HOT DOGS: NOT JUST BACKYARD FUN
A K-9 HEAT INJURY CASE STUDY

Thomas G. LeClair, CD, BA, A-EMCA, ACP, EMT-T (Adv.)
Executive Board / Tactical Medicine Section Chair
Michigan Tactical Officers Association

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BACKGROUND

On the weekend of 15-17 July 2011, the Police Dog Unit (PDU) of the Windsor Police Service hosted the US Police Canine Association (USPCA) Region 19 Trials. Twenty-eight police canine (K-9) teams from across Ontario and Michigan competed and certified in the following skill-sets: obedience, agility, box search, article search, and apprehension. In support of the "home team" nature of the event, new EMS Chief R.M. assigned Primary Care Paramedic K. B. and Advanced Care Paramedic T. L. from the Special Operations Division (SOD) of Essex-Windsor EMS to the event, tasked to provide medical coverage for public spectators, police K-9 handlers and their four-legged partners. Although planning and execution of the event by PDU members was exceptional, the one element they could not control was the weather. The Meteorological Report (METREP) for the event predicted the onset of a heat wave, with expected air temperatures in the low 30°C (86°F) range and heat index readings to approach 40°C (104°F).

HISTORY OF PRESENTING ILLNESS

At approximately 1030 hours, a K-9 officer from Michigan returned to his police vehicle, a late model Dodge Charger with standard K-9 modifications, to check on his K-9 partner. He discovered that the air conditioning in the vehicle had failed while he was watching and assisting other competitors in the Trials. The handler alerted nearby officers in the parking lot that his K-9 was suffering a medical emergency. One of those officers, an agent from the Detroit Field Office of the DEA, immediately moved to the assigned EMS SOD vehicle some 200 meters away and advised paramedics that there was a "K-9 down".

Paramedics drove to the location of the K-9 officer in the adjacent parking lot, a 90 second response from time of notification. As they approached, they observed that the K-9 handler, with tears in his eyes, had extracted his dog to the shade of a nearby tree and irrigated it's torso with bottled water to begin the cooling process. When questioned, he told them that his dog had been in the vehicle for a period of time not exceeding 60 minutes since he last checked on him. The handler stated that when he opened the door of his cruiser, the dog stood up, jumped out of the car and collapsed to the ground.

PAST MEDICAL HISTORY

Negative for previous heat-related injury. ACL repair to left hind leg two years ago with good post-op course and return to full duty without restrictions.

MEDICATION

Glucosamine QD at an undetermined dose

ALLERGIES

NKDA

OBSERVATION/EXAMINATION

Five year-old Malinois/Shepherd mix, approximately 35kg, well nourished with an athletic body type, was lying right lateral on the grass. The dogs' eyes were open, head raised and he seemed able to focus on simple commands from his handler. He displayed extremely weak motor tone and made no attempts to stand. The dog's coat was generally wet from the handler's attempt to irrigate and cool the dog.

Airway was patent with no stridor or wheezes audible. He had a grossly abnormal panting rate at approx 80/minute and was noted to be expelling frothy sputum and small amounts of tenacious mucous. The tongue was extended, very flushed and dry.

Femoral pulses were full (+3) and very rapid. An apical heart rate could not be auscultated over the left chest due to noise artifact associated with the extreme rate of panting. Examination of the oral mucosa above the upper canine teeth revealed it to be flushed, crimson in color, secondary to vasodilation. Capillary refill was within two seconds.

Abdomen was soft and non-distended. No vomiting or diarrhea was noted.

There was little spontaneous movement of the limbs, but no hemi-deficits deficits, muscle fasciculation or seizure activity was observed. Paw pads on all four limbs were dry and extremely hot to touch.

Rapid nose-to-tail assessment revealed no trauma.

TREATMENT

The K-9 was log rolled onto his right side on a Tactical Extrication Device (TED) litter then extracted into the rear of the

EMS vehicle and placed on the Stryker stretcher. The K-9 was maintained in the right lateral position.

Vehicle air conditioning was placed on its highest setting.

The handler was directed to the jump-seat at the head of the stretcher, controlling the dog's snout while the neck and torso were again irrigated with cool water. A muzzle was not required to ensure safety and control while care was delivered.

