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Livestock Industry Facilities and Environment: Heat Stress Indices for Livestock

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Heat Stress Indices for Livestock¹



Heat stress indices (HSI) combine the effects of both temperature and relative humidity, and are classified into alert, danger, and emergency zones. Because different animal species and humans have different sensitivities to temperature and relative humidity, the heat stress charts are thus unique of that particular species. For example, compared to swine, cattle can tolerate much higher temperature at lower relative humidity. This difference arises from the fact that cattle exposed to hot temperature can dissipate their body heat more effectively by sweating, whereas swine or poultry do not have sweat glands. As temperature increases, thereby temperature difference between the environment and the animal narrows, more body heat has to be dissipated via the so-called evaporative heat loss mode. The natural capability of sweating by cattle gives them an edge over swine and poultry to rid of their body heat in the hot and dry conditions. By the same token, increase in relative humidity during hot weather will put cattle under stress much faster than for pigs or chickens. Table 1 lists the recommended management measures for each of the three HSI categories.

Table 1. Recommended Management Actions for Heat Stress

Category	Recommended Management Actions
Alert	Prepared to take necessary cooling measures; increase ventilation rate; turn on cooling fans where applicable; monitor animal behavior for signs of heat stress such as panting or open mouth; make plenty of drinking water available; setup cooling sheds for cattle if possible.
Danger	Apply additional cooling by spraying or misting the animals with water (make sure that there is plenty of air movement during this phase); start evaporative cooling pads and tunnel ventilation where applicable; When possible, move air over the animals at a velocity of 250-300 ft per minute or 2.8-3.4 MPH for swine/cattle and 350 to 400 ft per minute or 4.0-4.5 MPH for poultry. Flush the water lines periodically. Closely monitor the animals.
Emergency	Avoid transporting market weight animals. In addition to measures listed for the Danger category, withdraw feed during the hottest part of the day; reduce light level in light-controlled houses to reduce animal activity and thus heat production.

¹ Written by Hongwei Xin and Jay Harmon, Assistant Professors of Agricultural and Biosystems Engineering, Iowa State University. March 1998.



