Direct evaporative cooling (DEC) systems intermittently apply and evaporate water from the cow's skin, drawing heat directly from her body. Indirect evaporative cooling (IEC) lowers the temperature of air surrounding the cow, increasing her heat transfer rate.

Spray cooling systems are low pressure DEC systems installed in feeding and holding areas that use a five to 15 minute wet-dry cycle. Spray nozzles emit a coarse droplet that penetrates the cow's hair coat soaking her skin for one to three minutes. Fans provide air movement for the remainder of the cycle to speed evaporation and draw heat away from her body. Studies show the respiration rate of a heat stressed cow decreases with the first wet-dry cycle. DEC seems to be the most effective evaporative cooling method for cows in more humid climates. However, it can require a significant water supply and good drainage.

Indirect evaporative cooling (IEC) uses heat in the air to evaporate water, lowering the dry bulb air temperature. The heat transfer rate increases when the difference in temperature between the cow's body and surrounding air is greater. Heat transfer from within the body also improves as cows inhale cooler air.

Fogging and misting are examples of IEC systems that use pressure to force water through nozzles emitting very small droplets. High pressure systems emit finer droplets that have a better chance of evaporating before settling on the cow's hair coat, resting surface and floor. Nozzles for lower pressure systems emit larger droplets, and are typically installed on circulation fans, so air movement can aid in evaporation. Pressurized IEC systems are popular in arid climates where the droplets are more likely to evaporate suspended in the air. These systems are prone to drift in naturally ventilated buildings.

Evaporative pads are another method of IEC. Thick, water-soaked corrugated pads are installed at inlet opening(s) used with tunnel and cross ventilation systems. Outside air drawn through the pad evaporates as much moisture as the air conditions allow, lowering the dry bulb temperature. All air drawn through inlet is cooled and can only pick up as much moisture as the air conditions allow.

Since evaporative cooling systems incorporate adding water to the animal space air, ventilation systems that provide a good air exchange to remove moisture-laden air and circulation fans to enhance evaporation, are essential.

The techniques for combating dairy cow heat stress currently available include shade, an adequate air exchange, good air movement, drinking water and evaporative cooling. Used properly, these tools can help balance the daily heat gain and loss of dairy cows, minimizing heat stress effects, and improving cow health, production and well-being during the summer season. ❐

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Is it weather or is it climate?

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Do you know what the difference between weather and climate is? Both of them rely on observations of temperature, pressure, sunlight, clouds, rain and wind to describe the conditions of the atmosphere near the surface of the earth. The main difference between the two is the time scale over which the conditions are described.

Weather is generally a snapshot of the atmosphere at a single time or over a few days. You can think of it as the atmosphere's day-to-day "mood," with all its short-term variability and excitement. Weather tends to look forward in time to conditions over the next few days, although it can also be used to describe specific events which have happened in the past.

Climate usually refers to conditions spanning months, years, and even centuries. Many people think of climate as "average weather" and it is often described that way, but it is more accurate to think of it as the atmosphere's "personality," an overall state on which the short-term variations of weather or "mood" are superimposed.

Often, because of the use of statistics, climatologists look backward in time to make sense of past conditions, but increasingly they are also now starting to use long-term climate models to predict what the climate might be like in the future. These models are similar to weather forecasting models in their use of physical equations of motion to make the predictions, but different in that the models are designed to get the long-term climate right rather than any individual storm, which is so important for weather forecasting of a hurricane or blizzard.

Computer models allow us to understand how individual contributions from climate factors can affect temperature, rainfall and other atmospheric quantities. These factors include sunlight, cloud cover and ocean circulations, among many others. Some of these vary naturally on a variety of time scales (from seasons to millennia, as the continents change position, for example). Others change due to human contributions to air quality and pollution, changes in land use, and the composition of the atmosphere, including greenhouse gases. These changes happen on a variety of time and spatial scales. Natural and human-induced climate changes often happen at the same time but can have different impacts depending on how fast and how extensively the changes are occurring. ❐