

Recognizing Heat Stress in Dairy Cattle: How to Visually Record Respiration Rate



Heat Stress on Dairy Cows

High temperature, humidity, and exposure to solar radiation can cause cows to become stressed. Temperature humidity index (THI) is a value that includes both ambient temperature and relative humidity and can be used to assess the intensity of heat load for an animal.

At a THI of 68 or higher, lactating dairy cows experience heat stress. As an example, an ambient temperature of just 72°F with 45 percent relative humidity and an ambient temperature of 76°F with 15 percent humidity both equal a THI of 68. You may not be hot in these conditions, but dairy cows have a lower heat stress threshold compared to people. Dairy cows in the southeastern U.S. spend nearly 50 percent of the year in a state of heat stress. Cows in Mississippi are in a constant state of heat stress from May to September, so, during this time, they rarely get a chance to relax, recover, and prepare for another day of being heat stressed.

Non-evaporative cooling methods are used with milder temperatures. These can include conduction (lying on a cool surface), convection (wind moves heat from near the surface of the cow's skin and is replaced with cooler air), and radiation (when all or parts of the surroundings are cooler than the cow's skin). Evaporative cooling methods like panting and sweating are used when environmental temperatures are high. In regions with a subtropical climate, like the southeastern U.S., the high relative humidity limits the rate of heat loss via evaporative cooling.

When a cow's natural heat abatement methods become insufficient because the heat and humidity are just too much, the result is decreased milk yield, decreased conception rates, increased days open, increased chance of abortion, and, in extreme cases, death. Somatic cell count and clinical mastitis infection rate can also increase indirectly from heat stress. This occurs when cows that already have a lowered immune response then lay in mud and manure to try to cool themselves.

Heat stress on cows already causes a decrease in production of up to 4,568 pounds per cow per year, and the higher risk of resulting mastitis decreases milk yield even more. The decrease in production and performance caused by heat stress leads to an economic loss of \$900 million each year for the dairy industry.

Recording Respiration Rate

Respiration rate has been identified as one of the most sensitive ways of observing if a cow is in a state of heat stress. A non-heat stressed cow will have a respiration rate range of 26 to 50 breaths per minute. When respiration rate exceeds 120 breaths per minute, the cow is experiencing severe heat stress.

Ideally, producers would employ heat abatement strategies like fans and sprinklers automatically when THI is close to 68, but many producers house cows outdoors or do not have automated systems to do this. In these cases, recording respiration rate is recommended. Use this method on about 10 percent of the herd each evening, as well as when any cow is exhibiting uncommon behaviors (e.g., isolation from the rest of the herd, holding head low to the ground, drooling, panting with her tongue out).

To measure respiration rate, it is important to be quiet and keep a reasonable distance from the animal you're observing. If cows are eating or drinking, wait until they finish before collecting respiration rate data. Do not observe respiration rates in the holding pen because they are typically crowded, elevating their temperature and respiration rate even more.

To visually observe respiration rate, you will need:

- pen/pencil and paper or notes app on smartphone
- stopwatch

Focusing on the flank area of the cow (**Figure 1**), start on an exhale and use the stopwatch to record the time it takes to count 10 full breaths. One full breath is defined as one inhale and one exhale. The cow is exhaling when the flank looks sunken in and inhaling when the flank looks full of air.

Once you have recorded the time for a cow to take 10 full breaths, use the following equation to calculate breaths per minute:

$$10 \div \text{number of seconds it took to take 10 breaths} \times 60$$

For example, you observe your cow take 10 full breaths in 14.4 seconds:

$$10 \div 14.4 \text{ seconds} \times 60 = 41.67 \text{ breaths per minute}$$

This cow is within the non-heat stressed range for respiration rate.



Figure 1. When visually observing the respiration rate of a cow, focus on the flank area. Photo: C. A. Becker.

Collecting respiration rate data from 10 percent of the herd each day should give you a good idea of when to intervene (turn on fans, misters, sprinklers, etc.) and whether your cow-cooling techniques are enough (or if an investment in cow cooling should be a priority). Early intervention can help reduce the amount of milk lost due to heat stress. Please see MSU Extension Publication 3464 *Recognizing Heat Stress in Dairy Cattle: A Scoring System to Help Producers Assess Heat Stress Severity* to learn how to further assess dairy cattle for signs of heat stress.

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