The University of Georgia

College of Agricultural and Environmental Sciences
Cooperative Extension

Poultry Housing Tips

Are Birds Cooler at Night When the Lights Go Out?

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One of the biggest challenges in growing large broilers is keeping them cool during hot weather. Whereas with a four-pound broiler producers have to worry about the possibility of their bird getting too hot for a few days at the end of a summer flock, when growing a 7 lb.+ broiler, heat stress can be a potential issue for two to three weeks at a time. Growers' efforts in combating heat stress are typically concentrated in the daylight hours, especially during the afternoon when temperatures are at their highest. Fans are checked to make sure they are all operating and are well maintained so that the highest possible air speed is produced over the birds. The evaporative cooling pads are examined to insure they are throughly wetted so that the incoming air temperature can be kept as low as possible and if it is really hot, interior fogging nozzles may be used to keep birds comfortable.

One common concern that producers often have during hot weather is that the broilers appear to be sitting for long periods of time during the heat of the day. This of course is of concern because if a bird is sitting it is not eating and drinking which would result in a reduction in bird performance. Of equal, if not of greater, concern is that when a bird sits heat could build up under the bird, causing the bird's body temperature to rise, possibly leading to an increase in mortality. Though the build up of heat under a bird during hot weather is of real concern, the fact of the matter is that producers should be more wary about it at night than during the day.

In the summer of 2015 studies were conducted to explore how broiler management practices affected deep body and subcutaneous breast temperatures during hot weather. The studies were conducted on commercial broiler farms during the last two weeks of the flock. Micro temperature data loggers were surgically implanted in the deep body and in a limited number of cases just under the skin on the breast to be an indicator of bird activity. After the surgery the birds were returned to the house and allowed to roam freely for 7 to 14 days. Studies were conducted on six farms and temperature sensors were implanted in three to six birds on each farm. Air velocity, house temperature and relative humidity were continuously monitored on each farm as well

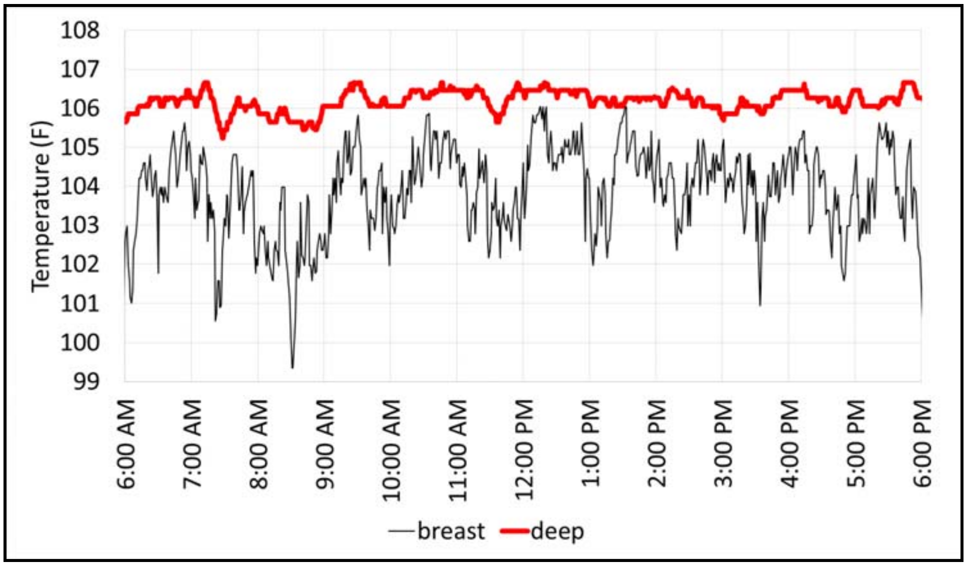

Figure 1. Deep body and subcutaneous breast temperatures (bird 1)

