The Acid / Base Basics of Heat Stress

During heat stress several things occur that leads to an acid / base disturbance. This is important as any prolonged disturbance can lead to a decrease in performance. In most cases, including sodium bicarbonate or S-Carb® during times of heat stress is beneficial, reducing the acid / base disturbance. The following is an overview of the events during heat stress.

Increased respiration (Panting) leads to a decreased CO_2

Short Term (less than 2 hours) Compensatory reaction is: $H^+ + HCO_3^- \rightarrow CO_2 + H_2O$
this aids in maintaining CO_2 levels, but results in an increased pH
and decreased HCO_3^-

This state is *RESPIRATORY ALKALOSIS*

To compensate (longer term) Renal compensation is to retain H^+, and excrete HCO_3^-
this results in *COMPENSATORY METABOLIC ACIDOSIS*

The additions of sodium bicarbonate or S-Carb to the feed increases circulating HCO3- resulting in:

$H^+ + HCO_3^- \rightarrow CO_2 + H_2O$

increases from buffer addition

increases from renal retention

as CO_2 increases, respiration decreases, HCO_3^- rises, pH declines and acid / base balance returns toward normal.

Periods of extreme, prolonged heat stress may exceed compensatory capacity resulting in death or permanent damage. However, in most situations periods of heat stress are less than 24 hours, with cooling at night alleviating some problems. Electrolyte balance may also be an issue during times of heat stress, and balancing for dietary electrolyte balance is recommended.

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