



Heat stress in poultry: background and affective factors

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ABSTRACTS

Heat stress and exhaustion is one of the top causes of chicken death. For those new to backyard chicken farming, it is important you learn to recognize the signs of this serious condition and how to keep your chickens cool and hydrated. Chicks, especially, need extra attention to help them remain healthy. For a flock of laying hens, knowing how to prevent heat exhaustion and treat a chicken suffering heat exhaustion is important to preserving their health and the health of their eggs. Once your chicks are old enough to move outdoors, remain vigilant for signs of heat stroke, especially if it's mid to late summer. Heat stress comes on quickly so it is important to watch them closely. Even older birds need supervision during the hot summer months.

Key words: Heat stress, Poultry, Chicken, Eggs

INTRODUCTION

Stress, a response to adverse stimuli, is difficult to define and understand because of its nebulous perception. According to Selye (1976), "stress is the nonspecific response of the body to any demand", whereas stressor can be defined as "an agent that produces stress at any time". Therefore, stress represents the reaction of the animal organism (i.e., a biological response) to stimuli that disturb its normal physiological equilibrium or homeostasis. Most poultry production methods in the UK involve large numbers of birds living in controlled environment housing (Bartlett, 2003). Heat stress results from a negative balance between the net amount of energy flowing from the animal's body to its surrounding environment and the amount of heat energy produced by the animal. This imbalance may be caused by variations of a combination of environmental factors (e.g., sunlight, thermal irradiation, and air temperature, humidity and movement), and characteristics of the animal (e.g., species, metabolism rate, and thermoregulatory mechanisms). Environmental stressors, such as heat stress, are particularly detrimental to animal agriculture (Renaudeau, 2012). The issue of environmental stress has quickly become a great point of interest in animal agriculture, particularly due to public awareness and concerns.

Signs of Heat Stress

Like dogs, chicks and grown chickens pant to keep cool—the first sign they need shade and water. With heat stress, they are open mouth panting while spreading their wings and squatting close to the ground (Nardone et al., 2010). They are trying to lose heat by adjusting their feather position.

- Gasping and panting
- Spreading wings
- Lethargic and droopy acting
- Extremely pale combs and wattles
- Closed eyes
- Lying down
- Drop in egg production
- Reduced egg size, egg weight, and poor shell quality
- Increased thirst
- Decreased appetite
- Lost body weight
- Increased cannibalism



Laying hens are susceptible to heat exhaustion. Water is the main content of an egg. Laying eggs requires a lot of fluids so keeping your hens hydrated and comfortable is important(Boissy et al., 2007). Egg layers also require large amounts of calcium to avoid soft eggshells. When hot, your hens may not eat as much so calcium consumption is low. Try adding small amounts of apple cider vinegar to their water 2-3 times a week. This helps to level their pH, making calcium absorption easier. Look at Diagram 1 – in the ‘thermo neutral zone’, birds can lose heat at a controlled rate using normal behavior. There is no heat stress and body temperature is held constant. When conditions mean the ‘upper critical temperature’ is exceeded, birds must lose heat actively by panting. Panting is a normal response to heat and is not initially considered a welfare problem. But as temperatures increase, the rate of panting increases(Nienaber et al., 2007). If heat production becomes greater than ‘maximum heat loss’ either in intensity (acute heat stress) or over long periods (chronic heat stress), birds may die. The body temperature of the broiler must remain very close to 41°C (106°F). If body temperature rises more than 4°C above this, the bird will die.

Effect of Heat Stress on the Immune Response

Many studies have been conducted to elucidate how stress affects the immune response in animals. Modulation of the immune response by the central nervous system (CNS) is mediated by a complex network that operates bi-directionally between the nervous, endocrine and immune systems. The hypothalamic–pituitary–adrenal (HPA) and the sympathetic–adrenal medullary (SAM) axes constitute the main pathways through which the immune response can be altered. It has been shown that lymphocytes, monocytes or macrophages, and granulocytes exhibit receptors for many neuroendocrine products of the HPA and SAM axes, such as Cortisol and Catecholamines, which can affect cellular trafficking, proliferation, cytokine secretion, antibody production and Cytolytic activity.

