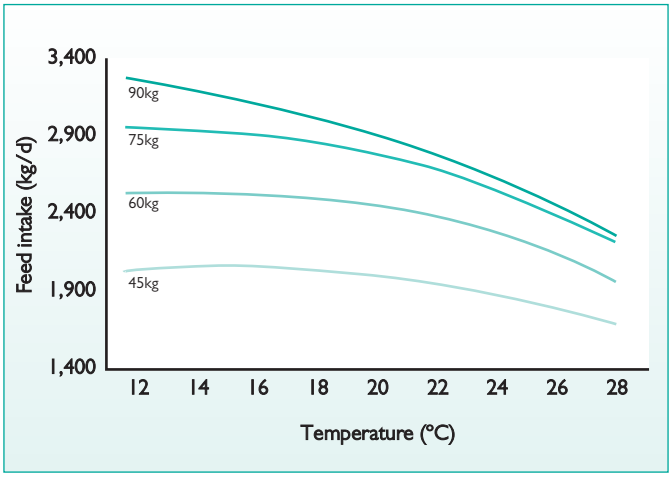
Fig. 1. Variation of voluntary feed intake with temperature and body weight (Quiniou N., 1999).



	Control group	Axion ThermoControl group	Comments
No. of sows	28	28	
Total born piglets per sow	12.4	12.32	
Live born piglets per sow	11.7	11.61	
Weaning day	23	23	
Weaned piglets per sow	10.46	10.57	
Total litter weight per sow (kg)	74.06	76.42	+3% of litter weight
Individual piglet weight (kg)	7.08	7.23	+150g/piglet
Total feed intake/sow in lactating period (kg)	91.5	100.7	+10% ofindividual feed intake
Average daily feed intake per sow (kg)	3.98	4.38	
Individual weight loss per sow (kg)	48.16	43.65	-9% of body weight loss

Table 2. Heavier piglets and more feed intake per sow with Axion ThermoControl (CCPA Group field trial, Hungary, 2014).

	Control group	Axion ThermoControl group	Comments
Duration of trial (days)	28	28	Finishing period
Number of fattening pigs	600	600	
Fattening period (days)	156	152	-4 days
Slaughter weight (kg)	100	100	
Carcase weight (kg)	77	79	+2.5%
Back depth (mm)	14.5	13	-10%

Table 3. Heavier and leaner carcases with Axion ThermoControl (CCPA Group trial in a farm of 180 sows, Costa Rica, 2015).

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the metabolism which enhances fatter carcases.

Increased feed intake

The use of Axion ThermoControl clearly increases feed intake and, as a consequence, the time necessary to reach the market weight is reduced by four days.

At the same time, the carcase weight is increased by 2kg on average and meat quality is improved through leaner carcases, as shown in the field trial set up in Latin America (Table 3).

The average ambient temperature during the trial was 30°C.

In order to evaluate the risk level of heat stress in farms, CCPA Group has also developed for pig producers a heat stress application for smartphones (Iphone and Android) entitled ThermoTool, which can be downloaded for free.

Thanks to this application, breeders can anticipate heat stress over five days and quickly adapt, if necessary, the management of their farm and the animal nutrition. ■

References are available from the author on request