Isopropyl alcohol was liberally applied to all four paws from the pads to the level of the dewclaws, to assist with dissipation of heat by evaporation.

Cold packs were placed into the inguinal (femoral artery) and axillary areas bilaterally.

A plastic, stiffener insert from a medical backpack was improvised as a fan and a bystander officer directed to utilize it from the foot of the stretcher.

Oxygen was delivered via K-9-specific mask at a high rate of flow, more in blow-by fashion than with the mask encircling the dog's snout, which would have hindered heat dissipation.

Rapid re-assessment revealed that the K-9's panting rate had decreased slightly and he had ceased to expel foamy sputum. His oral mucosa remained flushed as before. He was judged to be responding positively to treatment.

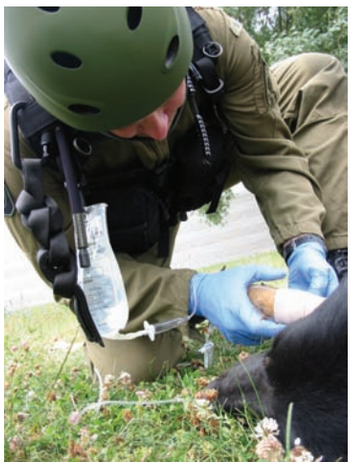
An 18 gauge IV catheter was inserted into the left cephalic vein and secured with tape and a Co-Flex dressing. A 1000mL bolus of Normal Saline was initiated. The IV bag and a cold pack were then inserted into a manual pressure infuser to both cool the fluid and ensure flow, given the low roof height of the evacuation vehicle.

Transport

Since the EMS vehicle was required to maintain medical coverage at the Trials, a privately-owned SUV was designated to transport the K-9 to the emergency veterinary facility and a marked Windsor Police vehicle designated as an escort. A pre-alert to the receiving veterinarian by cell phone was made by Constable R. W. of the PDU. Utilizing a five-person team, the K-9 was transferred from the back of the EMS vehicle to the SUV. The handler controlled the head, two personnel lifted the TED and two additional personnel protected the IV site and loaded the portable oxygen cylinder and K-9 medical bag. After transfer to the SUV, the K-9 and all medical interventions were subjected to a rapid re-assessment to ensure safety and readiness. Transport was initiated with the SOD paramedic on board and a 10-minute transit time.

Transfer of Care

Upon arrival at the veterinary emergency clinic, the K-9 was moved to an exam room at the direction of receiving staff. A verbal account of the incident, subsequent treatment and response was made to Dr. A. K., DVM. He ordered a continuation of the saline bolus to a total of 1500mL and weight-appropriate doses of Novamoxin (amoxicillin) and Zeniquin (marbofloxacin) given intravenously. The K-9's rectal temperature upon arrival was determined to be 39.4° C (103° F). After routine diagnostics and monitoring for approximately four hours and a continued recovery throughout, the K-9 was discharged to his relieved and grateful handler for their return home to Michigan.

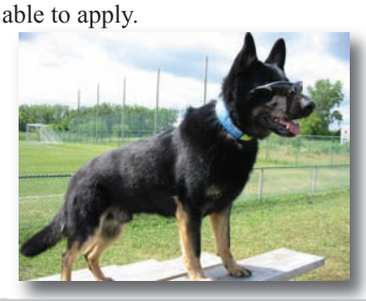


Observations and Lessons Learned

1. The rapid response time to the incident and the excellent out come were largely due to the Preventative Medicine (PM) approach taken to the K-9 Trials. An SOD member was already on the ground, properly trained and equipped, based

upon a relevant Medical Threat Assessment (MTA), including a reliable Meteorological Report (METREP) and real-time weather data gathered with a Kestrel 4000: a hand-held, multi-function weather meter, well-known in the sniper community. At the time of the incident, the heat index was 39°C (102°F)

