

# Heat Prostration

Rhea V. Morgan, DVM, DACVIM (Small Animal), DACVO

## BASIC INFORMATION

### Description

Heat prostration (heat stroke) can occur when body temperatures rise to 104-106° F (greater than 40° C). Heat stroke usually involves exposure to high environmental temperatures and can be precipitated by various medical conditions. Exertional heat stroke occurs when internal heat generated by strenuous exercise is not adequately dissipated and body temperature rises to dangerous levels. Exertional heat stroke occurs most often in racing and sporting dogs.

### Causes

Causes generally fall into two categories: those that decrease the ability to dissipate heat and those that increase heat production. External factors that decrease heat dissipation include confinement in a poorly ventilated space, sudden exposure to high environmental temperatures, increased humidity, and limited access to water. Internal factors include obesity, heart and brain diseases, upper airway diseases, and thick hair coats or jackets.

External factors that increase generation of heat include certain medications and the ingestion of macadamia nuts or hops. Internal factors include prolonged muscle spasms or seizures, certain hormonal problems, exercise, and fever.

### Clinical Signs

Signs vary depending on the degree and duration of temperature elevation. Panting and elevated temperatures (hyperthermia) are the most common signs. The animal may be dull, weak and wobbly, collapsed, convulsing, or in a coma. Respiratory and heart rates are usually high, and breathing may be very noisy. Gums of the mouth may be bright red or blue (cyanotic). Pulses may be weak. Vomiting and diarrhea may occur.

Bleeding tendencies may be noted, with small hemorrhages in the gums or skin and blood in the feces, urine, or vomitus. Exertional heat stroke may turn the urine a dark brown. Other signs may be present, depending on underlying diseases or contributing factors. Delayed signs may develop 3-5 days after apparent recovery, such as decreased urine production (kidney failure), jaundice (liver failure), infection (sepsis), severe respiratory distress, widespread bleeding, or sudden death from heart arrhythmias.

### Diagnostic Tests

Diagnosis is based on finding an extremely high body temperature, a history of exposure to heat, and compatible clinical signs. Laboratory tests and chest x-rays are often recommended to assess the effect of the hyperthermia on various body organs and to search for contributing causes. Common laboratory changes caused by

hyperthermia include dehydration, prolonged blood clotting, abnormal kidney and liver tests, low blood sugar, and electrolyte abnormalities.

## TREATMENT AND FOLLOW-UP

### Treatment Options

Heat prostration is an emergency! The goals of therapy are to lower body temperature, treat shock (if present) and other organ damage, and correct precipitating or contributing factors. As soon as you realize your pet has heat prostration, remove it from the source of heat and wet it with cool tap water. Wrap the animal in a cool, wet towel and transport it to the veterinary hospital immediately.

Cooling methods that may be used at the hospital include submersing the animal in a lukewarm water bath; applying alcohol to the footpads or ice to the groin; and placing the animal in front of fans. Cooling methods should not be extreme, because the body temperature could fall too low (hypothermia).

Treatment for shock may involve insertion of a breathing tube, oxygen therapy, and administration of intravenous (IV) fluids, supplemental electrolytes, and glucose (sugar). IV medications may be given to control muscle spasms and seizures, arrhythmias, and brain edema. If the animal is not breathing on its own, it may be attached to a mechanical ventilator, if one is available. If blood clotting tests are abnormal, plasma may be transfused.

Aggressive therapy is continued until the body temperature begins to decrease and the animal becomes stable. Treatment is then modified to address damage to various organs and any contributing factors or diseases.

### Follow-up Care

Most animals with heat prostration require intensive monitoring throughout the initial therapy and for a few days after the emergency has resolved. During therapy, blood pressure, pulse quality, gum color, heart rate and rhythm, breathing rate, blood oxygen levels (pulse oximetry), body temperature, and urine output are commonly monitored. In the hours and days after the crisis, laboratory tests and chest x-rays may be performed to detect problems that may arise in other organs from the effects of hyperthermia.

### Prognosis

Prognosis depends on the severity and duration of hyperthermia and the presence of secondary organ failure. Survival is poor for comatose animals and for those with kidney or liver failure or unresponsive bleeding. Animals that survive heat stroke are prone to a recurrence if exposed to a similar situation in the future, so preventive measures are important.