



***Why it is critical to know your dog's normal body temperature at rest, at play and at work: using our understanding of working dogs to support performance dog health***

**Interview with Dana A. Vamvakias, DVM, CCRT, cVMA**



Since September 11, 2001, working dog health has been a primary focus because of the critical role these animals play in our society, from the search and rescue missions directly following the attack to the increased deployment of Military Working Dogs as combat assets during the ensuing wars. Despite major advances in understanding and protecting the health of working dogs, little effort has been made to translate this knowledge to our growing population of sporting and performance dogs.

The AKC Canine Health Foundation (CHF) recently had the pleasure of interviewing Dr. Dana Vamvakias, Chief Veterinarian of K2 Solutions, Inc. The K2 Canine Training Center in Southern Pines, NC is a unique canine training and handler instruction facility that prepares dogs and their handlers to meet today's increasingly complex military and law enforcement challenges. Their goal is to train dogs that are well prepared for real world scenarios they will encounter while keeping our communities safe and serving on the battlefield.

Dr. Vamvakias, as their chief veterinarian, has extensive experience working with animals in the military and civilian sector and specializes in Military Working Dogs. She is a 1994 graduate of North Carolina State University College of Veterinary Medicine. Her diverse veterinary career includes experience with the active, reserve, and civilian services of the US Army Veterinary Corps and the United States Special Operations Command. She has extensive experience in private practice and emergency medicine, and is certified in Canine Rehabilitative Therapy. During this interview Dr. Vamvakias discusses hyperthermia and why it is important to know your dog's normal body temperature at rest, at play and at work. At the end of the interview is a daily temperature chart to help you monitor your dog's temperature.

**CHF: Welcome Dr. Vamvakias. First, tell us about your role as Chief Veterinarian at K2 and a little about what you do with working dogs.**

**Dr. Vamvakias:** My role as the chief veterinarian for K2 is composed of a wide range of responsibilities within the veterinary science fields. With the capability of housing over 320 dogs at our Training Center, I oversee the health of our dogs as a group using a "herd health" approach. I concentrate on



preventing or containing infectious disease, maintaining the husbandry procedures of the kennel, assessing feeding quantities, and training K2 personnel on these subjects. Next, I manage the care of each dog as an individual patient by overseeing his or her preventative care, sickness, and injuries. I also provide canine sports medicine guidance in the conditioning and strengthening of these working dogs, as well as rehabilitation when needed. Lastly, K2 works in collaboration with many universities and government agencies to support research efforts improving performance, health, capabilities, and longevity of working dogs. As the chief veterinarian, I write, conduct, and/or oversee many of these projects.

### **CHF: What is hyperthermia?**

**Dr. Vamvakias:** Hyperthermia is when the body temperature significantly exceeds the accepted normal temperature range of a healthy dog. The normal range we typically see in a dog is between 99.5°F-102.5°F, thus they have a higher body temperature than humans and have a broader range of normal.

There are two main types of hyperthermia that can be seen in healthy dogs, one is **classical hyperthermia (nonexertional)** and usually occurs in the summer when a dog is locked in a car, or placed in the sun with no shade and their attempts at cooling themselves are unsuccessful due to the environmental conditions. The other form is **exertional hyperthermia** where the dog's activities generate excessive physiological heat, their body fails to maintain adequate cooling, and they go into a crisis. Exertion based hyperthermia can happen in any season; for example, Iditarod dogs can suffer from exertion-based hyperthermia.

In really active dogs here in the south, we commonly see a combination of both classical and exertion hyperthermia.

### **CHF: Do any environmental conditions, breed, or behavior increase the likelihood of hyperthermia in a dog?**

**Dr. Vamvakias:** Yes. First, the most common time for working and performance dogs to have a heat crisis is in the spring. Based on the geographical location, the spring season can manifest in extreme temperature variances day-to-day and day-to-night. Dogs need time to become acclimated to the temperature changes as the weather starts to warm. Also, the degree of humidity present can cause added challenges. At K2, with the help of Dr. Mike Davis from Oklahoma State University, we devised a chart where both humidity and ambient temperature are used to determine the intensity of training possible for that day. If the temperatures are in the mid-seventies but the humidity is high, the chances of heat injuries are greater than a day in the eighties with very little humidity. Additionally, with the spring weather, people start going outside more and increase the physical activity with their dogs and often are unaware of the thermal stress the dog may be experiencing. An example is last spring, within



### ***Symptoms of Hyperthermia:***

**HEAT STRESS:** Excessive panting, tongue excessively protruding out with a flattened end, cheeks pulled back revealing the full arcade of the teeth including the molars, brick red mucous membranes, and early changes in the dog's focus or readiness.

**HEAT EXHAUSTION:** The excessive panting becomes uncontrollable, the other clinical signs are still present, but now there is possible vomiting, diarrhea, and weakness or stumbling.

