Heat stress: a life threatening situation

by Rochelle Jensen

Heat stress is the result of increasing heat storage in the horse’s body due to insufficient dissipation. In the horse, sweating is the most important means of thermoregulation and accounts for two thirds of heat dissipation. Sweat glands provide the water that through evaporation cools the skin. Body heat is also lost when the blood is shunted towards the skin through the processes of convection and thermal radiation. A small amount of heat is also lost via the respiratory tract. As the core temperature increases, the horse’s respiratory rate will increase. The horse may develop rapid shallow respiration, which looks like panting, or the horse may develop a slow, deep respiration with marked breathing effort. Environmental factors

Environmental factors, such as temperature and humidity, have profound effects on ability of sweat to evaporate. When the moisture content in the air is high, as happens in hot humid climates, evaporation slows. Hot sweat remains on the skin and acts as insulation, preventing the heat from dissipating. The body’s response is to produce even more sweat, and the horse becomes dehydrated, develops electrolyte imbalances and still fails to cool its core body temperature.

Signs of heat stress

Signs of heat stress are associated with the deleterious effects of hyperthermia, dehydration and electrolyte imbalances.

Horses with early heat stress may exhibit signs as subtle as a loss of enthusiasm for their work. Horses with more severe signs of heat stress are fatigued, have rapid shallow respiration, elevated heart rate, i.e. above 60-80 beats per minute at rest, and a rectal temperature above 41°C. They may develop irrational behaviour, such as licking, and will appear agitated. Horses with worsening heat stress may stagger and seize. Even if they recover from the initial episode, signs of muscle damage or organ dysfunction can occur up to three days later.

Early detection

Monitoring of rectal temperature, pulse rate and respiration rate will aid in the early detection of heat stress.

- Heart rate should drop to 44-52 beats per minute within 15 minutes of exercise.

Dissipating heat

Heat stress is the result of increasing heat storage in the horse’s body due to insufficient dissipation. Normal respiration for an adult horse is 8-12 breaths per minute (normal foals are between 20 and 40 breaths per minute); however, horses that are heat stressed can have respiratory rates of 120-140 breaths per minute. Respiration rate can be determined by watching the horse’s chest move in and out (inhalation and exhalation is counted as one breath) or, if the horse is breathing heavily enough, the nostril flare can be counted. Remember that respiration rate is also affected by excitement, respiratory disease or changes in the acid-base (pH) balance, which could be caused by diet and/or disease.

Dehydration

Because the horse’s primary mode of heat loss is to produce large amounts of sweat, they are highly susceptible to dehydration.

In a normal horse, the oral mucous membranes should be moist and when the skin is pinched on the side of the neck the skin should immediately return to its normal position. When fluid is lost from underlying tissues, the skin becomes less elastic. When a horse reaches 2-3% dehydration, the mucous membranes become dry and the skin tent (pinch test) becomes delayed. By 5% dehydration the eyes become sunken and the skin tent can be delayed for greater than 2-3 seconds. It is important to note that horses must be 2-3% dehydrated before these physical factors indicate dehydration, and that they are not sensitive for determining mild (less than 2%) degrees of dehydration.

Heart rate elevates as the heart attempts to pump more blood to the skin surface for cooling, but during episodes of heat stress there is less fluid in the circulation to do so and capillary refill time will be delayed.

To assess the capillary refill time, press your finger into the gum above the incisors. The blood should immediately rush back and the normal gum colour returns.

The normal rectal temperature for an adult horse is 37.5°C to 38.6°C. Healthy foals less than one month of age can have a rectal temperature as high as 38.8°C. To take a horse’s rectal temperature, approach from the side. Raise or move the horse’s tail and insert the thermometer into the anus. Lift the thermometer to the side so that you are measuring the temperature of the rectal wall and not the temperature of faeces sitting in the rectum.

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Environmental factors, such as temperature and humidity, have profound effects on ability of sweat to evaporate and reduce body heat.

When the moisture content in the air is high, as happens in hot humid climates, evaporation slows. Hot sweat remains on the skin and acts as insulation, preventing the heat from dissipating. The body’s response is to produce even more sweat and the horse becomes dehydrated, develops electrolyte imbalances and still fails to cool its core body temperature.
Monitoring of rectal temperature, pulse rate and respiration will aid in the early detection of heat stress. After releasing a pinch of skin it should immediately return to its normal position - any delay is a sign of dehydration.

Contributors to heat stress

Hot weather is not the only factor which contributes to heat stress. A horse that is exercised at a level higher than that of its conditioning or fitness level, is also at risk of developing heat stress. Horses with longer hair coats, heavily pregnant mares, obese horses or those who are heavily muscled (Warmbloods, Quarter Horses) are at increased risk of heat stress.

Horses should undertake a training program that is suitable to their level of exercise or competition. When there is a requirement for horses to perform in hot or humid conditions, the horse should be acclimatised gradually. Most horses require a minimum of three weeks to allow for acclimatisation, and this is an important consideration to take into account when there is an unseasonal heat wave and when traveling from cooler to hotter climates.

Diagnosis of heat stress is usually based on clinical signs and a history of exercise during hot or humid weather. Horses showing signs of heat stress require immediate attention.

Cooling

Cold water should be applied to the head, neck and body and immediately removed with a sweat-scraper to enhance conductive heat loss. Maximum cooling can be achieved by applying cool water over the major superficial veins such as the jugular (the vein that runs along the jugular groove in the neck), cephalic (inside the front leg) and femoral (inside the hindleg).

When the horse is able, he or she should be moved to a cool, shaded area.

Cold water should be applied to the head, neck and body and immediately removed with a sweat-scraper to enhance conductive heat loss. Without scraping, the layer of water will act as an insulator and prevent heat from escaping. Ideally, two people can work on the horse, one hosing and the other scraping.

Horses suffering from heat stress can be offered water. An average 450kg horse can safely drink up to 10 litres immediately after exercise.

Anhidrosis

Horses most at risk of heat stress are those who suffer from anhidrosis. Anhidrosis (from the Greek meaning “without sweating”) is a condition primarily of horses in which the horse fails to sweat effectively in response to heat or exercise. It occurs almost exclusively in horses living in hot or humid climates, and the incidence is increased when horses are bred in temperate climates and transported to the tropics.

The condition also known as ‘Pulic’ or ‘Dry Coat’ manifests as an inability to produce sweat, consequently the horse will pant with marked nasal flaring when hot and their core temperature will increase.

Despite an increasing body temperature, the horse will not sweat adequately, producing only small patches beneath the mane, between the legs and under a halter.

The thermoregulatory system of a horse is capable of maintaining core body temperature within a specified range in the face of extreme heat loads during exercise or during hot, humid weather.

The prognosis following an episode of heat stress is variable depending on severity. An understanding of the process that leads to heat stress and recognising the early signs are essential to ensure the welfare and continued performance of your horse.

Rochelle Jensen, BVSc, graduated from James Cook University in 2012 with a degree in veterinary science and was awarded the AVA citizenship award. She spent five years working in the equine industry before starting veterinary science, gaining experience in racing stables and working as a riding instructor. She undertook internships at equine referral centers and specialised reproduction facilities around Australia. Her special interests include reproduction, neonatology and imaging.