

INTRODUCTION

Summer is the primary season for many equine competitions, and intense exercise coupled with a high ambient temperature can quickly put horses in the danger zone for heat-related illness. In this guide, we will discuss heat-related illness, physiological mechanisms of heat loss, and techniques for relieving heat stress in equines.

OVERVIEW OF HYPERTHERMIA

Before going into greater detail, it is necessary to define some basic terms related to thermoregulation—or the regulation of body temperature. The normal rectal temperature of the horse ranges from 99 to 100.5°F. The horse's natural thermoregulatory mechanisms are capable of maintaining this normal body temperature except when overwhelmed by severe circumstances, such as disease or intense exercise in hot climates (Figure 1).

Hyperthermia (heatstroke) occurs when the core body temperature starts to rise because these regulatory systems can no longer effectively cool the horse. Heatstroke is a serious condition that can be fatal if not dealt with quickly. The most common clinical signs include an elevated respiratory rate of 40 to 50 breaths per minute (normal at rest is 8 to 16) that does not slow when at rest, a heart rate of 80 or more beats per minute (normal at rest is 36 to 44) that does not slow down after a few minutes of rest, a rectal temperature of over 103°F, lethargy, and/or profuse sweating or an absence of sweating altogether. Some horses may suffer from a condition called anhidrosis, a disorder where the



Photo courtesy of Amy Smith Muise.

Figure 1. Hot climates such as the desert Southwest can pose a greater risk for heat stress.

horse does not sweat normally. These horses are especially prone to hyperthermia if not managed appropriately. The specific cause of anhidrosis is unknown; however, it is thought that there is a physiological defect at the level of the sweat gland that inhibits sweating. Your veterinarian can perform diagnostic tests that can confirm this condition if you suspect that your horse might be afflicted.

Hyperthermia most often occurs as a result of inadequate physical conditioning (poor fitness), extreme hot and humid conditions, a weakened thermoregulatory system, or a combination of the three. The heat index (HI), which is the temperature (in °F) plus humidity (%), gives a means of assessing the danger that extreme environmental conditions pose to horses performing intense exercise in such an environment. If the HI is less than

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130 (e.g., 90°F and 20% relative humidity), then the horse's built-in cooling mechanisms are usually capable of dissipating the excess body heat generated during exercise. However, when the HI is greater than 150 (e.g., 100°F and 60% or higher relative humidity), the horse will probably need assistance in order to prevent heatstroke. Owners should proceed cautiously when, or seek alternatives to, exercising horses in situations where the HI is greater than 170 or the relative humidity is above 75% since these conditions severely diminish the effectiveness of the horse's thermoregulatory systems.

MECHANISMS OF HEAT REGULATION OR HEAT LOSS

In order to maintain a normal body temperature, the horse must dissipate heat that is produced as a result of normal body processes (e.g., digestion and muscular exercise). There are four main mechanisms that allow for this: evaporation, conduction, convection, and radiation. Evaporation (sweating) is the most important cooling mechanism for the horse because it removes heat as water (sweat) changes from a liquid to a gas (water vapor). Conduction occurs when heat is transferred from a hotter object to a cooler object by direct contact, such as using an ice pack on a sprain. Convection is heat exchange that occurs when an air current moves over the skin to pick up heat and/or moisture from the skin and carry it away. Radiation occurs when infrared rays carry heat from a hotter object to a cooler object. The heat that we feel from the sun is an example of radiation. We will describe the practical significance of these mechanisms later in this guide when we discuss means of relieving heat stress.

HOW TO PREPARE YOUR HORSE FOR A HEAT STRESS ENVIRONMENT

Prevention is the best medicine also goes for heat stress in horses. If at all possible, avoid strenuous exercise of horses when the heat index is near the danger zone. This may require adjusting your training/exercise schedule to do intense work early in the morning or late at night when ambient temperatures are lower.

If a horse must be worked in a high heat index situation, take extra precautions to prepare the horse for the challenge. First, make sure that the horse is

physically fit and accustomed to the exercise program. Also, make sure that the horse does not suffer from anhidrosis before putting it in a potentially dangerous situation. Second, take frequent breaks that allow the horse to return to a resting heart and respiratory rate. Third, make sure that the horse has adequate access to clean, fresh water and salt through its normal diet in order to prevent dehydration during intense exercise. If you expect that your horse will be worked enough to sweat profusely and “lather up,” you may wish to provide an equine electrolyte supplement according to the manufacturer's directions. If electrolytes are added to the water, make sure that the horse also has access to plain water with no electrolytes. Be sure to accustom the horse to the electrolyte solution before relying on it in a heat stress situation. Accustom your horse to the active cooling methods described later (such as a cold water bath with a sponge and garden hose) so that it is not frightened by the procedure. Finally, make sure that you are able to consistently monitor your horse's vital signs (rectal temperature, heart rate, respiratory rate, and hydration status) so you can determine if they are entering a “danger zone” for heat stress.

