

Hot Weather Management for Turkey Breeders

In order to maximize breeder flock performance during hot weather, additional attention must be given to the breeder, house environment, water, feed and nutritional programs. This bulletin provides practical advice for managers and staff in each of these areas. The overall intent is to improve bird comfort and reduce the effects of heat by modifying husbandry and nutritional practices.

To properly manage birds during hot weather, it is important to be aware of the processes by which the turkey can lose heat and how the bird responds to heat stress. The turkey can lose heat by four different processes:

1. Radiation – loss of heat by radiation to cooler surrounding surfaces
2. Convection – heat loss via natural rising of warm air
3. Conduction – heat transfer by contact with a cooler surface
4. Evaporation – heat loss from respiratory surfaces

Turkeys respond to heat stress at both a physiological and behavioral level (see Table 1). These physiological and behavioral changes are what allow birds to maintain their body temperature across a range of environmental temperatures and is known as thermoregulation.

TABLE 1 PHYSIOLOGICAL AND BEHAVIORAL MECHANISMS

Response to Heat Stress	
Physiological Mechanisms	Behavioral Mechanisms
Panting Vasodilation Appetite is depressed Hormonal changes to increase water intake	Seeking shade/cooler areas Reducing activity Spreading feathers Reducing feed intake Increasing water intake Burrowing in the litter



Seeking Cooler Areas



Burrowing in the Litter



Panting and Wings Drooping

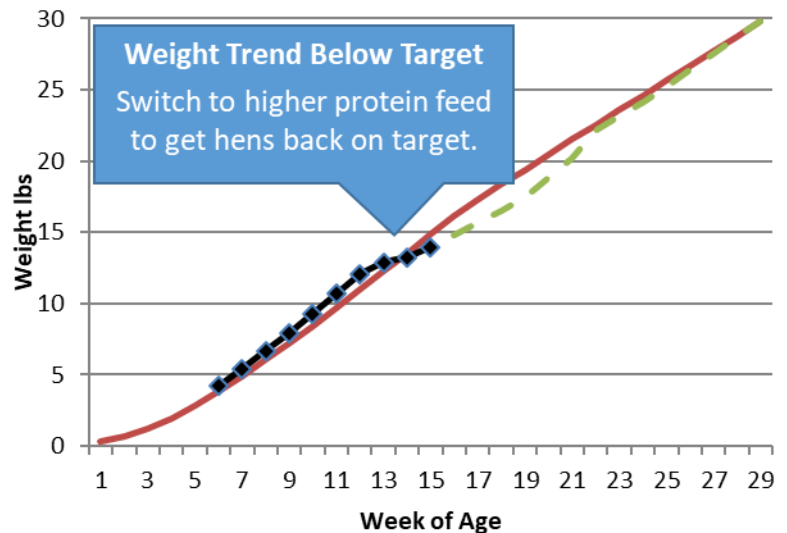
Breeder Conditioning

During hot weather a major feature of thermoregulation is reduced feed intake. For this reason, the breeder hen must be correctly conditioned during the rearing stage in order to have the best chance for success in the lay barn. It is essential for hens to be at or above the target weight (up to 1.5 lbs / 0.7 kgs over) at lighting so the hen will have the reserves to maintain egg production through times of high heat stress (reduced feed consumption).

This is achieved by ensuring the birds are in a positive body weight trajectory from 22 weeks to lighting. If a deviation to the target weight curve is occurring, an adjustment should be made to the feeding regime to insure that birds are at or above target weight when lit.

If the birds are less than 5% of the weight target, the feed schedule may need to step back to a higher protein feed until recovery is evident (see Figure 1). If hens don't reach or exceed the target weight by lighting age, consideration should be given to delay lighting until birds have achieved the positive weight requirement.

FIGURE 1 ADJUST FEED TO ACHIEVE WEIGHT TARGET



House Environment

High environmental house temperatures can impact laying performance, egg size and shell quality of the female turkey. Following is a list of structural and management factors that can reduce heat stress:

- Increasing insulation to prevent solar heat gain will reduce the total amount of heat that has to be removed from the house.
- Increasing air speed at bird level can be used to promote heat loss from the birds. Air speed can be increased by providing vertical hanging fans or ceiling mounted circulatory fans. These fans can be successfully used in both fan powered and naturally ventilated houses.
- Tunnel ventilation is becoming the most popular system for removing heat from both the birds and the barn. In tunnel ventilated barns, drop curtains can be used to increase the air speed at bird level. Air movement is one of the most effective methods of cooling birds during hot weather. For turkey breeders, tunnel ventilation can make a significant difference in egg production versus a naturally ventilated house with hanging fans for cooling. In some areas there can be as many as a 10 eggs/hen difference in birds housed in tunnel ventilated barns. Additionally, tunnel ventilation is well-suited for the addition of evaporative cooling. Evaporative cooling can be either cool cell pads or a fogging/misting system or even both.
- Increase ventilation rates at cooler times of the day to reduce latent heat and allow birds to recover from hotter conditions. Ensure all fans are in working order, belts are tightened and fan housings are kept free of dust.



