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ANIMAL MEDICAL CENTER

ADVANCED TREATMENT, RESEARCH, EDUCATION, DEVOTION, SINCE 1910

Pearls for the Practitioner

Topic: Heatstroke

The Animal Medical Center has created this e-mail publication to keep you informed about the latest practices in veterinary medicine and how these practices are being applied at The AMC. If you are interested in obtaining past issues of "Pearls for the Practitioner" or if you would like to be removed from this mailing list, please e-mail allison.younger@amcny.org.

Each year as the warm weather returns, there is an increase in the number of pets being treated for hyperthermia and heatstroke. Already this year, during a period of above average temperatures in April, several pets have been treated for heatstroke by the Emergency and Critical Care Service at The Animal Medical Center.

Client education is essential as heatstroke is nearly 100% preventable, and when it does occur, rapid institution of treatment (such as cooling) can decrease the extent and severity of sequelae. Consequently, heatstroke may not be obvious in animals cooled by their owners prior to presentation as body temperature may return to normal by the time they present to the veterinarian.

PATHOPHYSIOLOGY AND PATHOGENESIS

The majority of heat loss in dogs and cats is through radiation and convection, although significant heat loss also occurs through evaporation from the respiratory tract, especially as body and environmental temperatures become equal. Heatstroke is most likely to occur during hot and humid weather, as humid conditions decrease the efficacy of evaporation. Cooling through evaporation is decreased when humidity is high, with poor ventilation, and in the presence of upper airway abnormalities, such as brachycephalic syndrome, laryngeal dysfunction or collapsing trachea.

The body begins to adapt to increasing environmental temperatures through increased cardiac performance, salt conservation, increased plasma volume, increased glomerular filtration rate, increasing resistance to rhabdomyolysis and increased capacity to sweat (in certain species). It can take several weeks for people and animals to fully acclimatize to the increased temperatures of the summer season.

Heatstroke is a form of hyperthermia associated with a systemic inflammatory response leading to a syndrome of multiple organ dysfunction in which encephalopathy predominates. Compared to humans, the canine brain is intrinsically more resistant to the effects of thermal injury. This accounts for the apparent earlier onset of neurological dysfunction in human heatstroke patients.

Physiologic responses to hyperthermia include induction of the acute phase response leading to activation of both inflammatory and anti-inflammatory processes, as well as up regulation of heat shock proteins which help to maintain cellular functional and structural integrity. Exaggeration of the acute phase response and development of a predominantly inflammatory condition leads to heatstroke. The pathophysiology of heatstroke has many similarities to the pathophysiology of sepsis.

TREATMENT AND MONITORING

The mainstay of treatment is rapid, controlled cooling and supportive care. Cooling through external conduction techniques such as bathing in cool water and application of ice packs seem to be very effective although research has not identified any single cooling technique to be superior. Cessation of active cooling as rectal temperature reaches 103 degrees Fahrenheit will help to prevent rebound hypothermia.

Supportive care will be patient dependent, but may include IV fluids, oxygen, dextrose supplementation, treatment of cerebral edema, GI protectants, blood products and antibiotics for GI translocation. In patients with severe neurologic dysfunction manifested by seizures and persistent altered mentation, we have found that decreasing the cerebral metabolic rate through the use of phenobarbital appears to be of benefit. There is no evidence to support the use of glucocorticoids in treatment of heatstroke. Severely affected patients will benefit from intensive monitoring and treatments and some may require advanced therapy such as mechanical ventilation, which may be available through Critical Care Departments at specialty hospitals such as The Animal Medical Center.

PROGNOSIS

Veterinary literature has identified hypoglycemia, decreased cholesterol, increased bilirubin, decreased albumin, ventricular arrhythmias, increased creatinine, declining neurologic status and most recently the presence of nucleated erythrocytes in peripheral circulation as negative prognostic indicators. Mortality of veterinary heatstroke victims has been reported to be around 50%.

SUGGESTED READING

Bruchim Y, et al. Heat Stroke in Dogs: A Retrospective Study of 54 Cases (1999-2004) and Analysis of Risk Factors for Death. J Vet Intern Med 2006; 20:38-46.

Johnson SI, et al. Heatstroke in small animal medicine: a clinical practice review. J Vet Emerg Crit Care 2006; 16(2):112-119.

Aroch I, et al. Peripheral Nucleated Red Cells as a Prognostic Indicator in Heatstroke in Dogs. J Vet Intern Med 2009; 23:544-551.

The Critical Care and Emergency Service at The Animal Medical Center has doctors available 24 hours a day for your patients in need of critical care and/or emergency services. Veterinarians can reach us anytime at 212-329-8608 or 212-329-8616. Non-urgent inquiries or questions can also be addressed via email: susan.meeking@amcny.org.

To reach a Referral Coordinator, please call 212.329.8758/8890.