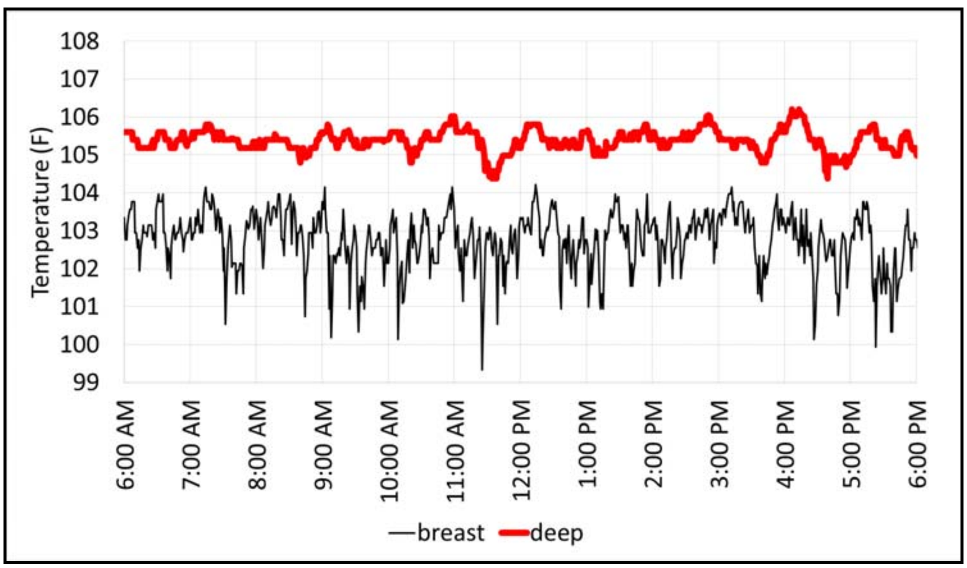

Figure 2. Deep body and subcutaneous breast temperature (bird 2)

Figures 1 and 2 are representative graphs of deep body and subcutaneous breast temperatures seen during the daylight hours on the study farms. Deep body temperature for both the birds illustrated remained around 106ºF, which is considered normal for a broiler. A body temperature of over 108ºF would tend to indicate that a bird is significantly heat stressed. Subcutaneous breast temperatures were typically between one to five degrees lower than deep body temperature. When the birds were resting/sitting subcutaneous breast temperatures typically rose to within one degree of deep body temperature. When the birds got up and moved about the house, breast temperature would fall between two and three degrees. When the birds rose momentarily or shifted about, smaller changes in temperature were observed.

Changes in subcutaneous breast temperatures did correlate with changes in deep body temperature. During periods of elevated breast temperatures, presumably when the birds were sitting, deep body temperatures tended to rise with subcutaneous breast temperatures. When subcutaneous breast temperatures decreased, deep body temperatures tended to follow. Over the course of the day, illustrated in Figures 1 and 2, there is a near constant cycling of breast and deep body temperature, indicating a relatively high level of bird movement and/or activity.

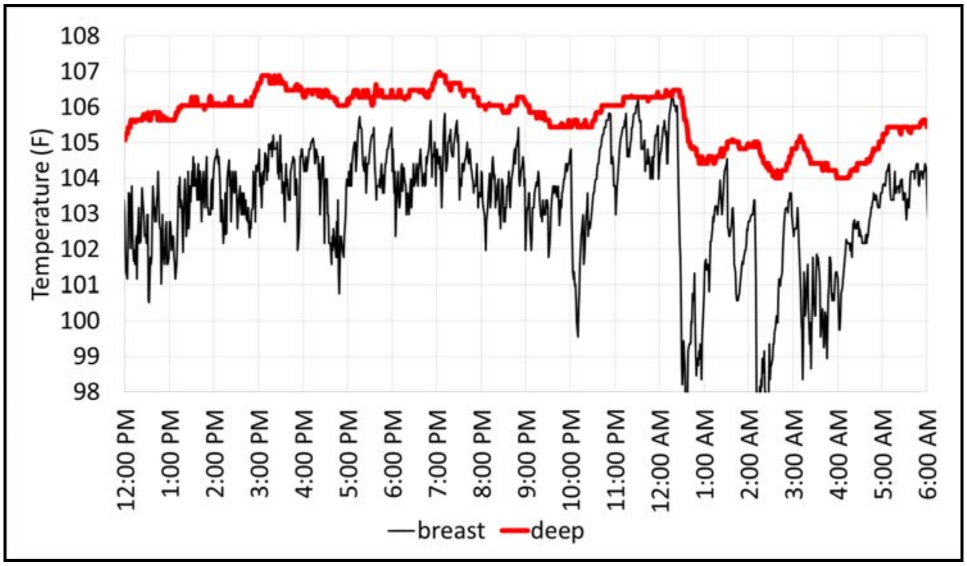

Figure 3. Deep body and subcutaneous temperature measurements (bird 2)