- During hot weather events, egg production can possibly be improved when there is a difference of at least 18°F (10°C) between day and night temperatures. Maintaining this temperature difference is particularly important in hot climates to help control broodiness. This can be difficult to achieve especially in areas where high humidity occurs at night and evaporative cooling cannot be used. In well insulated naturally ventilated houses, it is also important to ensure that the ventilation rate at night is sufficient to remove heat accumulated during the day.
- The effect of high temperature can be exacerbated by high humidity. Birds which are not acclimated to warmer conditions may find it more difficult to adjust to hot weather. In regions where hot summers are common, bird housing should be designed with features to minimize the likelihood of heat stress.
- Minimize obstructions which may reduce air-flow: trim vegetation around barns, clean vent openings and louvers to remove dust accumulation, keep screens and light traps (where used such as tom barns) clear of dust and feathers. Direct hanging fans so air flows across the birds. Air movement at bird level has a cooling effect by removing body heat from the birds.
- Fully functioning and properly set alarm systems are always essential and critical in hot weather. Take care when altering alarm system settings to ensure they are appropriate for the difference in day and night temperatures. Separate day and night alarm settings may be required. Test emergency systems before placement and weekly thereafter. This includes alarm systems, automatic generators, and emergency ventilation (curtain drops etc.).
- Check ventilation systems routinely during the day to insure they are functioning properly.



Evaporative Cooling

Evaporative cooling can be effective in reducing house temperatures.

- Test ALL fogging and evaporative cooling systems prior to use each summer.
- Follow Manufacturer recommendations to thoroughly clean/inspect Evaporative Cooling Systems prior to onset of hot weather.
- Fogging / misting nozzles can become clogged; hoses and pipes can become cracked. Prior to beginning use each year systems should be checked for leaks and malfunctions and repaired prior to the onset of hot weather.
- Dripping nozzles will reduce mist onto birds, decrease the cooling capability of the system and create wet spots. Watch for drips and repair as needed.

- When using cool pad systems, the water should wet the pad evenly through its length and not overflow into house wetting the litter. Cool cell pads should be kept clean and free of obstructions.
- Fogging / cool cell pad systems should be run at service technician recommendations on temperature and timer settings.

Water

As water consumption doubles at temperatures above 85°F (30°C), available drinker space should be adequate for birds to drink freely during periods of high ambient temperatures.

- Monitoring daily water consumption will indicate potential problems.
- If using water storage tanks they should be situated within an enclosed area to ensure they are not exposed to heat from direct sunlight. Ensure that adequate water is available in storage tanks prior to the onset of increased bird and mechanical usage.
- Ensure all drinkers are in working order. Adjust drinker height and water depth to ensure good access to water.
- Ensure free access to cool water throughout the barn by providing sufficient drinkers for the number of birds being grown. Extra drinkers may be required in hot weather.
- Cooling water to lower temperatures will also assist the bird's thermoregulation. Ideally water should be cooled to below 70° F (22°C). Water temperatures in excess of 80° F (26°C) will likely result in reduced water intake. Water can be cooled by flushing water lines multiple times during the day, installing a drip system to keep water flowing at all times, or altering water lines to run along the base of cool cell pads.
- Consider using electrolytes to reduce stress on birds at key times. Look for electrolyte packs with stabilized vitamin C.
 - Excessive heat (>85°F / 29°C) - run electrolytes during daylight hours and fresh water overnight.
 - Moving birds to laying farms - run electrolytes for 24 hours before moving.

Work Schedule

Inseminations, vaccinations, or bird movements should be avoided during the warmest time of day and should be done at cooler times of the day. Always avoid crowding hens or pushing them too hard.

Eggshell Quality

As birds hyperventilate during heat stress, there is increased loss of CO₂ gas via the lungs. Lower CO₂ in blood causes blood pH to elevate or become alkaline resulting in a condition called respiratory alkalosis.

