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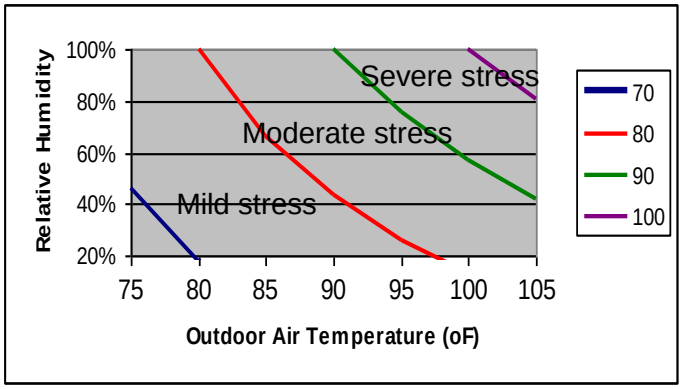
WASHINGTON STATE UNIVERSITY EXTENSION & WSU COLLEGE OF VETERINARY MEDICINE

Heat Stress

Preparing for Summer on the Dairy: Heat Stress Prevention

In the summer of 2006, over 30,000 head of cattle died due to severe heat stress effects in California. Deaths due to heat stress are unusual but what are more common are the effects that heat stress can have on cattle health, milk production and reproduction.



What is heat stress?

Heat stress is the combination of heat and humidity that negatively impact a cow's health and performance. It is often defined as a Temperature humidity index (THI) greater than 72. The ideal ambient temperature for a dairy cow is between 41 and 77° F. Moderate signs of heat stress may occur when the temperature is between 80° and 90°F with the humidity ranging from 50 to 90 percent. As ambient temperature approaches body temperature, sensible routes of heat loss (through respiration) are compromised which leaves only evaporative heat loss as the major route of heat dissipation. Because cows sweat very little we need to assist their heat dissipation. Heat stressed cows will often have the following behaviors:

- Seek out shade, and may not leave to drink/eat,
- Increase water intake,
- Reduce feed intake,
- Stand rather than lie down,
- Increase respiration rate,
- Increase body temperature,
- Increase saliva production.

What are the effects of heat stress?

- Heat stress **INCREASES:** Respiration Rate, Rectal Temperature, Water Intake, Sweating.
- Heat stress **DECREASES:** Rate of Feed Passage, Dry Matter Intake, Blood Flow to Internal Organs, Milk Production, Reproductive Performance.

Recent research on heat stress and reproduction showed that insemination at no to mild heat stress resulted in a Conception Rate (CR) of 38.8% but insemination under heat stress resulted in a CR of 17.6%. THI on day of insemination had greatest effect on non-return rate at 45 days.

Heat stress leads to **acidosis** through:

- Panting and loss of CO^2,
- Decreased rumination,
- Drooling and loss of salivary buffer (bicarbonate),
- Slug feeding (eating) in the cool part of the day leading to a drop in rumen pH.

In one study, summer heat had the largest impact where:

- There was little or no heat abatement,
- Bunk space and cow space were compromised,
- Pen densities were high (overcrowded),
- No segregation of 1st lactation from older cows.

Transition management was less than optimal:

- Improper ration formulation and feed delivery,
- Less than 3 feet bunk space for close-up cows,
- Fresh cows with less than 2.5 feet bunk space,
- Adequate cooling not in place during transition.

These factors all point to the importance of planning ahead and preparing for potential heat stress issues.

Managing heat stress effects on WA dairy cows:

The priority for heat stress management starts with the simple factor of increasing water availability to the more intensive cooling of cows in the facilities.

1. **Water availability** -- Cows need to increase water intake during times of heat stress to dissipate heat through respiration and by sweating. Water consumption will increase by as much as 50%. A 1400 lb cow producing 65 lb of milk at 3% butterfat needs at least 32 gallons of water per day at 80 degrees F. The same cow needs at least 36 gallons of water at 90 degrees F. If water supplies are not adequate or heat stress becomes severe, cows divert water normally used in milk synthesis to the processes of heat dissipation. Water intake will rise by 5-6 gallons on summer days due to temperature effects alone.
   To improve water availability:
   - Put waterers in the shade.
   - Provide access to water right after milking. Cows drink 50-60 percent of their total daily water intake immediately after milking. When grazing, water should be located at the milking parlor exit and in each paddock so that animals are always within 600 feet of clean, fresh water sources.
   - Ensure enough waterer space by:
     a. Having at least 1 station per 20 cows.

b. Having a water supply with 3-5 gal/minute (cows can consume 6 gal/hr).
c. Maintaining 3 inches water depth.
d. Providing 0.65 sq. ft. surface area per cow at single- or double-position waterers.
e. At least one watering space or 2 feet of tank perimeter for every 15-20 cows and two feet of linear trough space per cow in return alleys.

- Keep water tanks clean.
- Monitor water temperature (cows prefer 70-86° F).
- Water trough size and height: In an experiment, cows were given access to two water troughs that differed in height (30cm versus 60cm) and size (126cm × 68cm versus 139cm × 95cm), but were otherwise similar. Cows spent more time drinking, consumed more water and took more sips from the higher and larger of the two troughs.

2. **Provide for maximum shade** in the housing areas and holding pens (Lactating & Dry).
   - Are your shade structures sited North-South?
   - Are your freestall barns sited East-West?
   - Are you providing at least 25 to 50 square feet of shade space per cow?
3. **Reduce walking** distance to the parlor
4. **Reduce time in holding pen**
5. **Improve holding pen and freestall ventilation**
6. **Add holding pen cooling and exit lane cooling**
7. **Cool close-up cows** (3 weeks prior to calving)
8. **Cool fresh cows and early lactation cows**
9. **Cool mid & late lactation cows**
   - Cooling cows might include:
     a. Providing a cooler environment,
     b. Eliminate direct solar radiation,
     c. Decrease cow density,
     d. Cool the air (misting systems),
     e. Create air movement (draw out hot air).
   - Cooling the cow:
     a. Soak the cow with **sprinklers**:
        - 0.33 gallons per cow/cycle.
        - Operate when temperature greater than 70° F.
        - Duration depends on nozzle size (1-2 minuntes).
        - Frequency: at 70-80°F (every 15 min), 81-90°F (every 10 min) greater than 90°F (every 5 min).
        - Mounting height 6-12 inches above headlocks or 5 to 6 feet above floor.
        - Pressure in distribution line 15 to 20 psi.
        - Nozzle spacing every 6 to 8 feet.
        - Maximize number of wet-dry cycles/hour.
     b. Add **cooling fans:**
        - Post spacing 24-30 feet (one 36-inch fan/post):
          - Post spacing less than 20 feet – One 48-inch fan every other post.

    - Place fans over both free stalls and feed line.
  - Mount fans so that air flow is with prevailing winds and close to cow height.
  - Operate when temperature greater than 70°F.
  - Adding fans provides little benefit unless a good soaking system is installed first.

10. **Changes in feeding:** Cow maintenance requirements *increase* with heat stress while dry matter intake goes down. Consider increasing feeding frequency (an extra feeding or two), feeding at a cooler time of day, or even changing the ration. Summer rations will require a buffer and better forage quality.

Preventing heat stress will help maintain higher milk production, better reproduction, improve animal health through reducing chances of acidosis and lameness, and improve animal well-being.

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