

Heat Stress

Heat Stress Definition

What is heat stress?

- It is a condition that occurs when an animal is exposed to above optimal temperatures and humidity.

What is its impact?

- Heat stress generally changes a bird's physiology and places stress on many systems thereby causing decreased performance, possible welfare concerns, and even increased mortality.

Cont. ...

- › Normal broiler body temperature is 41 C.
- › Optimum growing temperature is 21 to 24 C.
- › Heat stress can be elicited by conditions such as high temperature and high humidity depending on age.

Heat Stress Cost

- › A decade ago it was estimated that heat stress costs the broiler industry **128 million dollars** annually.

Preventive Measures

- › The detrimental effects of heat stress have been shown to be alleviated by:
 1. Dietary means prior exposure to heat treatment
 2. Chilled drinking water
 3. Fasting
 4. House cooling measures

Chickens Cooling Mechanisms

Chickens Cooling Mechanisms

- › Chickens have cooling mechanisms that allow them to survive at above optimal temperatures.

Cont. ...

- › There are two main methods that chickens use:
 1. **Non-evaporative cooling**
 - › It occurs via convection and is enhanced by air movement in the house.
 2. **Evaporative cooling**
 - › It occurs through the evaporation of water from the lungs.
 - › This method of heat dissipation is enhanced by low humidity and increased respiratory rates.
 - › Enhanced respiration rate during heat stress results in carbon dioxide loss and acid-base balance alterations.

Cont. ...

- › It has been shown that **non-evaporative cooling is more efficient** than evaporative cooling and is therefore the first line of defense.

- › But, as the **ambient temperature rises** to near body temperature;
 1. Non evaporative cooling becomes ineffective and evaporative cooling becomes necessary.
 2. Respiration rate will increase thereby initiating a higher rate of evaporative cooling.

Cont. ...

- › When **the relative humidity** rise,
 - The problem will be complicated, since evaporative cooling rate is inversely related to humidity.

Cont. ...

- › It is understood that chickens have means to cool themselves, but due to its ineffectiveness under certain climatic conditions, proper management is paramount.

Impacts of Heat Stress

Impact of Heat Stress

Where are the impacts result from?

- When temperatures exceed the effective range for non-evaporative cooling, the way that chickens cool themselves (increase in respiration rate will initiate a higher rate of evaporative cooling) causes certain physiological changes that further complicate the issue.

Cont. ...

1. Alkalosis

- Evaporative cooling is accomplished by increasing the respiratory rate also known as panting, and this can lead to respiratory **alkalosis**.

2. Electrolyte imbalance

- Acid-base imbalance has been shown to cause electrolyte imbalance and increased electrolyte excretion, mainly K^+ and Na^+
- Acid-base imbalance and the resulting electrolyte imbalance, caused by heat-induced panting, may play a big part in the decreased performance, altered meat quality and increased mortality seen in heat stressed broilers.

Cont. ...

- › Acid-base balance and electrolyte balance play key roles in broiler health and performance, and both can be drastically altered when chickens are heat stressed.

Overcoming Impacts of Heat Stress

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Some supplements may help birds overcoming impacts of heat stress;

1. Electrolyte supplements
2. Non-electrolytes supplements

1- Electrolytes Supplements

Benefits of supplementing electrolytes to heat stressed birds via feed or drinking water

- › Many studies have shown that the provision of additional electrolytes to heat stressed broilers can;
 1. Increase performance
 2. Decrease mortality
 3. Improve acid-base balance

Cont. ...

Side effects of adding **extra** electrolytes to heat stressed birds

- › It has been shown that excess electrolytes can;
 1. Increase excreta moisture
 2. Increase litter wetness, a known cause of foot pad dermatitis in turkeys.

2- Non-Electrolytes Supplements

Adding non-electrolyte feed additives

- › Many studies have shown benefits from the inclusion of non-electrolyte feed additives in broiler diets, such as **betaine**, which is a non-ionic organic osmolyte.
- › This molecule has also been shown to improve the performance of heat stressed broilers, but unlike electrolytes it has not been shown to increase litter wetness.

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