The highest sustained subcutaneous temperatures on all the study farms tended to occur at night when the lights were off. For instance, in the house illustrated in Figure 3 the lights were off for two hours from 10:30 pm to 12:30 am. When the lights were off, subcutaneous breast temperature rose to nearly deep body temperature, which would tend to indicate that there was essentially no heat loss from the breast to the floor. This brings up an important fact. The build-up of heat under the birds is not necessarily the result of litter heat production but rather due to the fact that litter is a very good insulator, preventing the bird from losing heat from its breast while it is seated. If the litter were producing a significant amount of heat the subcutaneous breast temperature would likely rise well above bird's normal deep body temperature of 106°F. Though there were slight variations in breast temperature during dark periods, they were minimal and likely related to the bird shifting its body. Unlike during the day when the periods of elevated deep body and subcutaneous breast and deep body temperatures were very short in duration, at night, these temperatures remained elevated for most of the two hours the lights were off. When the lights came on and the birds got up to eat and drink, subcutaneous breast temperature immediately decreased six degrees and deep body temperature fell quickly by approximately two degrees.

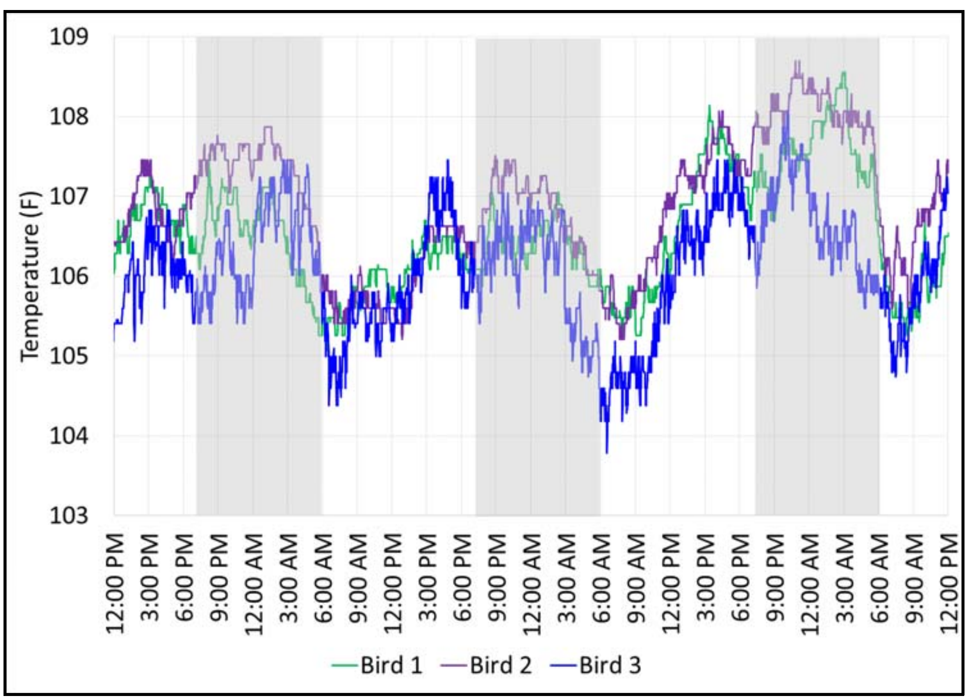

Figure 4. Deep body temperatures of three near-market-age birds during hot weather (shaded areas are the dark periods).

