



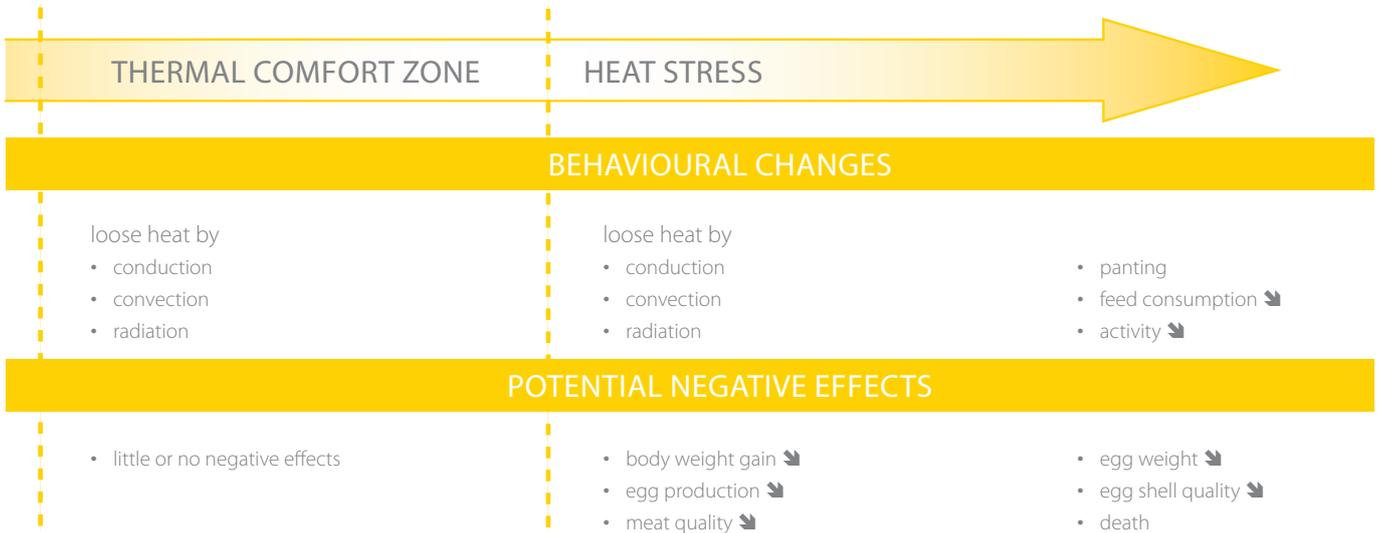
Nuvisol Heat
Water-soluble supplement

BE PREPARED FOR THE HEAT

Introduction

High ambient temperatures can be disastrous for commercial poultry, and in combination with high humidity, the effects can even be much more harmful. Therefore, chickens have to make behavioural and physiological changes to release excess heat to control their body temperature.

FIGURE 1: CONCEPT OF THERMAL COMFORT ZONE



Maintain body temperature

As long as the ambient temperature increases within their comfort zone, chickens will lose most of their heat by behavioural mechanisms to control body temperature (fig. 1 and 2), via :

Conduction

The chick touches a surface that is cooler than her own body

Convection

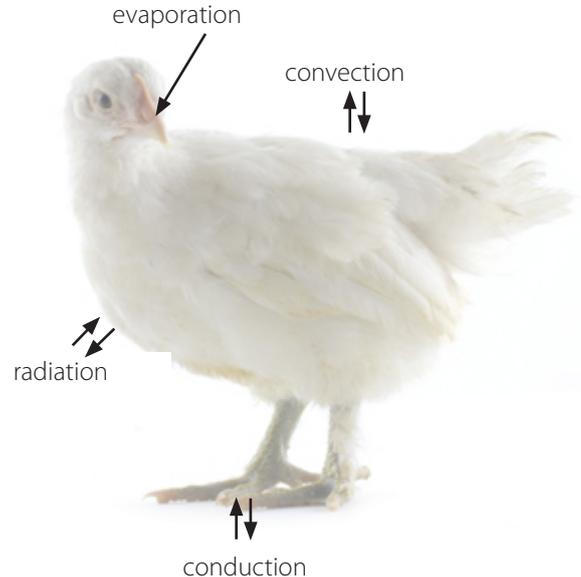
A cool breeze carries heat from the chick's body

Radiation

Heat moves from a warmer to a colder surface without using a medium.