Higher blood pH results in reduced calcium and carbonate ions transferred from the blood to the shell gland (uterus) resulting in thin, weak egg shells. Increasing the amount of calcium in the diet will not correct the issue, however restoring the acid/base balance through supplementation with potassium chloride or sodium bicarbonate has been shown to improve the bird's tolerance to heat stress.



Feed Physical Quality

Feed physical quality can have a significant effect on how the bird deals with hot weather conditions. Good physical feed quality allows the bird to consume the feed efficiently without expending an excessive amount of energy. Poor physical feed quality tends to have the opposite effect. The bird expends more energy and generates heat trying to consume the feed it needs; this heat becomes an added burden on a bird which is already experiencing heat stress. Providing optimal feed form, consistently, will also support compensatory feed intake during the cooler periods of the day or night.

Nutrition

Breeder nutritional strategy should be adjusted for hot weather.

- Adjust nutrient specification levels to ensure sufficient intakes of key nutrients, vitamins and minerals.
- The diet formulation should focus on reducing heat associated with digestion.
- Consider the use of anti-heat-stress additives.
- Feed physical quality is important to maintain intake and reduce heat stress.

Feed Consumption

Closely monitor feed consumption of the flock during hot weather; feed intake can reduce by as much as 30% during hot conditions. Adjust the nutrient specification levels to ensure intake of key nutrients is maintained. The critical nutrients are digestible amino acids, energy, calcium, sodium and phosphorus.



Ensure Birds Continue to Eat

Formulation Approach

Energy contribution from starch has a higher heat increment of feeding – heat associated with digestion – per unit of energy compared to lipid (fat). Increasing the energy contribution from oil addition to the diets will reduce body heat production and reduce the heat-burden on the bird.

Insufficient digestible amino acid intake is one of the main reasons for productivity loss during hot weather, however excess crude protein supply should be avoided. Metabolism of excess dietary crude protein involves significant energy expenditure by the bird. Minimizing excess crude protein reduces the metabolic load on the bird during heat stress, reductions in dietary crude protein by as little as 0.5% (while maintaining digestible amino acid density) has been associated with improved production during hot weather. Proteins derived from animal sources have higher heat increment values than vegetable protein sources.

Formulating to digestible amino acids rather than crude protein is a means of avoiding excess crude protein intake by the bird. There is also evidence that formulating to an ideal amino acid profile results in more efficient use of amino acids in warmer environments. Higher arginine to lysine ratios are associated with improvements in heat tolerance.

Due to the decrease in feed intake during heat stress the intake of vitamins and trace minerals is also reduced. Use of higher levels of vitamins, provided as a 'booster' pack, can be fed at strategic periods.

Try to anticipate periods of heat stress and implement the dietary changes ahead of the hot weather. It is preferable to increase the micronutrient intake by the bird prior to the onset of heat stress and maintain intakes throughout the hot weather period. It is useful to quantify the degree of reduction in feed intake during the period of stress and calculate the overage of micronutrients to compensate for this reduction.

The key vitamins to consider are: E, A, C and B-Complex. All of these vitamins are considered beneficial to the bird during heat stress conditions especially when used in combination.

Trace minerals provided in an organic form are considered more bioavailable than inorganic forms. Organic forms of zinc, copper manganese and selenium are the key trace elements to consider.

A 'summer' feed formula should:

- Compensate for reduced feed intake.
- Decreased crude protein – use vegetable protein sources.
- Formulate to digestible amino acid levels.
- Heat increment value of fat is lower than carbohydrate and provides more of a 'cooling effect' on the bird
- Supplement the diets with fats/oils.
- Use elevated levels of key micronutrients – vitamin and trace elements.

Additives

A number of additives have been shown to assist in reducing the effects of heat stress. Consult your Nutritionist and veterinary practitioners regarding their use.

Aspirin (acetylsalicylic acid) is considered an anti-heat stressor through its effect on increasing vasodilation and blood flow to the body's extremities. A combination of acetylsalicylic acid, ascorbic acid, potassium chloride and sodium bicarbonate has been shown to prevent heat stress related depression in performance.

Betaine has been shown to have benefits on egg production and egg shell quality under heat stress.

Summary

Good prior planning is the key to successful management of turkey breeding hens in hot weather. It is not possible to know when hot weather will begin each year. Therefore, it is essential to have the hot weather management plan in place before it is actually needed. This plan should include proper conditioning of the breeder candidates, and development of means to help the birds to minimize the effects of heat stress during the hot weather months. Ventilation and cooling systems must be in good repair and operating at full capacity, and nutritional programs should be designed to help the bird deal effectively with hot weather.