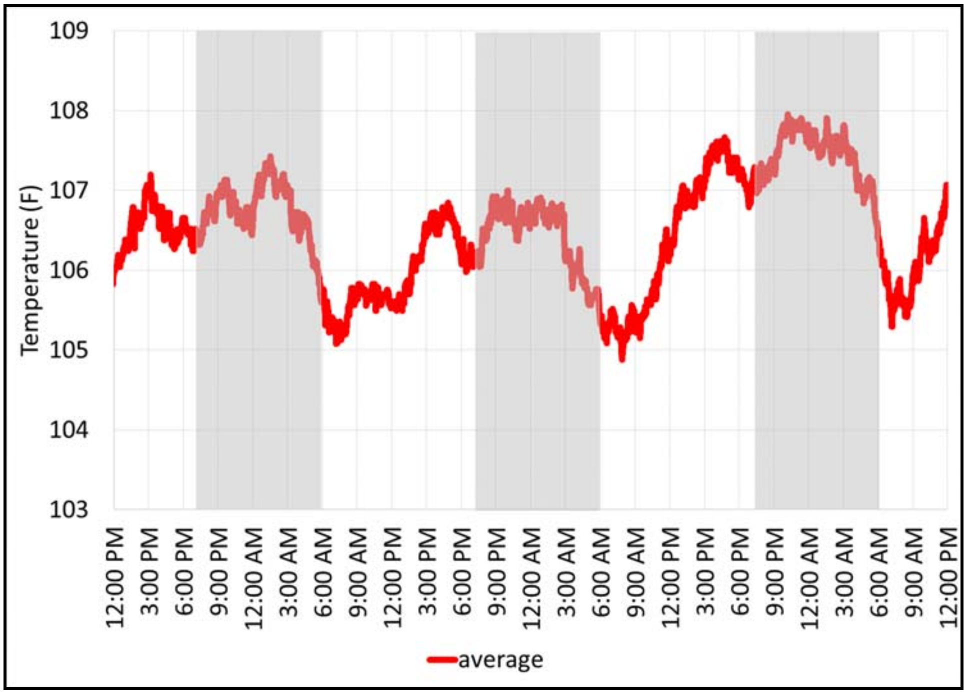

Figure 5. Average body temperatures for the three birds in Figure 4 (shaded areas are dark periods).

The effect of prolonged dark periods on deep body temperature in houses where the birds remain seated for a long period of time is well illustrated in Figures 4 and 5. House temperatures over the three-day period shown in Figures 4 and 5 ranged between 75°F during the night and 85°F during the day. Air speed in the tunnel-ventilated house ranged between 500 and 600 ft/min. The house was dark from approximately 7:00 pm until 6:00 am. In the late afternoon as house temperatures began to fall, the average deep body temperatures of the three birds monitored also tended to decrease until 7:00 pm when the lights went off. When the lights turned off, deep body temperatures of the three birds started to rise. Though there were differences between the birds, deep body temperatures tended to stay elevated for approximately the next six hours. The decrease in body temperature prior to the lights coming on is likely due to the birds being cooled as house temperatures dropped into the low seventies in the early morning hours. It is important to note that in some of the birds deep body temperature during the dark period was higher than it was during the day when house temperatures were at their highest.

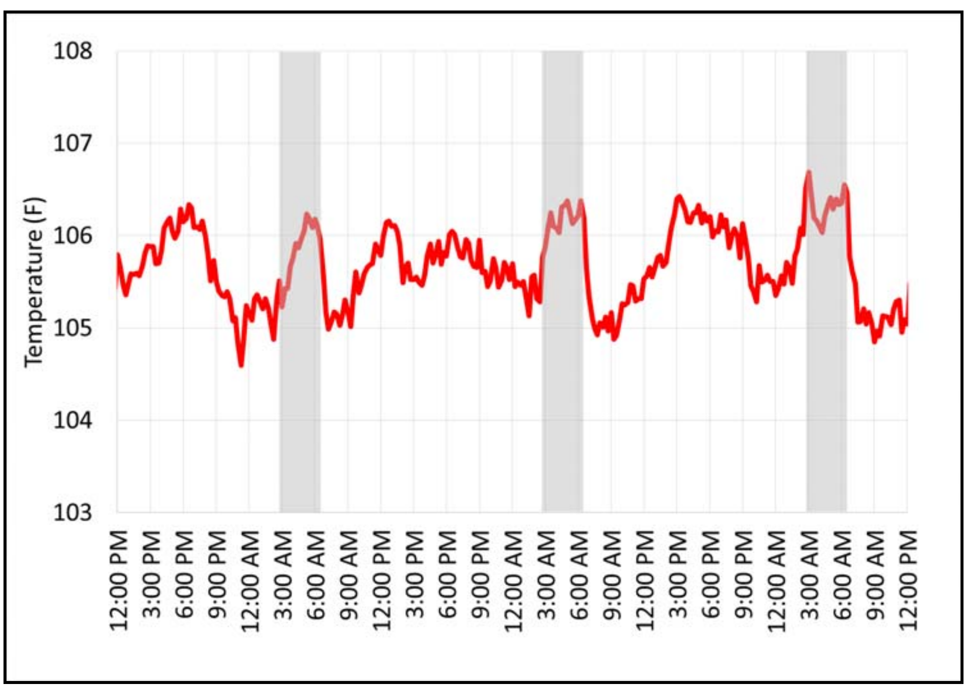

Figure 6. Average deep body temperatures of three near-market-age birds during hot weather (shaded areas are dark periods).

