Protecting gut health and animal performance during heat stress

The year 2020 was the planet's second warmest year since instrument records began in 1880. As climate change continues to present challenges for livestock producers – even in northern climates – research suggests that feed additive interventions can help manage animal health and performance challenges.

by Narendra Venkatareddy, Global Product Manager, Selko, The Feed Additives Brand of Trouw Nutrition. www.trouwnutrition.com

Research on heat stress across different production environments indicates that prevention is the key. Along with shifting management practices, select types of feed additives can be used to support an animal during heat stress conditions.

Feed additive use tends to be less expensive than management changes and has been linked to a reduction in heat stress response.

Additives can be used to help maintain the animal's antioxidant balance, osmolyte balance, and electrolyte balance. They can also support intestinal integrity and water intake.

This article looks at the research results that were recently shared during a webinar, 'Heat stress: How to support your animals with feed additives'. The event was part of Trouw Nutrition's global webinar series.

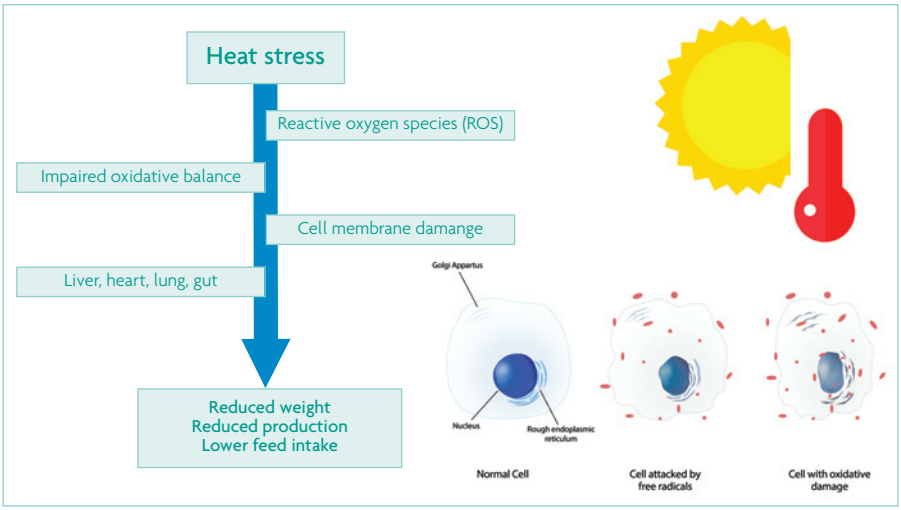


Fig. 2. Heat stress increases the generation of free radicals, which can impair the oxidative balance within an animal and damage cellular membranes.

Heat stress expansion and challenges

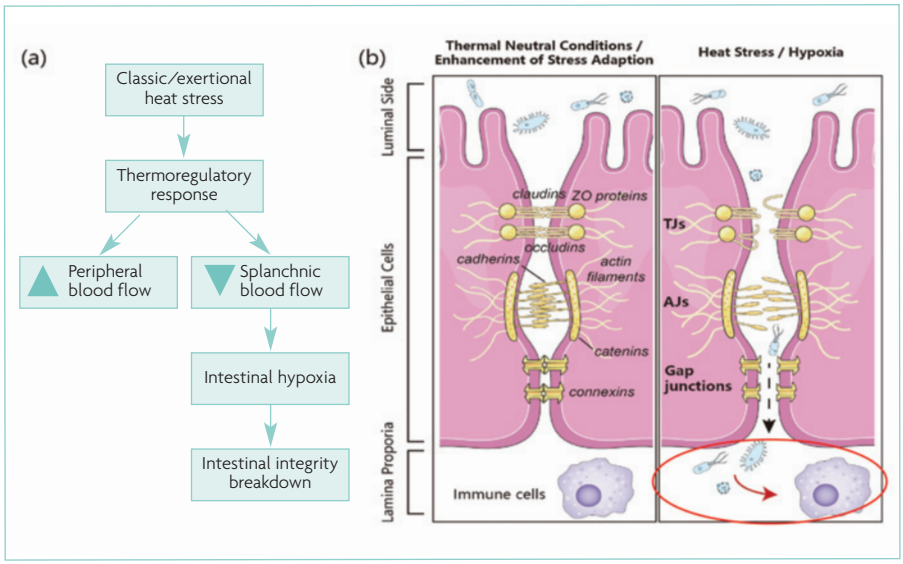
Heat stress has become an expanding global concern as temperatures rise around the world. Annually, heat stress is estimated to cost global agricultural producers more than $150bn, according to research done in 2003.

However, those losses only account for directly related adverse effects from heat stress – delayed results may be harder to quantify. Symptoms of heat stress include panting and depression and the condition can result in reduced feed intake and lower average daily gain, increased feed conversion ratios and lower performance.

Although there are outward signs that heat stress is occurring, livestock can also develop internal damage, including:

- Free radical generation – damaging cells and organelles.
- Reduced intestinal barrier function – leaky gut – and increased pathogen penetration.
- Microbiota imbalance and reduced resistance to immune challenges.
- Electrolyte imbalance and increased blood pH.

Fig. 1. Heat stress can lead to intestinal barrier damage, potentially leaving animals at more risk from pathogens.



Despite the stress of climate change, heat stress damage does not have to occur. Management and feed-based interventions can be used to improve livestock resistance to high heat conditions.

Some management practices strategies support:

- Increasing air flow.
- Reducing stocking density.
- Lowering the temperature of drinking water.
- Feeding during cooler parts of the day.

Feed additive strategies can support:

- Antioxidant balance.
- Intestinal integrity.
- Osmolyte balance.
- Electrolyte balance.