These ways of heat loss occur rapidly and are at a low cost to the bird. It will cause little or no loss in egg production or growth.

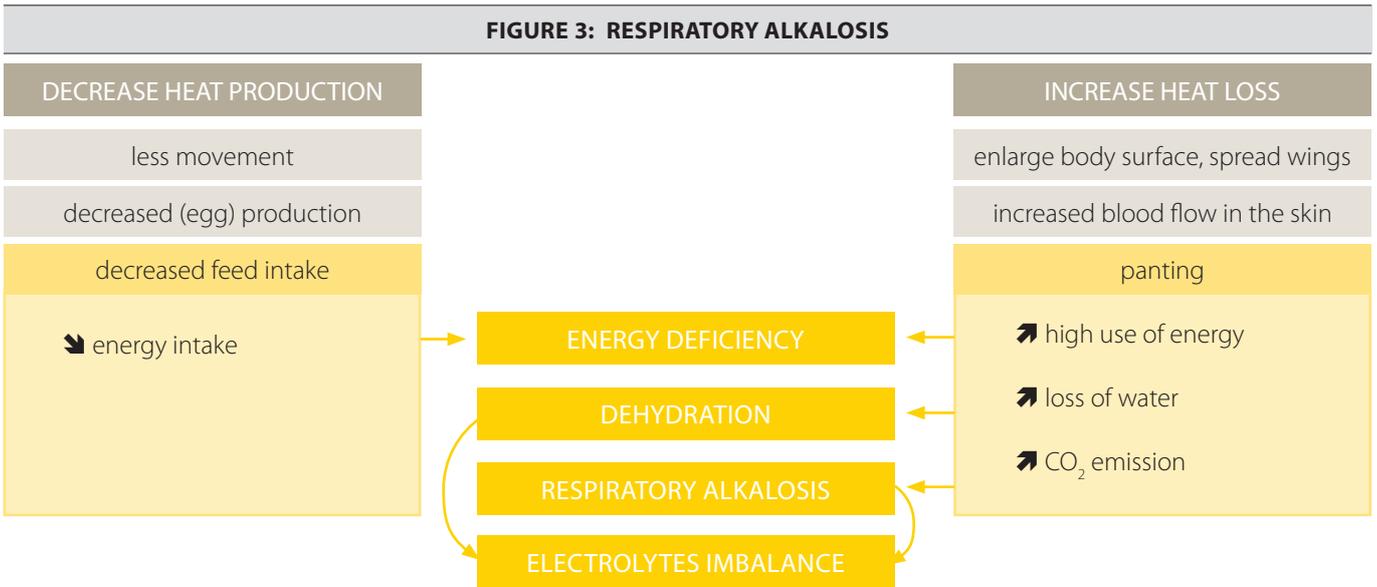
FIGURE 2: MECHANISMS TO LOOSE HEAT



Heat stress

Heat stress begins to occur when ambient temperature rises outside of the comfort zone (fig. 1). In this case, it's difficult for the bird to lose sufficient heat via the above mechanisms, because the difference between body and ambient temperature becomes very small. In this case, evaporation of water through the respiratory tract (panting) becomes the major route of heat loss, since birds don't have sweat glands.

Panting requires considerable energy expenditure due to increased muscle activity. Therefore, birds try to minimize thermogenesis by becoming less active, less productive and by reducing feed intake. Unfortunately, this means that the full genetic potential of the chick is often not achieved: heat stress causes dehydration, poor body weight gain and poor meat quality in broiler chickens, poor laying rate, egg weight and shell quality in laying hens and it can even lead to death.



Severe panting increases the loss of CO₂ from the lungs, which leads to a reduction in the partial pressure of CO₂ in blood plasma. In turn, this will lower the concentration of H⁺ and causes a rise in plasma pH over about a two hour period, a condition referred to as respiratory alkalosis (fig. 3).