Figure 6 illustrates the average deep body temperature for three birds over a three-day period on a farm with a shorter dark period (3:00 am to 6:30 am). The conditions within the house as well as the age of the birds were similar to that in the previous farm in Figure 5. As seen previously, when the lights shut off average deep body temperature rose approximately one degree and was similar to that seen during the middle of the afternoon. Since the dark period was shorter, body temperatures were elevated for a shorter period at night. This trend was seen on all the farms studied. The degree to which deep body temperature rose did vary to some extent from bird to bird and farm to farm but all the birds experienced some rise in deep body temperature.

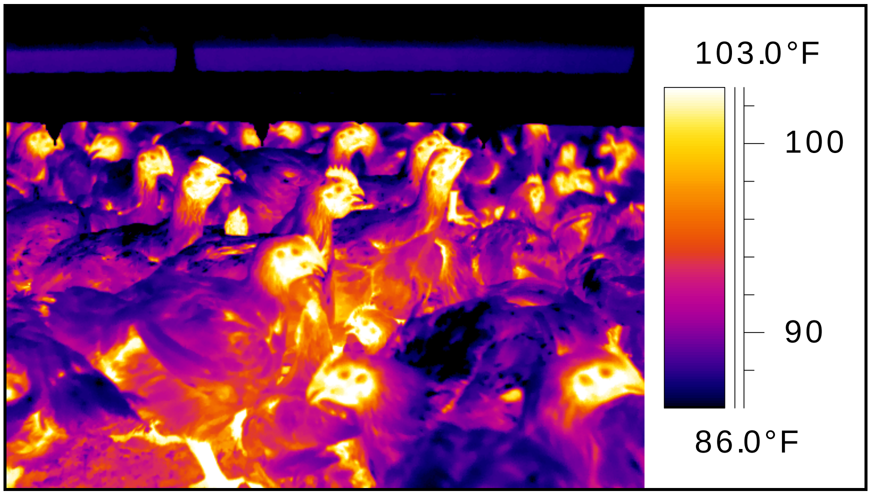

Figure 7. Thermal images showing the cool backs and warm sides of near-market-age broilers.

This research confirms what has been determined in other studies: namely reducing heat stress is a 24-hour-a-day job. Though air temperatures may drop into the seventies at night, relative humidity typically climbs to near saturation at night, reducing the birds' ability to lose heat through respiration which is crucial to a bird's ability to cool itself. To make matters worse, is when a bird sits down at night the amount of its surface area exposed to air movement is reduced. First, there will be little or no heat loss from the underside of the bird due to the insulating qualities of litter. Second, heat loss from the sides of a bird will tend to be minimal due to the close proximity of other stationary market-age birds (Figure 7). During the day birds will occasionally get up, providing an opportunity for some air to move over the sides of the birds that are remaining seated. But at night the only surfaces of a seated bird that is exposed to air movement would be its back, neck and head, which all and all is a relatively small percentage of a bird's total surface area. The lower the amount of exposed surface area, the lower the amount of heat removed from a bird by the air flowing down the house, and the hotter the birds will be. The net result is that though air temperatures may be lower at night, the combination of high relative humidity and the reduction in exposed bird surface area can result in higher body temperatures at night than during the day.

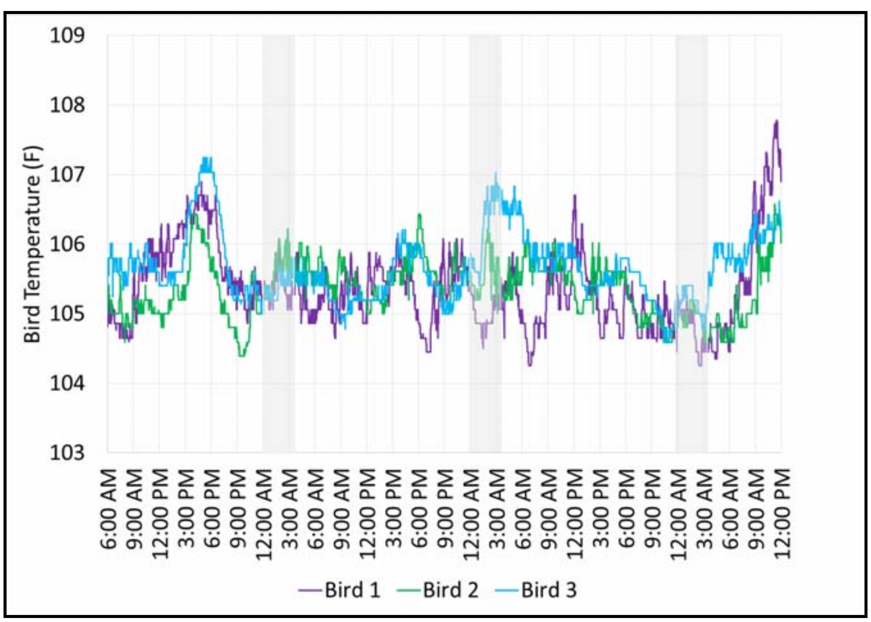

Figure 8. Deep body temperatures of low-density, seven-week-old birds.