MEANS OF RELIEVING HEAT STRESS

During intense exercise in a high heat index, the horse's rectal temperature may exceed 103°F. Therefore, it is crucial to monitor your horse's vital signs. If the horse recovers normally after exercise, then the heart and respiratory rates should be near normal after 30 minutes of rest following exercise. While rectal temperature may actually rise in the first 5 to 10 minutes after exercise as the horse dissipates the heat generated during exercise, the horse's rectal temperature should begin to decline within the 30 minutes of rest following exercise. If the temperature doesn't decline or if the rectal temperature is over 105°F, this is a cause for concern and the following methods should be used and you should seek veterinary guidance if available.

The primary goal is to lower the horse's body temperature as rapidly as possible, and this is best done by employing “active cooling” methods that make the most efficient use of the heat loss mechanisms described previously. Once the horse's rectal temperature has dropped below 101°F, active cooling can be reduced and the horse can be walked leisurely until all vital signs are normal.

Cool water bathing. The primary purpose of cool water bathing is to maximize conductive heat loss. The most efficient method is a cool water bath with a garden hose (Figure 2) or a sponge and bucket. The goal is to cool the blood in the major vessels along the neck, on the belly, and inside the legs. The cool water will take up body heat as it is warmed, so the water will need to be scraped off with a sweat scraper in order to remove the heat. This situation might require a team of three people, one to hold the horse, one to hose or sponge water onto the horse, and one to scrape the warmed water off of the horse. If water is not limited, it can be applied to the horse's entire body, taking care not to get it in the horse's nostrils or ears. If water is scarce, then towels wetted with a 50/50 mixture of water and rubbing alcohol might be helpful. Be sure to remove the towels, wring out the warmed water, and rewet them frequently to continue the cooling process.

Increasing air flow. You can increase air flow over the skin by standing the horse in front of a fan or in a natural breeze if available. Convection pulls heat and moisture away from the skin, allowing it to cool.

Shading. Keeping the horse out of the sun can minimize heat gain from the sun's radiation and help maximize the heat loss gained by convection and conduction.

Drinking cool water. Giving your horse cool drinking water can help with conductive heat loss while restoring the body fluids lost in sweat. Sweating results in a significant loss of body fluid, so it is important to monitor the horse and ensure that normal body fluid levels are maintained. Horses with mild dehydration (a loss of less than 4% body fluid) typically show no visual signs. Horses that are moderately dehydrated (4 to 9% loss) will show decreased skin elasticity (skin pinch test), poor capillary refill time of the gums, reduced saliva production, sunken eye sockets, muscle weakness, and fatigue. To perform the skin pinch test, take a fold of the horse's skin on the side of the neck between your thumb and index finger and gently pull it away from the horse's neck to create a "tent." Then count the number of seconds that it takes for the "tent" to return to normal. In a properly hydrated horse, the "tent" should immediately go back into place. The more



Photo courtesy of Amy Smith Muise.

Figure 2. Using a water hose to give a horse a cool water bath.

dehydrated the horse becomes, the longer it takes for the skin "tent" to return to normal.

We have all heard "you can lead a horse to water, but you can't make him drink." This is all too true, but research has shown that providing horses with a normal saline solution (0.9% saline or 2 tablespoons of normal table salt per gallon of water) to drink may encourage them to drink more and further aid in replenishing their body fluids. However, this is definitely a case where "more is not better"; be sure to provide the proper amount of salt in the saline solution, and also provide a bucket of plain water without any salt. Another study compared voluntary water intake of exercised horses that were offered water at three different temperatures (50°F, 68°F, and 86°F). Results showed that the greatest intake of water occurred when the temperature was 68°F. Offering a cool normal saline solution (68°F) can help restore body fluids while also cooling the horse via conduction (cool water inside hot horse). While it is not a good idea to allow a hot horse to consume an unlimited amount of water (as this may lead to colic), it is important to note that an 1,100-pound horse that has a 5% loss in body fluid would require approximately 5 gallons of water to restore this loss. So, it is advisable to allow the horse to voluntarily drink 2 to 3 gallons of water at a time separated by 10- to 15-minute intervals until the horse is no longer thirsty.

CONCLUSION

The key steps in helping horses handle heat and humidity are to

1. determine the potential for heat stress using the heat index criteria,
2. make efforts to minimize strenuous work in high heat index conditions,
3. be able to recognize the signs of hyperthermia in horses,
4. understand how the horse's body cools itself, and
5. be able to employ active cooling methods in a critical heat stress situation.

Knowledge of these guidelines and methods will help you look out for the well-being of your horse during the hot, humid days of summer.

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