2. Based upon the totality of experience with the Tactical Extrication Device (TED) litter, a North American Rescue product, it rates as only "satisfactory" for officer extraction because a patient must remain alert enough to be safely seated. In contrast, it is a "superior" litter for K-9 extraction, being of small weight and cube, easily cleaned and modest cost. It should remain the primary K-9 litter when spinal precautions or high-angle rescue are not required.
3. Careful analysis of the requirement to apply a muzzle to a K-9 should always be made before rendering care. One of the principal attributes of the patrol K-9 is as a weapon system!
4. Canines dissipate heat through their tongues and by panting, in addition to evaporation and radiation from their paw pads. They also possess a complex of intermingled small arteries and veins in the carotid sinus at the base of their neck which act as a heat exchanger to thermally isolate the head, containing the temperature-sensitive brain, from the body, containing the muscles that generate most of the heat. Application of oxygen is basic care for a number of illnesses and injuries, but in the case of heat injury, even when a K-9 specific mask is available, it should be used in "blow-by" fashion rather than over the snout which restricts the heat dissipation mechanisms. Although few K-9 officers will have an oxygen source available, a mask can be easily improvised in advance from a bisected piece of a two-liter soda bottle, fitted with some plumbing or automotive supplies to accommodate oxygen supply tubing and secured with duct tape or glue. If a muzzle is required for safety and control, the oxygen tubing can be zip-tied to the muzzle in "blow-by" fash ion.
5. Isopropyl (rubbing) alcohol applied to the paw pads is an effective adjunct to other cooling measures, inexpensive and easily performed by non-medically trained personnel. It is a technique all K-9 handlers should be readily able to apply.
6. Despite evacuating the distressed K-9 to a $135,000 ambulance containing $90,000 of emergency medical equipment, an emergent requirement for increased airflow to cool the K-9 was identified. This was improvised by having an officer manually fan, utilizing the large, plastic insert designed to stiffen the nylon material of an Eagle medical pack. As an aid to the development and maintenance of improvisational skills under stress, training templates and general problem solving should emphasize an unconventional medicine mindset, as applied to the Mission Essential Task List (METL). The part-Malinois patient in this case had a short coat, but long wet hair can actually lay on the skin, forming a barrier to heat loss. Good air flow is critical to prevent it from impeding heat exchange in this manner. That being said, discussions have ensued regarding the wisdom of including a medium-sized, battery-powered fan to provide effective airflow with less manpower.
9. IV cannulation of the cephalic or lateral saphenous veins of a K-9 can be made considerably easier by shaving limb hair with an inexpensive, single AA battery, beard trimmer. Utilizing a lithium battery will best ensure sufficient charge after lengthy storage. With practice, as used in this case, simply wetting the hair with isopropyl alcohol or betadine will cause it to "lay down" so underlying vasculature can be easily visualized in an athletic working K-9.
10. When canines are stressed or ill, they often slough from the intestinal wall, resulting in diarrhea, sometimes with self-limiting hematochezia. A failure of the intestinal epithelial bar rier function, resulting in increased mucosal permeability, has been hypothesized to be a major promoter of bacterial (indigenous gastrointestinal microflora) translocation into the submucosa, muscularis or mesenteric lymph nodes. Administration of the antibiotic was prophylactic coverage for bacterial peritonitis, in the event this occurred. There are numerous sources in the literature which speak to this hypothesis, including: Berg RD: Bacterial translocation from the gastrointestinal tract. *Adv Exp Med Biol*. 1999, 473:11-30.



Thomas G. LeClair is a full-time Advanced Care Paramedic, employed in Windsor, Ontario, Canada for over a quarter of a century, with most of those years consumed in the study and practice of Special Operations medicine. He is an honours graduate of the Advanced Care Paramedic Program at the Michener Institute for Applied Health Sciences in Toronto and the Advanced Counter Narcotics & Terrorism Operational Medical Support Program at the Uniformed Services University of the Health Sciences in Bethesda, Maryland. He holds a Bachelors Degree in Communications and a Graduate Certificate in Adult Education & Instructional Design, both from the University of Windsor.

LeClair served for six years as a Tactical Paramedic with a SWAT team in Metro-Detroit and fourteen years as a Military Police Sergeant in the Canadian Forces Reserve. He is an Executive Board member and the Tactical Medicine Section Chair of the Michigan Tactical Officers Association, an Advisory Board member of the National Patrol Rifle Competition & Conference and a member of the NTOA, SOMA, and ILEETA. He instructs Special Operations medicine on a part-time basis and has trained over 3,000 police, military, and medical personnel in thirty-four states and provinces, in five countries, on three continents.

Thomas LeClair can be reached at 519.792.3626 or Paratus60@hotmail.com.