RESPIRATORY ALKALOSIS

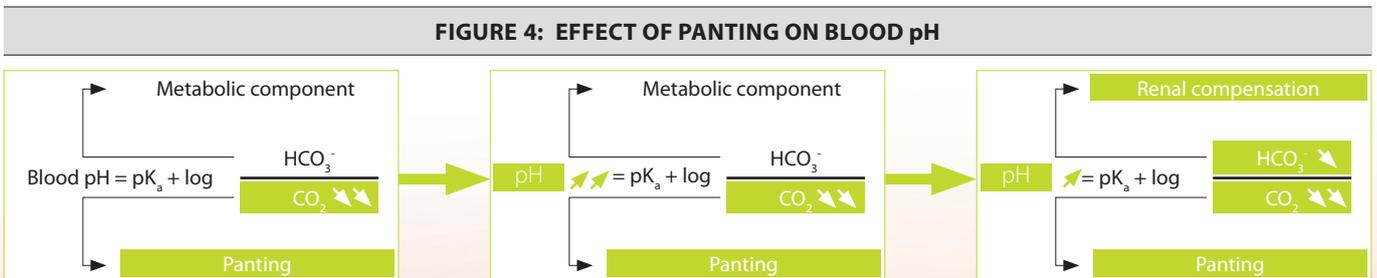
Blood alkalosis is directly related to the bicarbonate buffer system and to the effects of respiration on the acid-base balance. The bicarbonate buffer system is the most important buffer system for maintaining a normal blood pH.

The relation of pH, H₂CO₃ and HCO₃⁻ of the principal buffer is expressed in the Henderson-Hasselbach equation:

$$pH = pK_a + \log (HCO_3^- / CO_2)$$

The system functions under the dual regulatory control of the lungs and kidneys and consists of a mixture of H₂CO₃ and HCO₃⁻. H₂CO₃ is a very weak acid and is transformed almost entirely to CO₂ and H₂O. As a net result, a solution of H₂CO₃ has a high concentration of dissolved CO₂ and a weak concentration of H⁺.

This equation clearly shows that modification of the arterial CO₂ tension influences the pH of the blood (fig. 4). A decrease in arterial CO₂ tension causes the pH to rise. In response, the kidneys increase HCO₃⁻ excretion and reduce H⁺ excretion in an attempt to maintain the bird's acid-base balance. However, primary disturbances in the respiratory component result in metabolic adjustments that are established less rapidly by the urinary system. Moreover, renal compensation is rarely complete and cannot bring the pH entirely back to normal, resulting in blood alkalosis during heat stress.



ELECTROLYTE IMBALANCE

Respiratory alkalosis also has a profound influence on the electrolytes balance. A disturbed electrolytes balance and increased excretion of certain electrolytes will have important consequences for the heartbeat, the proper functioning of the skeletal muscles and impulse conduction in the nerves.

DEHYDRATION

Panting is accompanied by an increased water loss via the lungs which causes dehydration.

Nuvisol Heat | Prevention & treatment of heat stress

Nuvisol Heat Water-soluble supplement

Nuvisol Heat is a water-soluble mixture of nutrients for poultry that helps maintain performance during and after heat stress. Nuvisol Heat is a balanced combination of vitamin C, electrolytes and L-lysine (table 1).

TABLE 1: ACTIVE SUBSTANCES

Product	Species	Active ingredients			Dosage
		Vitamin C	Electrolytes	L-Lysine	
Nuvisol Heat		✓	✓	✓	250 g per 1000 L drinking water

BENEFICIAL EFFECTS OF NUVISOL HEAT

Stimulates water intake

It's important for birds to maintain adequate water intake at high temperatures in order to prevent dehydration from panting. This can be stimulated by adding salts to the drinking water to stimulate water intake.

Restoration of electrolyte imbalance

Nuvisol Heat contains a balanced range of electrolytes which helps to maintain the essential electrolytes balance.

Stabilizes blood pH

Respiratory alkalosis disturbs cell metabolism and enzyme activity, which is reflected in decreased performance. The stabilizing effect of Nuvisol Heat on the blood pH has a beneficial effect on performance during heat stress.