

offer cool water. Discontinue all oral fluids if abdominal discomfort or gastric reflux develops.

- Flunixin meglumine, 1 mg/kg IV initially and then 0.3 mg/kg q8h; this treatment may not be effective if the hyperthermia is not mediated by the hypothalamus.
- Hyperimmune plasma with antibodies against endotoxin: administer 2 L. **Note:** Exhausted athletes are at increased risk of endotoxemia.
- Administer antioxidants: vitamin E, 7000 U PO per adult.

WHAT NOT TO DO

Exhausted Horse

- *Do not* use phenothiazine tranquilizers. These patients are at high risk of cardiovascular collapse and death.
- *Do not* administer nonsteroidal anti-inflammatory drugs without appropriate fluid replacement.

Prognosis

Prognosis is generally good if appropriate therapy is instituted early. However, multisystemic complications develop in some patients 2 to 4 days after an exhaustion episode. These manifestations include the following:

- Myopathy
- Rapidly progressive laminitis
- Renal dysfunction
- Gastrointestinal ulceration
- Elevation in values of liver-derived enzymes and bilirubin
- Impaction colic

Hypothermia and Frostbite

- Common in cold climates, donkeys, and under certain clinical situations (i.e., postanesthesia, *septic and hypotensive foals*, hemorrhagic/traumatic shock, or debilitated and aged horses).
- Rare among adult horses but can occur in debilitated patients and is common in donkeys and weak foals exposed to extreme cold.

Diagnosis

- Mild hypothermia occurs between 93° and 97° F; body temperatures below 93° F indicate severe hypothermia.
- With severe hypothermia, shivering response may be lost and peripheral vasodilation may even occur, both of which may worsen the hypothermia. A cascade of systemic acidosis and coagulopathy may occur with severe hypothermia.
- Cold extremities with color change are present: white to deep purple skin may be warm and red if recirculation has started.
- Mild hypothermia may cause an increase in heart rate, whereas severe hypothermia may cause a bradycardia and diminished respiratory rate and effort. With severe hypothermia, depression is expected.

WHAT TO DO

Hypothermia

- Initiate *core rewarming* to provide heat centrally; for extreme hypothermia, surface rewarming without core rewarming may in some cases cause a lowering of the core temperature.
- **Practice Tip:** *The speed of rewarming depends on the clinical condition of the patient, the primary illness, and specific laboratory findings. Trauma patients with bleeding are generally rewarmed rapidly. Septic patients or those with evidence of early organ failure, including the brain, are generally managed by warming more slowly because the hypothermia may have some benefit in organ preservation.*
- Use warm fluid therapy:
 - Warm crystalloids and colloids, especially plasma, provide antithrombin III and other anticoagulants. In addition to their rewarming effect, intravenously administered fluids may be needed to treat hypovolemia.
 - Initiate gastric or rectal administration of a warm, balanced isotonic electrolyte solution.
 - Administer thyroxine 0.1 mg/kg PO q24h to hypothermic donkeys and weak foals with clinical or laboratory evidence of hypothyroidism.
 - Rewarm extremities (surface rewarming). **Practice Tip:** *With peripheral rewarming alone, hypovolemic shock may occur as the result of peripheral vasodilation.*
 - Move affected individual to a heated area or at least out of the wind, and apply blankets to prevent convection (atmosphere) or conduction (ground) loss of heat while trying to institute a heating process that may include the following:
 - Circulating warm water heating pads or warm water bottles (100° F) and heating pads or heat lamps may be used, being careful *not* to burn the skin. Be careful with hair dryers!!
 - Forced-air warming blankets such as the Bair Hugger³ can be set at different temperatures and are effective at warming hypothermic foals.
- Restore dermal microcirculation:
 - Antiprostaglandins: flunixin meglumine dose recommended IV
 - Pentoxifylline, 10 mg/kg PO q12h
 - Vasodilator: Use acepromazine, but only if hydration and pulse pressure are normal!
 - Platelet aggregation inhibitor: aspirin or clopidogrel⁴
 - Low-molecular-weight heparin, 50 to 80 U/kg subcutaneously (SQ) q24h
- Provide local treatment to frostbite areas:
 - Apply topical aloe vera gel three or four times per day.
 - Nitroglycerin ointment (2%) can be applied to small areas that are most severely affected, although absorption through the skin in the horse is not proven.
 - **Note:** Wear gloves when handling nitroglycerin ointment.
- Administer antimicrobial agents if necrosis is expected or to help protect against sepsis associated with hypothermia-induced immunosuppression.
- Provide analgesics.
- Administer broad-spectrum antibiotics to severely hypothermic foals because of the increased risk of bacterial translocation.

³Augustine Medical, Eden Prairie, Minnesota.

⁴Plavix (Bristol-Myers Squibb).

▶ WHAT NOT TO DO

Hypothermia

- *Do not* attempt to rewarm septic, hypovolemic, and/or organ failure (including brain dysfunction) patients too fast or to above 101°F! The warming system(s) (see Neonatology, Chapter 31, p. 530) should not be higher than 105°F, and the rewarming process should be over 30 minutes. *Do not* place foals in a hot water bath tub.
- *Do not* burn patient with heat lamps or hair dryers; they may not have normal sensation and may not react to the high temperatures.
- Avoid rubbing, which damages frozen cells.
- *Do not* feed milk to a severely hypothermic foal.
- *Do not* allow horses and foals to become progressively hypothermic while recovering from general anesthesia.
- With severe hypothermia accompanied by hypotension, *do not* warm the skin and distal extremities without providing intravenous fluids (preferably of body temperature).

Prognosis

- Influencing factors are the following:
 - Duration of exposure
 - Temperature
 - Wind chill
 - Moisture on skin

- Circulatory status of patient
- Effectiveness of treatment
- Some patients slough skin or hooves in the affected limbs, whereas others have no additional signs once the limb is rewarmed.
- Edema and failure to rewarm usually are poor prognostic indicators for the limb.
- **Practice Tip:** *In cases of septicemia, especially in foals, a similar syndrome is caused by arterial thrombosis in one or more distal extremities. There may be no association with cold weather! If the thrombosis is known to be acute (hours), tissue plasminogen activator (tPA)⁵ (2 to 5 mg) can be administered into the arterial thrombus or just proximal to the thrombus. It is unlikely to be effective, and the prognosis is grave.*
- Some foals may have seizures following the rewarming, requiring treatment to control seizures and the presumed cerebral injury (see Chapter 22, p. 372, and Chapter 31, p. 538).

References

References can be found on the companion website at www.equine-emergencies.com.

⁵Activase.