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## HEATSTROKE

**What is it?** Heatstroke is an elevation in body temperature causing injury to the body. The elevation in body temperature is not caused by infections or inflammation – that is to say heatstroke is not the same as a fever, even though both result in elevated body temperatures. Heatstroke can be caused by exposure to high air temperatures, especially during exercise, exposure to high temperatures in a closed environment (such as a car), inability to remove heat from the body (brachycephalic dogs or dogs with laryngeal paralysis), or a combination of all of the above.

**Who gets heat stroke? Which species are affected?** Both dogs and cats can get heatstroke. Large breed dogs (i.e. German shepherds, Labrador retrievers), working dogs, obese dogs and cats, and brachycephalic animals (those with pushed in faces) such as the Pug dog or Persian cat are all at increased risk. Also animals that have an underlying respiratory tract abnormality such as laryngeal paralysis, laryngeal masses, or collapsing trachea are at higher risk of heat stroke.

**What are the clinical signs?** Symptoms of heat stroke include muscle spasms, fatigue, weakness, muscle tremors, vomiting, diarrhea (which can be bloody), altered mentation, seizures, or coma. Most dogs and cats with a heat related illness will present to a veterinarian when warm, humid weather begins and before the animal has had a chance to acclimate to the changes in temperature. In Wisconsin, this usually occurs, but is not limited to, the first few weeks of truly warm, humid, summer weather.

**How is it diagnosed?** A complete physical exam will be done on the patient. Full vital signs including temperature, pulse rate, respiratory rate will be obtained. Body temperature alone does not tell the whole story of heatstroke. The doctor will carefully listen to the patient's heart and lungs for disruptions in normal heart rhythm and abnormal breath sounds. An electrocardiogram may be run on the patient to further evaluate the heart, and blood pressure may be monitored to watch perfusion of blood to the tissues. A neurological examination of the patient will occur to check pupil size and responsiveness, presence of tremors, head bobbing, and ability to balance, stand, walk or other neurological abnormalities. Laboratory analysis of the patient's blood and urine will be recommended to look at kidney function, blood clotting ability, electrolyte levels including sodium, potassium, and glucose, complete blood count, and blood chemistry levels. Radiographs may be recommended to look for secondary complication in the lungs.

**How is it treated?** Treatment begins with cooling the patient. At home, it is best to do the following: remove from the heat if at all possible, offer water to drink if the pet is conscious, wet fur with tap water or water from a hose – pay special attention to the abdomen, insides of legs and paws – wet these areas liberally. Do NOT immerse in ice water. Cooling too quickly and cooling too much can actually worsen the problems related to heatstroke. In fact, if you are able to measure rectal temperatures, it is recommended that you stop cooling when the animal's temperature reaches 103.5 degrees F.

In the hospital setting, several cooling methods may be used alone or in conjunction and are dependant on the patient and its medical condition upon arrival at a veterinarian. These include, but are not limited to, cool water baths, room temperature intravenous (IV) fluids, removing some or all of the hair coat, cool water enemas, or cool water gastric lavage (pumping cool water in and out of the stomach). Animals must be cooled slowly and monitored closely as hypothermia (low body temperature) can easily occur if

the patient is cooled too fast. Patients in any level of heat illness may present in shock, and it will be treated with fluids and oxygen as needed. Electrolyte levels will be corrected. Central nervous system abnormalities will be addressed and medicated as needed. Kidney function will be monitored with blood analysis and urine production and supported or corrected as needed with fluids. Blood clotting levels will be addressed, and transfusions of blood products will occur as needed. Gastric protectants will be used to protect the GI tract from further damage, and broad-spectrum antibiotics will be used as needed to protect the patient from infection secondary to the breakdown of the lining of the GI tract from shock and high body temperatures. If aspiration pneumonia has occurred from the patient vomiting and then inhaling small amounts of vomitus, it will be addressed as the patient stabilizes.

**What is the aftercare/homecare?** The amount and depth of homecare is dependent upon how stable the patient is when they present to the veterinarian. Even a very stable patient upon presentation may go home on gastric protectants and broad-spectrum antibiotics. Administer all medication as directed by the prescribing veterinarian. Patients that have developed poor kidney function as a result of heatstroke, may need to be supported at home with fluids administered by the owner under the skin. Blood clotting levels may need to be rechecked several days after going home to ensure they are stable. If the patient developed aspiration pneumonia from vomiting, antibiotics, nebulization (breathing in moist air), and coupage (gently breaking up the mucus in the lungs) may need to be provided by the owner at home.

**What is the prognosis?** Prognosis is dependent on how stable the patient is when it presents to their veterinarian or the nearest emergency clinic. When heat related illness is recognized quickly by the owner and treated immediately by a veterinarian, patients have a good prognosis. If kidney function is decreased, blood glucose is low, liver levels are high, albumin levels are low, or the heart is having abnormal rhythms upon admission to the hospital prognosis is much more guarded. If neurological abnormalities such as seizure, non-responsiveness, or coma are present when the patient admits to the hospital, prognosis can be poor especially if these symptoms worsen with treatment.

**Can it be prevented?** Yes, heat related illness is completely preventable. Keep cats indoors in a cool or air-conditioned environment. This step is especially important if you have a Persian or similar flat faced breed as they can overheat rapidly with their shortened airway. Walk dogs early in the morning before it gets warm or in the evening after the sun sets and the air temperature is cooling down. Go for two short walks (one in the morning and one at night) if you have a dog that requires high levels of exercise. If your dog is outside in warm weather, monitor it frequently, make sure it has shade to lie in and plenty of water to drink. Do not leave your pet outside for extended periods of time in warm weather. If your dog or cat has a long, thick hair coat consider a trip to the groomers for a trim. If you have a pushed in face or short nosed dog breed (i.e. Pug, Pekinese, Shih Tzu, French Bulldog, American Staffordshire, American Pit Bull Terrier) or a large breed dog (i.e. Labrador Retriever, German Shepard, Golden Retriever, Great Dane, St. Bernard, Newfoundland) keep them inside in air conditioning on warm days. NEVER leave an animal unattended in a car, not even for a few minutes. On a 75° F day, the temperature inside of a car can exceed 120° F within twenty minutes, even with the windows cracked open. And if you suspect your pet may be suffering from a heat illness, in any form, immediately call your veterinarian or the nearest emergency clinic, and they will be able to advise you on steps to take to begin treatment of your pet as you transport it to the veterinarian.