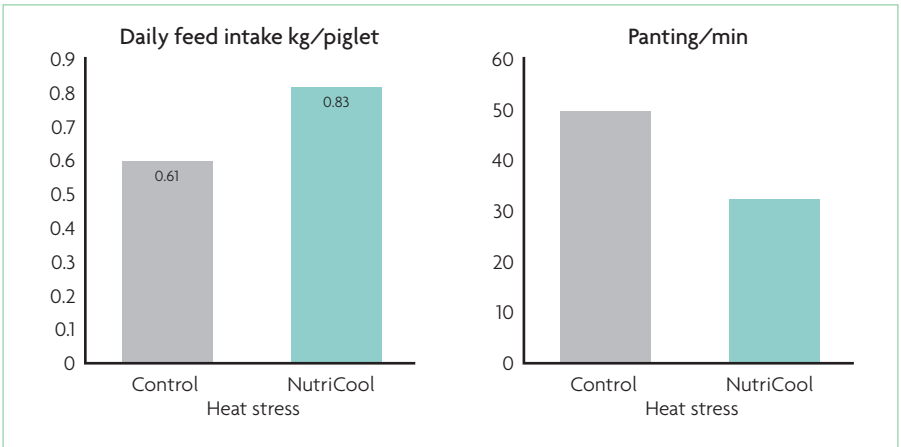


Fig. 4. NutriCool trial showing improved feed intake and reduced panting in piglets under commercial heat stress conditions.

Addressing free radicals and oxidative stress

An initial point of damage for livestock experiencing heat stress is oxidative stress and the generation of free radicals. Antioxidants in feed can help livestock mitigate potential damage by scavenging free radicals, but not all antioxidants function in the same way.

To provide optimal protection, antioxidants need to be able to distribute throughout the animal including through both lipid and water-based structures and have a high digestibility and bioavailability. Those requirements mean that not every antioxidant is suitable for addressing heat stress-based challenges.

In a comparison trial with piglets, two antioxidants were provided – vitamin E and Selko AOmix. The alternative antioxidant has more hydroxyl groups than vitamin E and has lipophilic tail, meaning it moves differently within the animal. Results from the piglet trial were analysed at Ghent University. Animals were exposed to high heat temperatures, 40°C (104°F), for a 24 hour period. Blood samples were taken before and after heat stress exposure and checked for indicators of oxidative stress – superoxide dismutase (SOD).

When increased levels of vitamin E were provided, there started to be a decline in SOD. However, a smaller amount of AOmix was able to generate similar results (Fig. 3).

Preventing gut damage

Another area where livestock can suffer damage during heat stress is the intestinal barrier. Heat stress generates a thermoregulatory response that can alter blood flow patterns leading to intestinal hypoxia and a breakdown of intestinal integrity. The consequences of damaged intestinal barrier function allow for increased pathogenic movement within the animal. However, maintaining cellular osmolarity or gut function helps cellular barriers stay in place.

Supporting antioxidant and osmolyte function

Although there are feed additives that can support animal production during heat stress conditions by providing antioxidants or boosting osmolyte function, it is possible to combine those responses.

A newly developed feed additive, NutriCool was designed by Trouw Nutrition researchers to both maintain cell osmolarity and reduce oxidation reactions for livestock.

In a heat stress trial with piglets the feed additive was given at 1kg/ton and a control group received non-supplemented feed. Piglets were tracked from weaning until reaching 20kg.

Piglets on the supplemented feed saw daily feed intake increase by 36% and panting drop by about 36% (Fig. 4).

Conclusion

Heat stress is an increasing challenge faced by livestock producers globally, which brings economic damage along with production issues.

Producers may see reduced feed intake, lower weight gain and performance. Livestock can have internal damage from an increased production of free radicals and complications to intestinal integrity.

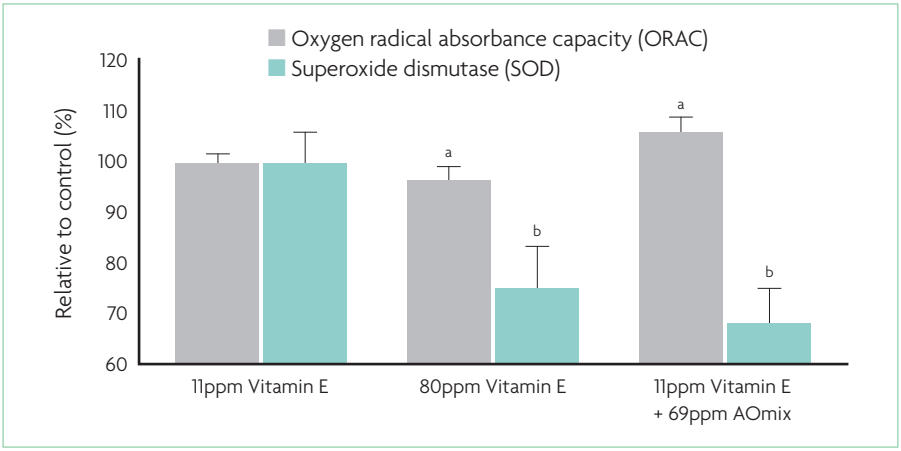
Prevention is the key. As we can predict heat stress and put some strategies in at once we can reduce the losses and improve profitability.

There are management and feed-based strategies that producers can employ to prevent or mitigate some of the damage done.

Supplemental feed additives like AOmix, TNI Betain and NutriCool can be used to provide antioxidants or scavenge free radicals or to maintain gut barrier function to alleviate heat stress leading to improved animal health and performance.

If heat stress has already happened, adjust the electrolyte balance and water intake and implement some more nutritional strategies with the help of your nutritionist. ■

Fig. 3. Combination trial of AOmix and vitamin E showing lower SOD levels under heat stress conditions in piglets.



References are available from the author on request