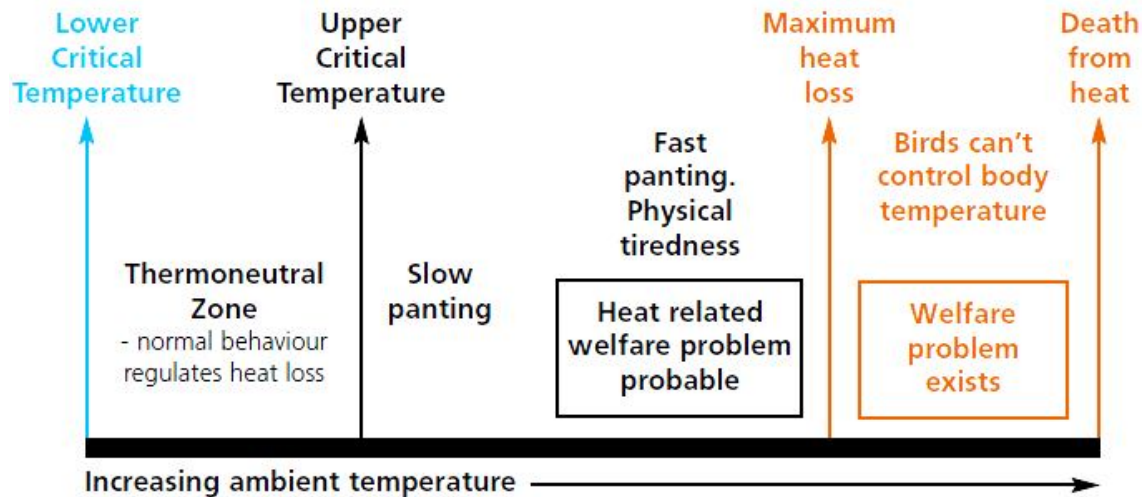


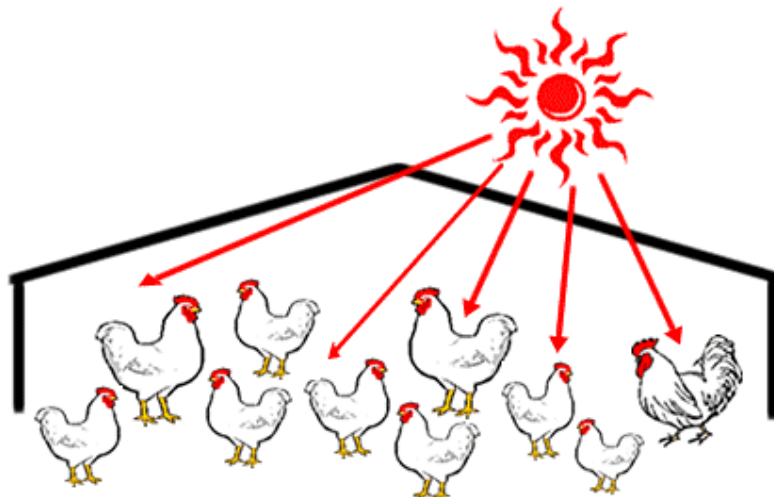
Diagram 1 – Diagram of Thermo neutral Zone

How to Control Heat Accumulation in Poultry

The most important measure to combat hot weather is to reduce the amount of heat accumulation in poultry. The sooner a heat stressed bird can bring its body temperature back to normal, the quicker it will get back on feed and the more likely performance will not suffer. Ventilation, bird density and nutrition are a few areas that play a role in controlling heat accumulation.

Evaporative Cooling

Sprinklers are commonly found in turkey barns for evaporative cooling, which are used when temperatures are more than 79-86°F (26-30°C) and the barn air is very dry. Too much water can actually increase the humidity of the barn to dangerous levels (Ebeid et al., 2012). Remember, high temperatures and high humidity make heat dissipation by evaporation very difficult. Death due to heat exhaustion will occur more quickly if both temperature and humidity are high.



Nutrition

Panting is accompanied by an increase in water loss so more water has to be consumed by birds during hot, dry weather in order to prevent dehydration. Drinking water cooler than body temperature will absorb body heat, which will help with cooling the bird. Adding an electrolyte to the drinking water will replenish vital nutrients that will help balance blood pH levels (Elnagar et al., 2010). Offering a night-time feeding program will encourage birds to eat during cooler periods and help maintain their performance during hot weather.

Ventilation

Proper ventilation is crucial for heat stress management. A good ventilation system performs the following:

1. Removes moisture laden air from the poultry house.
2. Brings in an equal amount of fresh outside air.
3. Directs incoming air to all areas equally.
4. Keeps inside air moving to flush hot, humid air from between the birds.

Conclusion

Heat stress is one of the most important environmental stressors challenging poultry production worldwide. The negative effects of heat stress on broilers and laying hens range from reduced growth and egg production to decreased poultry and egg quality and safety. However, a major concern should be the negative impact of heat stress on poultry welfare. As presented in this review, much information has been published on the effects of heat stress on productivity and immune response in poultry (broilers and laying hens). However, our understanding of basic mechanisms associated to the reported effects, as well as related to behavior and welfare of the birds under heat stress conditions are in fact scarce.

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