

The Best Feed Additives for Heat stress

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A new paradigm has recently emerged which places damage to gut tissues as the key to the negative impacts of heat stress on animals.

The best approach to managing heat stress is to be proactive. Prevention is better than trying to recover lost performance or in the worst-case mortalities (which is hard to recover from!).

Maintaining intestinal cell hydration is essential. The most effective osmolyte for hydration is natural betaine.

Electrolytes like potassium and sodium are a short-term emergency fix that are energetically expensive.

Minimising the inflammatory response in the gut is very important. Acute and subclinical disease will cause inflammation. So, protect against enteric disease and in ruminants prevent sub-acute ruminal acidosis (use the best buffer).

The best products for reducing inflammation are yeast metabolites from Diamond V.

Introduction

As the severity and incidence of cyclic heat events grow it is necessary to improve the management regarding heat stress for intensive animal production systems. Physical interventions like environmentally controlled housing, misters & shade all are important or in some cases essential for modern production systems. Under hot conditions no intervention is perfect. Even environmentally controlled poultry housing has its limits. There are several feed additives that can assist in alleviating the impacts of heat. This is both important from a production and animal welfare perspective.

What happens to the animal when heat stress occurs?

We tend to think of heat stress as dehydration and that's sort of right, but the impact is more complicated than that. Certainly, maintaining water balance is very important. While we see feed intake decline, as response to lowering the heat increment of digestion, the most significant impact of heat stress is the inflammation and degradation of the gut wall causing toxins (lipopolysaccharides) to enter the blood stream. The innate immune system becomes activated and energy is spent to fight that "infection". The loss in production from heat stress can generally be split 50% through reduction in feed intake and 50% in energy spent on the innate immune system. The more severe impacts of heat stress, including mortality, are associated with toxins entering the blood stream.

Every heat stress event magnifies the chances of heat damage from the next event.

What is the right approach alleviating heat stress in animals?

A new paradigm has recently emerged in the field of human medicine, which places damage to the tissues of the gut as the pivot through which the adverse effects of heat load are expressed. This invokes the possibility of novel approaches to the treatment and prevention of heat stress. Instead of treating the symptoms we should stop gut degradation. Maintaining the gut cell hydration and reducing inflammation of the gut are the approaches we recommend focusing on.

Feed additives to reduce heat stress

In the past feed additives like electrolytes (potassium, sodium), antioxidants (Selenium) and Vitamins (Vitamin C, Vitamin E) have been proposed and are still used. These in general treat the impacts or are short term solutions. Let's address the two key areas, cell hydration and inflammation.

Cell hydration

This can generally be described as maintaining osmolarity (water balance) of the cell. The short term "emergency" response of cells is to use electrolytes like potassium and sodium to maintain water balance. This is energetically costly so instead cells use organic osmolytes to regulate cell volume. Betaine is an organic osmolyte that is selectively absorbed or secreted by a wide variety of cells including those of the gut, liver and kidney. In fact, it's the most widespread osmolyte in nature with single cell bacteria, plants, animals and humans all using betaine through evolution to maintain cell osmolarity.

It is interesting to note that the betaine is preferentially used as the mechanism of gut cells to maintain hydration. That makes sense given electrolytes like potassium and sodium cost energy to move in/out of the cells via the ion pump process. In addition, high levels of intracellular ions also destabilise the cell protein risking degradation and gut damage under heat stress. So, while a short term "urgent" reaction to heat electrolytes works these ions do not solve the gut damage caused by heat stress.

When applying the use of natural betaine in animals, cell hydration is enhanced and the impacts of heat stress in all animal species is improved (poultry, pigs, cattle, sheep etc.). We have direct experience and research in each species supported by many years of commercial field application.

The results from using natural betaine supports the new paradigm on how protecting gut damage from heat stress is so critical to animals' health, welfare, and production.

Betaine is nature's osmolyte, but an intriguing finding is that natural betaine extracted from sugar beet molasses is far superior to synthetically produced betaine. In fact, these synthetic sources have a negative effect themselves on gut inflammation. So, while chemically they appear the same only natural betaine elicits the true osmolyte function expected through evolution.

Gut Inflammation

This inflammatory response to heat is quite rationale. The innate immune system reacts to protect the body. Of course, there is an energy cost to this, but the body needs to protect itself. Survival first! So, anything to minimise gut inflammation and maintaining gut integrity is a good thing under heat stress.

Managing disease such as coccidiosis and necrotic enteritis in poultry through to sub-clinical rumen acidosis in cattle/sheep are all important to minimise gut inflammation.

This cost of inflammation is an amazing area of research now days, not just under heat stress. While we've considered many approaches to this issue the one product type that has stood out for us has been functional yeast metabolites from Diamond V. They effectively reduce inflammation and support the innate immune response. There are other benefits for these bioactives but in the context of heat stress they reduce inflammation. No doubt.

By reducing gut inflammation, the energy spent by the innate immune system is less and that goes towards maintaining or improving production.

Summary

A new paradigm has recently emerged in the field of human medicine, which places damage to gut tissues as the key to the impacts caused by heat stress.

The best approach to managing heat stress is to be proactive. Prevention is better than trying to recover lost performance or in the worst-case mortalities (which is hard to recover from!).

Maintaining cell hydration is essential. The most effective osmolyte is natural betaine. Don't use synthetic versions for challenges such as heat stress.

Electrolytes like potassium and sodium are a short-term emergency fix that is energetically expensive.

Minimising the inflammatory response in the gut is very important. Acute and subclinical disease will cause inflammation. So, protect against enteric disease and prevent sub-acute ruminal acidosis (use the best buffer).

The best products for reducing inflammation are yeast metabolites from Diamond V.

If you have any questions please forward them to Mal.mottram@feedworks.com.au