**Heat Stroke:** Dogs have the signs of heat exhaustion with the addition of mentation and consciousness changes. The dog can be in a stupor, seizures, head tremors and depressed, or in a coma.

our private practice we were presented with a whippet that was taken out on a two-mile jog with its owner. The dog collapsed and presented to us with a temperature exceeding 108°F, even though the outside temperature was only 74°F. The summer can pose significant challenges as well, with an increase of environmental heat and exertion heat.

As far as breeds, due to the fact that dogs' main source of cooling occurs through the airway with panting, any brachiocephalic breeds, such as Boxers, Boston Terriers, and Pugs, are predisposed to hyperthermia.

Other predisposing factors are obesity, underlying illness or infections, and high drive dogs

that become physiologically hot with excitement, for example; before a training event, competition, or even feedings.

Lastly, there are some medications that dogs may be placed on that may predispose a dog to hyperthermia, so always check with your veterinarian if your dog is active.

### **CHF: What are the clinical symptoms of hyperthermia in dogs?**

**Dr. Vamvakias:** Within K2, all of our trainers, handlers, and kennel staff are trained on the causes of hyperthermia, the early identification of hyperthermia, and the treatment. It is my professional opinion that awareness and early identification of hyperthermia will eliminate a potentially catastrophic event in your dog.

The first thing I stress is that an ***elevated temperature alone does not mean a heat injury***. There is no magic number that translates to heat injury. A dog may have an elevated temperature but may not



be in a heat crisis. With working dogs, it is not uncommon for our dogs to reach temperatures above 106°F with no evidence of physiological injury or distress.

At K2, I break down the clinical signs into three categories. For one of our dogs to be classified as being in a heat crisis, there must be clinical signs **and** a rectal temperature above 105°F. The temperature alone is not enough.

**The three categories:**

**HEAT STRESS:** Excessive panting, tongue excessively protruding out with a flattened end, cheeks pulled back revealing the full arcade of the teeth including the molars, brick red mucous membranes, and early changes in the dog's focus or readiness.

**HEAT EXHAUSTION:** The excessive panting becomes uncontrollable, the other clinical signs are still present, but now there is possible vomiting, diarrhea, and weakness or stumbling.

**HEAT STROKE:** The dogs have the signs of heat exhaustion with the addition of mentation and consciousness changes. The dog can be in a stupor, seizures, head tremors and depressed, or in a coma.

There are other clinical signs that start to occur as the dog gets further into a heat stroke, but for the sake of this discussion, I think it is important to just list the signs that you would see before the dog goes down.

**CHF: What physiological changes are occurring during heat stroke that put a dog's life at risk?**

**Dr. Vamvakias:** Heat stroke is a polysystemic disorder that occurs from the toxic effect of heat on cellular function. In efforts to cool the blood and preserve organs, as the body increases in temperature, the blood vessels dilate peripherally. This means there is more blood being shifted to the skin, feet, ears to help facilitate heat loss on the surface. The panting of a dog will increase due to heat dissipating properties of moving large volumes of air across the mucosa of the oral and upper airways. The process of rapid breathing produces physiological heat and can yield changes in the body's pH, just as humans experience in hyperventilation. The heat dissipation from panting is greatly reduced in high humidity.

*“Elevated temperature alone does not mean a heat injury. There is no magic number that translates to heat injury. A dog may have an elevated temperature but may not be in a heat crisis.”*



As the temperature increases and the body fails to compensate, the more diffuse cellular damage occurs in the body. There is significant neuronal death illustrated with seizures, neurological abnormalities, and coma. The shunting of blood in attempts to cool, but the failure to succeed, leads to hypovolemic shock and heart tissue death. The shunting of blood causes decrease in blood perfusion through the kidneys which can cause acute renal failure. The thermal injury to the cells lining the blood vessels can cause a toxemia or a fatal clotting disorder.

**“Treatment of hyperthermia starts with the obvious, stop the activity of the dog and cool it immediately. What is important is not how high the temperature goes, but how long the temperature stays at the excessive level. The best and cheapest way to start the cooling is to use cool water from a hose, or partially submerge the dog’s body in a cool swimming pool. My approach is to focus on cooling the main arterial and venous regions. “**

High temperatures and failure to identify and start cooling effects every cell in the body, and many times the cell death is so catastrophic, that hospitalization and treatment cannot reverse the damage.

**CHF: In your line of work do you see hyperthermia more frequently than a general practice veterinarian?**

**Dr. Vamvakias:** Yes, most likely due to the high training temperature of our working dogs and the high level of awareness of K2’s staff. With that said, I do not think that our dogs experience it more, only that it goes unidentified in pet population unless the dog is experiencing a full heat stroke and therefore private practice veterinarians do not see it as frequently as it is happening.

