



HEAT STROKE

and MALIGNANT HYPERTHERMIA IN DOGS AND CATS

Heat stroke is a non technical term for hyperthermia, a body temperature that is so far above normal that physiological processes are subjected to damage and dysfunction. The damaging effects of hyperthermia can be transient or permanent and can cause sudden death; the effects on dogs, cats man and any other life form is dependent upon time and temperature. The higher the temperature and the longer the hyperthermia persists the more damage it causes.

Malignant hyperthermia is different from what is generally called heat stroke. Malignant hyperthermia is a well documented metabolic disorder of skeletal muscle that can occur subsequent to the inhalant anesthetic agents or sometimes from stress. There may be an inherited predisposition to develop **malignant hyperthermia** in dogs, man and other animals. Most commonly it is seen in heavily muscled dogs. According to the Merck Veterinary Manual it is abnormal "*calcium regulation, glycogenolysis, and contractile protein activity resulting in production of heat, CO₂, and lactic acid. Clinical signs include tachycardia (rapid heart rate), tachypnea (rapid breathing), pyrexia (fever), muscle rigidity, and cardiopulmonary failure. Signs develop 5-30 min after exposure to the anesthetic agent. Treatment consists of immediate cessation of anesthesia and hyperventilation with oxygen. IV fluid therapy, corticosteroids, and ice packs are also used. A muscle relaxant, may be given but prognosis is poor in severe cases. Urinary output, serum potassium levels, and cardiac function should be monitored.*"



HEAT STROKE! It might only be ten minutes... and the dog or cat will be near death. And sometimes even if heroic treatment measures are taken the animal will die from massive intravascular clotting, hemorrhaging, cerebral edema and kidney failure. It is a gruesome thought but every day dogs and cats suffer from heat stroke due to inattention by their caretakers. In most cases, the pet is left "for just a minute"... but for various reasons the pet's owner is distracted by something unusual, or delayed beyond what was expected... and returns to the vehicle to see their pet collapsed, salivating, panting uncontrollably and loosing consciousness. Don't let it happen to your pet.

According to The Weather Channel your car acts like an oven when the sun is shining on it. And keep this in mind: if the outside temperature on a warm, sunny day is 90 degrees the temperature inside a car left in the sun in 10 minutes will climb to 113°, in 20 minutes it will be 120°, and in 30 minutes will be 133°! And leaving a gap open in the windows has little effect because the heat buildup occurs mainly from radiant energy from the hot metal of the car. The interior color of the car, dark being most troublesome, influences the heat buildup.

UNATTENDED PETS

Leaving a pet alone in a vehicle has a number of potential risks. Always be conscious of the effects of heat buildup in a vehicle because it only takes a few minutes for the internal heat to increase forty degrees above the outside air temperature... especially in direct sunlight. Even a dog's body heat (expired air in the dog's breath is 102 degrees and has 100% humidity!) will act like a heater inside an enclosed space. Leaving windows open slightly at the top surely helps IF there is a breeze. However, that opening also invites children to poke their fingers in or unkind folks to tease the dog with sticks. **Pets left in cars are at a severe disadvantage when it comes to being able to dissipate heat from their bodies.** Even in the shade, and especially in humid conditions, dogs need to inhale air cooler than their normal body temperature of 102 degrees. In fact, even 80 degree air temperatures can be dangerous. Heat stroke is a dire emergency and one from which many pets do not recover. And you'd be shocked to find out just how fast it can occur. If you ever find your pet distressed from overheating in a vehicle, get to the nearest animal hospital immediately... don't even call first; just GO!



WHAT IS HEAT STROKE

Living cells have temperature tolerance limits. Go beyond those limits and the cell breaks down, loses functional capacity, releases chemicals within itself that cause more adverse reactions, and eventually ceases to function and dies. Tolerance to higher than optimum temperatures for mammals breaks down at about 107 degrees. And the death of the cell (that state where the traumatized cell cannot recover from the heat injury) occurs when time and temperature factors combine to terminate the cell's integrity. The longer the cell is above the 107 degree level the less chance there is for the cell to recover. The higher the temperature becomes above 107 degrees the faster the cell death occurs. In pets confined to a space where the ambient (surrounding)

temperature and humidity are above tolerable levels the animal's body will begin to acquire heat from the environment faster than it can dissipate that heat. In overheated humans we begin to sweat, which evaporates (unless the humidity is 100 percent), and cools the skin surface and assists in dissipating that heat buildup. In fur covered dogs and cats that have very few sweat glands to begin with the only means of dissipating excess body heat is via panting. This movement