An experiment was conducted in pens at the UGA Poultry Research Center to explore if body temperatures would rise during the dark period if birds are placed at very lower densities. Seven-week-old birds were placed in pens with over two square feet per bird and body temperatures were monitored. Temperatures ranged from high sixties at night to the low eighties during the day. Air movement was provided by circulation fans and was approximately a few hundred feet per minute. Though air movement over the birds was relatively minimal since there was a significant amount of space around each bird, their body temperatures did not significantly increase during the dark period (Figure 8). This could in part explain why in houses with significant bird migration those on the tunnel fan end of the house will gain more weight than those on the tunnel inlet end of the house. Though the air temperature is higher on the tunnel fan end of the house than the pad end, the fact that birds are more spread out and are therefore able to get air movement not just over their backs, necks and head, but their sides as well can lead to significantly greater cooling than the tightly packed birds on the tunnel inlet end of the house (Figures 9 and 10). This increased surface area is of potentially the greatest benefit at night when all the birds sit down for extended periods.

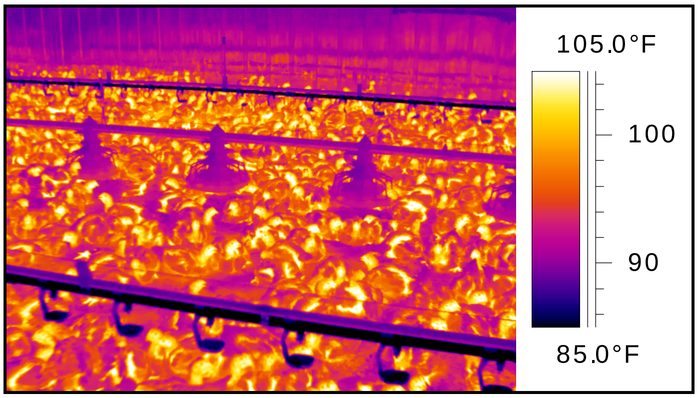

Figure 9. Typical thermal image of birds near the tunnel inlet in a house with significant bird migration.

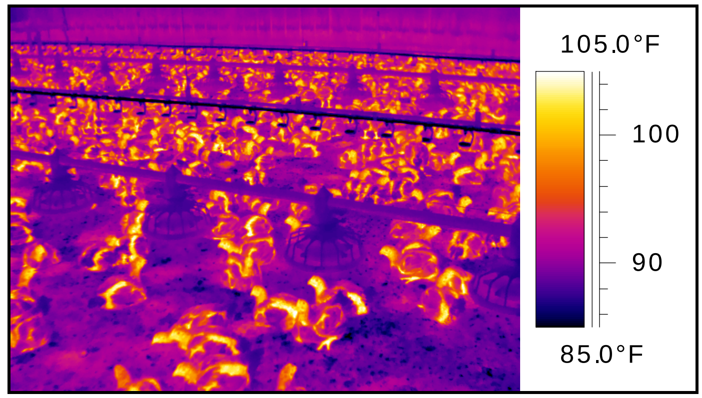

Figure 10. Typical thermal image of birds near the tunnel fans in a house with significant bird migration.

Though it is difficult to avoid the potential for birds getting hot when the lights shut off, there are steps growers can take to minimize potential problems:

1) Even if the temperatures drop into the low seventies or high sixties when growing a large bird it is imperative that high air speeds are maintained at night especially when the lights shut off and the birds sit down.

2) Though dark periods are necessary it is important to carefully consider how long the dark periods are during hot weather. With market-age birds, during hot weather it may be best to keep dark periods to four hours or less.

3) Make sure that you manage your birds to limit bird migration. Make sure that multiple migration fences are up within two weeks of age and that houses are equipped with at least two water meters, one for the pad end of the house and one for the tunnel fan end of the house. Monitor water usage daily. If the bird density is the same on each end, chances are daily water usage will be the same for both ends of the house.

4) Extended dark periods are should not be of concern when used in conjunction with younger birds. There is typically enough space between the birds that even when they sit down the air flowing down the house will be able to move over at least 75% of the surface of the birds.

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