**CHF: How do you treat hyperthermia?**

**Dr. Vamvakias:** *The treatment starts with the obvious: stop the activity of the dog and cool her immediately.* What is important is not how high the temperature goes, but how long the temperature stays at the excessive level. The best and cheapest way to start the cooling is to use cool water from a hose, or partially submerge the dog’s body in a cool swimming pool. My approach is to focus on cooling the main arterial and venous regions. At K2, we start with applying hose water to the groin, armpits and jugular regions. We don’t focus energy on spraying down the back, tail or head. Towels



submerged in icy water can be applied over the back and head while the underside is being sprayed. Place the dog in the shade, by a fan, or in air conditioning. We also ensure all of our trainers are proficient at placing an IV catheter and administering fluids in case they are in a remote location and the dog needs fluid support.

The key component of cooling a dog is to make sure you are checking the temperature and that you do not cool a dog beyond 103°F. When their temperature reaches 103°F cooling treatment is stopped to avoid rebound hypothermia.

### **CHF: Is hyperthermia preventable?**

**Dr. Vamvakias:** Absolutely! First and foremost, if you have a dog you should have a thermometer to take their temperature. At K2, all of the trainers, handlers, and kennel staff carry thermometers on them, and they are responsible for being able to take the temperatures of the dogs within their care.

- Know the clinical signs and be prepared on the actions you will take if your dog needs to be cooled.
- Be aware of the ambient temperatures and the humidity when you go out to exercise with your dog. Realize that they need time to acclimate to seasonal changes.
- Accept that with real active dogs, the risk of hyperthermia exists regardless of the ambient temperature.

### **CHF: You feel it is important to know a dog's individual body temperature and how it changes with exercise. Do you see dramatic differences in working body temperatures of your dogs?**

**Dr. Vamvakias:** At K2, I have stressed the importance of knowing the working temperatures of the dogs being trained by our individual trainers. Based on the heat guidelines established at K2, trainers were to get a dog's temperature before they started training that dog, mid-point of training, at the conclusion of the training, and within about 30 minutes before placing back in their runs. Once these data were gathered and recorded, personnel became familiar with the wide range of temperatures the individual dogs had during the course of the workday. K2 personnel quickly realized which dogs "run hot" and they became familiar with early signs that the individual dogs may be exhibiting if they were getting close to a heat stress situation. At K2 we train a large number of handlers on how to utilize the working dogs. Our awareness of an individual dog's "working temperature" has allowed us the ability to educate the handler on the dog. This knowledge allows a handler to catch issues sooner if they are unsure of picking up the early clinical signs. With heat being the number one cause of death in deployed military working dogs in the Middle East, we have found this to be an effective way to better prepare deploying dog handlers.



**CHF: As an example, take us through how and when an owner of an agility dog should measure their dog's body temperature to get an idea of that dog's individual setpoint.**

**Dr. Vamvakias:** First, let me acknowledge that I realize some dogs don't appreciate this procedure. I want to assure you that with a little lubrication and a standard digital thermometer, there is not pain associated with this, just a new process to which they can become conditioned. I would encourage owners to keep a small area in their notebook or training records and designate an area where you record the current outside temperature/humidity. Take your dog's temperature, and keep in mind that many agility dogs start to get excited when they are going to train/work - you may easily see a temperature >103°F before anything happens. Repeat the temperatures at some point during the training or when you start to see the dog panting a bit heavy, not because it is a heat crisis, but so you can know your dog's behavior. Take the temperature at the end of training as well. If you do this on different days with different temperatures/humidity, you will be amazed at how quickly you find your dogs optimal working temperature as well as how much better you are a noticing when your dog may need a break, shade, and a cool drink. **“High drive” working, performance, and active dogs will not self-modify their activity because they are getting hot; as the owner you must make the decision to prevent heat injuries in your dogs.**

**CHF: Since your focus is the working dog, what are the greatest research needs for the working dog right now?**

**Dr. Vamvakias:** K2 is committed to research that improves a working dog's performance, health, capabilities, and the longevity of the work life of these amazing dogs. My personal focus is on the physical conditioning and strengthening of working dogs to enhance performance as well as improving their cognition capabilities. Additionally, I would like to show how early identification and treatment of subclinical pain can enable us to get the peak performance from these dogs. There is so much still unknown about canine capabilities; thus research to better understand olfaction and the dog's ability to detect is always at the forefront of research needs along with Behavioral and genetic research to determine the factors that yield these high performing dogs, and more!

**CHF: Dr. Vamvakias, thank you so much for sharing your knowledge about the working dog and helping us apply it to our own dogs.**



**Daily Temperature Chart**

| Date | Time | Activity | Ambient Temperature | Humidity | Body Temperature |
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