of air over the moist tongue and airway surfaces increases evaporative cooling (again, unless the ambient humidity is 100 percent). Unfortunately, panting is a rather inefficient means of dissipating body heat and actually generates some heat due to the muscle activity involved. Keep in mind that as an animal is confined to a closed space the expired air, which is at 100 percent humidity and 102 degrees, will eventually increase the ambient humidity and temperature of the animal's space. Plus, especially with larger animals such as Great Danes and St. Bernards, their body heat will increase the ambient temperature in the vehicle. It should be readily obvious that leaving an animal in an enclosed space, even if the vehicle is in the shade and even if the outside temperature is only in the seventies, will cause a buildup of temperature and humidity in that vehicle. Time and temperature and humidity are critical factors in the development of heat stroke in pets. And once the animal's cells reach 107 degrees it is crucial for any chance of recovery to lower that temperature as fast as possible. Otherwise death will result no matter what you do to try to save the animal.

SIGNS OF HEAT STROKE

Signs of heat stroke are intense, rapid panting, wide eyes, salivating, staggering and weakness. Advanced heat stroke victims will collapse and become unconscious. The gums will appear pale and dry. If heat stroke is suspected and you can take the animal's temperature rectally, any temperature above 106 degrees is dangerous. The longer the temperature remains at or above 106 degrees the more serious the situation. If you return to your car or the area in which the animal was confined and find your pet seems to be highly agitated, wide-eyed and panting uncontrollably... start for the nearest animal hospital right away with the air conditioning at full blast. Otherwise get the dog to a cool area and begin the treatment for heat stroke.

TREATMENT FOR HEAT STROKE

Take the pet's temperature rectally if possible. A body temperature of about 105 degrees or higher is probable evidence for **heat stroke**. Place your pet in a tub of cool running water or spray with a hose **being sure the cool water contacts the skin and doesn't simply run off the coat**. Thoroughly wet the belly and inside the legs. Run the cool water over the tongue and mouth. Take a rectal temperature if possible to know when to stop cooling. A safe temperature is about 103 degrees. A small dog will cool down much faster than a large dog. Once the temperature gets to 103 or 104 degrees do not cool the pet any further because the cooling effects will continue to bring the temperature down even further. Seek veterinary attention as soon as possible.

If you are near an animal hospital, go there right away. At the animal hospital they may administer oxygen, cortisone and dextrose to help protect the traumatized cells. The staff can provide proper cooling measures and monitor the dog's temperature, heart rate and provide oxygen which some evidence indicates may help protect stressed body cells. Providing intravenous fluids and anticoagulants may be utilized as well.

WHAT DOES HEAT STROKE DO?

In severe cases, the elevated body temperature triggers chemical reactions in the cells of the body... highly active cells such as brain, intestinal and liver cells are at greatest risk for heat trauma. The metabolic disturbances brought on by excessive heat instigate the release of chemicals within the cells that cause the ultimate destruction and breakage of the cell. Most heat stroke victims are dehydrated, as well, and their blood viscosity increases to the point that the heart has severe stresses placed on it in trying to pump the abnormally "thickened" blood through the blood vessels. The result is stagnation of blood, blood clotting and eventual death of tissues due to what is termed ischemic necrosis. Wherever a clot forms, the tissues nourished by that clogged vessel die from metabolic starvation. The dying cells give off chemicals that further damage surrounding tissues and a point is reached beyond which no recovery is possible. In some unfortunate situations where the heat stroke victim has experienced a dangerously high body temperature for a length of time such that too many brain and other body cells have been damaged, no matter what life saving measures are employed and bioprotective medications are administered, death will result.



HOW TO AVOID HEAT STROKE

Always be careful about leaving pets in vehicles or tied out in the direct sunlight during warm, sunny days... even a few minutes can be critical. And flea markets and other outdoor activities are often the worst place to bring a dog on a hot summer day. Factors that increase an animal's risk of developing heat stroke include:

- * water deprivation
- * exercise
- * enclosed space
- * age
- * excessive humidity
- * cardiovascular disease
- * obesity
- * lack of acclimatization

Short faced (brachycephalic) breeds such as Boxers, Pekingese, Pugs and dogs with heavy coats are at greater risk for heat stroke than some other breeds. Also age, heart trouble, and physical condition such as being overweight all



contribute to a lesser efficiency in dissipating heat buildup in the body. Any animal or human when faced with the ambient conditions of high temperature, high humidity and time to build up heat within the body faster than heat can be dissipated, can face the tragedy of being a victim of heat stroke. All it takes to avoid this serious problem is diligence and common sense. Older pets have less resistance to stresses such as traveling, heat, noises, and unusual activities. Excitement or discomfort brings on panting and elevated metabolic rate which elevates the animal's temperature; and if the animal cannot remove that heat buildup within its body it may be just a matter of a few minutes before the dog or cat gets into some serious medical difficulty.