Managing Heat Stress in Horses

Kevin H. Kline, PhD
Professor of Animal Sciences
University of Illinois

As summer approaches, and the weather heats up, so does the competitive season for horse shows, racing and other equine events. This is the time of the year that severe heat-related stress occurs in equine athletes. Symptoms such as reduced skin elasticity and capillary refill time, anhidrosis (failure of the sweat glands), colic due to decreased water content of digesta, and hyperthermia may all be due to heat-induced disruption of the horse's normal water and electrolyte balance. Many horse owners don't realize that only about 25% of the energy used in the performance horse's working muscles is converted to actual muscle movement. The remaining 75% loss of efficiency is represented by waste heat that becomes very difficult for the horse to dissipate in hot and humid weather.

Unfortunately, the problems described above are often partly brought on by poor management due to some common misconceptions among horse owners and trainers. Several of the following misguided ideas have been found in equine publications of years past:

1. "Never let a hot horse drink more than one or two swallows of water at a time".

2. "Never give ice-cold water to a hot horse – either inside or out".

3. "Never let a hot horse cool out without a blanket or sheet".

4. "Never let a hot horse cool out in a drafty area".

Each of the above disproven practices severely restricts the overheated horse's ability to dissipate heat the way nature intended. The immediate need for performance horses to rid themselves of highly detrimental waste heat is accomplished through four main routes. These include evaporation, convection, conduction, and radiation.

By far, the most important mechanism for heat dissipation in horses is evaporation. Conversion of the water in sweat (or other sources of water placed on the horse's hot skin) into gas consumes heat and cools the horse's skin. During and after exercise, the horse's skin is laden with dilated capillaries carrying overheated blood from the body core. The blood in these capillaries is cooled to help maintain a reasonable body temperature that will allow the horse's nervous and muscular systems to function normally. Even a normally hydrated horse with no inhibition of evaporative cooling that is exercising in a hot and

humid environment may achieve a rectal temperature in excess of 104 degrees Fahrenheit. Disallowing the adequate water consumption that can be used for sweating, or blocking the evaporation of water from the skin using a blanket, are very bad ideas during hot and humid conditions. These practices can result in a horse's body temperature spiking into a dangerous range of up to 107 or 108 degrees Fahrenheit (heat stroke). Although allowing a hot horse to consume unrestricted amounts of water may lead to problems such as colic due to hyperdistension of the stomach, it should be realized that a typical horse's stomach can hold between 2 and 4 gallons of fluid without being distended. So, even though a horse's stomach is small compared to other animals of its size, one or two sips of water at a time is overly restrictive when the hot horse is rapidly losing water trying to keep itself cool.

Statement #2 above has been the source of some controversy over the years because of the belief among certain horse trainers that ice cold water placed on a hot horse's body will "shock" the horse's thermoregulatory system into shutting down blood flow to the skin. This belief has been found to be wrong. Extensive research conducted during 1995 at the University of Illinois and University of Guelph and at the 1996 Olympic Summer Games in Atlanta proved conclusively that horses working under hot and humid conditions were better able to maintain core body temperature within an acceptable range or even reduce it during rest periods after intense phases when ice water baths were used. Liberal application of icy cold water to overheated horses helps to dissipate heat not only by providing more water to evaporate from the skin, but also by direct conduction of the horse's body heat into the water which runs off the horse, carrying away excess heat in the process. According to University of Illinois researcher Dr. Jonathan Foreman, "In our treadmill simulations of C Halt (a rest period during a phase of the equestrian competitions at the Olympic games), cold water baths were used with significant decreases in core temperatures and heart rates. No adverse clinical effects were apparent during the remainder of Phase C trotting or after exercise. Horses actually trotted more freely after bathing stops."

Standardbred trainers are probably the worst at helping their horses to thermoregulate between multiple heats on hot and humid days. The Standardbred training traditions of blanketing, limiting water intake and refusing to apply cold water to horses may severely limit the horse's ability to return its body temperature to near normal before the second heat is contested.

Another practice that makes little sense physiologically is preventing access to moving air during hot and humid conditions. During the 1996 Atlanta Olympic Games, 85 misting fans were placed at shaded recovery areas throughout various phases of the equestrian courses to allow these elite athletes to stabilize and lower their body temperatures. Regular dry fans work to both increase evaporation, and also dissipate heat by the cooling process known as convection. Misting fans take advantage of the additional cooling property of blowing water onto the horse that is in the process of changing from liquid to gas.

The shaded areas guard against additional heat load through solar radiation. Although radiation of heat from the horse's body into the atmosphere is a potential mode of heat dissipation, it most often works in the opposite direction during sunny days, with horses (especially dark ones) gaining radiant heat from the environment.

In the battle against heat stress in performance horses, trainers should take advantage of all available modes of heat dissipation during hot and humid conditions. Making certain that horses are adequately hydrated before exercising in hot and humid conditions and providing as much water as possible between bouts of exercise is an important strategy for maintaining the critical sweating mechanism. Realistically, only a portion of the fluid losses incurred during long term exercise in hot and humid conditions can be replaced immediately. However, providing plenty of electrolyte-rich, high quality hay and fortified grain along with free-choice trace mineralized salt and water in the days after intense exercise should fully replace both the fluid and electrolyte losses. Additionally, taking advantage of conductive heat loss through cold water baths, convective heat loss through fans and natural air movements and avoiding radiant heat gain through the use of shade are effective methods to minimize the chances of excessive heat stress in performance horses during hot and humid conditions.