



Heat stress can seriously impact the health, comfort, and milk production of cattle. Some cattle breeds, like the Senepol cow and calf shown here, are naturally adapted to tolerate heat. New insights on the genes involved in heat tolerance in Senepol cattle is helping select and breed cattle that will thrive in hot, humid regions. Photo by Robert Godfrey, UVI.

The Impacts of Stress on Animal Welfare & Performance

Environmental and management conditions can stress livestock and impair their health. Poor health can result in poor performance. For example, the U.S. dairy industry loses around \$1 billion each year as a result of heat stress to dairy cows. Adverse weather conditions and temperature extremes can be especially hard on grazing cattle that are often exposed to the elements and confinement feeding operations where close quarters can intensify conditions.

Researchers from land-grant universities across the nation are working with the U.S. Department of Agriculture and international partners to find innovative ways to reduce stress on livestock and maintain high levels of performance.

By providing scientists, educators, veterinarians, producers, and policymakers with the latest research-based information, this project is helping protect livestock health, sustain livestock performance, and ensure a steady supply of high-quality beef and dairy products for consumers.

Factors that Influence Wellbeing

- Studies show that shade reduces the intensity of heat, but does not fully remove the effect of heat, and shade benefits dark cattle more than light cattle.
- Calves born in the summer are at greater risk of bacterial infection, disease, and death, indicating a need for better cooling systems and more hygienic conditions during late pregnancy.
- Rapidly cooling pigs after acute heat stress can worsen intestinal damage and inflammation.
- Weight loss due to heat stress was four times higher among pigs on commercial farms than pigs on breeding farms.
- Researchers identified cattle genes that are responsive to long-term stress, but not acute stress and vice versa. This sheds light on cattle response to different stressors.
- Cattle and pigs genetically selected for enhanced production traits have lower resistance to stress and require better management in order to maintain their wellbeing.

Measuring Animal Stress & Pain

- New measures of animal stress and unease will help guide better therapeutic interventions.
- A new smartphone app identifies heat stress in cattle based on temperature and humidity and recommends ways to relieve the stress. Users can enter an animal's breaths per minute to identify sensitive and insensitive animals in the same herd.

Strategies to Enhance Animal Welfare & Performance

- Sprinklers with lower flow rates use less water and are just as effective at cooling cows as sprinklers with higher flow rates. These “cow showers” reduce the heat load on cattle, especially in extreme heat.
- Conductive cooling, where heat is transferred between a cow's body and cooled bedding, decreases dairy cows' internal body temperatures and breaths per minute, indicating it can alleviate heat stress. Conductive cooling also uses less water and energy compared to water sprinkler or fogging systems.
- Wetting cow udders lowers the body temperature of cows while using less water and producing less wastewater than other cooling systems. This makes it especially useful for arid regions and during droughts.
- Newborn dairy calves are typically housed in individual hutches to prevent the spread of disease. Reflective covers for calf hutches can greatly reduce the inside temperature, improving calf comfort.
- Gravel, sand, or rubber mat bedding can be used without compromising the health of Jersey calves.
- Reducing the temperature of barns by 8° C at night to save on heating costs does not harm nursery pigs.
- Young, lightweight sows often suffer social stress in groups. Sorting sows by age or weight in group housing may reduce this stress.
- Providing more feeder space can improve the feed intake, growth, and wellbeing of slow-growing pigs.
- Adding 0.20% L-glutamine (an amino acid) to piglet diets can improve their health and productivity following weaning and transport.



Feedlot steer in heat stress. Photo by Carl Dahlen, NDSU.



Sprinklers and fans can relieve heat stress. Photo from Schaefer Ventilation.

This Multistate Research Project (*W-2173: Impacts of Stress Factors on Performance, Health, and Well-Being of Farm Animals, 2011-2016*) is supported by the Multistate Research Fund through USDA-NIFA and by grants to project members from the following institutions: Alabama Cooperative Extension, University of Arizona, University of Arkansas, University of California-Davis, Colorado State University, Cornell University, University of Florida, University of Georgia, University of Hawaii, University of Illinois, Kansas State University, University of Minnesota, Mississippi State University, University of Missouri, Montana State University, University of Nebraska, North Dakota State University, University of Rhode Island, Ruakura Research Centre-New Zealand, University of Tennessee, Texas AgriLife Research, University of Queensland-Australia, University of the Virgin Islands, Virginia Polytechnic Institute and State University, University of Wisconsin, and the USDA-ARS.

This project has been renewed through 2021. Learn more: bit.ly/W-2173