Thermoregulation in Dogs and the Dangers of Hyperthermia for the Layperson

Jerilee A. Zezula, D.V.M.
July 24, 2011

Stationary cars or other enclosed areas in that are in direct sunlight heat up vary rapidly and stay heated even though there may be some slight ventilation. This is sometimes called the “hot house” effect. Basically the windows allow the sun’s rays to enter but preclude the heat waves to exit. The whole interior of the car heats up quite quickly (seats, steering wheel, dash board) and hold the heat. Putting an animal into this situation is like putting an animal into an oven and turning on the heat.

Body Responses to Temperature Changes

Each animal is made up of cells which carry out the functions of the body. In mammals these cells only function at optimal temperatures. To assure that they function, animals have a built-in mechanisms to regulate internal body temperature. These mechanisms are very complex.

If an animal lives in an extremely hot or cold climate, his body gets used to the temperatures as his physiology adjusts. If he is not used to the extreme temperature, his internal mechanisms have to work very hard to keep his temperature normal so his cells can function.

Responses to Heat:

When the temperature is very hot and especially when it is humid, everything heats up...including an dog’s body. His body responds by trying to cool off and it basically attempts to use conduction, convection, radiation, and evaporation. He will seek a cool place in the shade to lie down to absorb the coolness (conduction). His blood vessels will dilate in his skin and tongue bringing hot blood close to the surface radiating his internal heat. He will seek out fans or breezes to blow air to transfer the heat from body to air (convection). He will pant to bring air into his upper respiratory system to evaporate water from his mucous membranes. He will drink a lot of water to compensate for the evaporation.

While all this is happening, all his physiological resources are all going towards cooling the body and other body systems either shut down or are stressed by unusual demands. If cooling is not soon effective, body cells will be in danger and body systems will be negatively affected. There is a cascade of reactions that occur that is very hard to stop, even if the animal eventually gets his temperature down. There can be some changes that occur some of which can indicate severe illness and lead to the death of the dog.

If dog has been exposed to high heat and humidity for any period of time -- especially without water, and, whether or not he seems distressed or ill, he should be examined by a veterinarian. Hot cars are especially dangerous because the dog has no means of cooling by conduction (the reverse is true as the seats may be hot) or convection (no air moving). Radiation is ineffective. He will basically be relying on
panting (evaporation) to cool his body. This cannot continue to be effective very long especially without water. Old dogs, young dogs, and dogs who are ill have more difficulty regulating their body temperatures and are in danger more quickly in a hot car. Dogs with short faces, because of structure of their upper airways, do not effectively cool by panting and do not tolerate high temperatures.

Noticeable symptoms of dangerous heat stress may be:
- Increased body temperature (above 104 ° F.)
- Severe panting with tongue way out; tongue dry and not moist
- Lack of awareness of surroundings (depression, lethargy)
- Lying down and won’t get up (panting may have ceased)
- Staggering, appears blind
- Tiny blood clots on gums, in ears
- Diarrhea, sometimes bloody
- Weak rapid pulse; decreased capillary refill time
- Dehydration

Laboratory work at a veterinary hospital may show:
- Evidence of dehydration
- Evidence of liver and kidney damage
- Decreased blood glucose

Aggressive treatment may be necessary to overcome the effects of excessive heat exposure even if the animal appears to be responding after removal from a car.

**Bibliography**


