A Canine Thermal Model for mitigation of heat strain in working dogs

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Abstract

A Canine Thermal Model (CTM) to predict thermal responses of a military working dog (MWD) was validated against core temperatures (Tc) of 47 MWDs during exercise and recovery in neutral to hot environments. The CTM uses inputs of weight and length to determine basal metabolic rate and body surface area. Meteorological conditions (air temperature, relative humidity, solar radiation and wind speed) and an accelerometer-based estimate of metabolic intensity (MET level) are also used to calculate heat storage. The CTM predicted Tc at the end of exercise within ±0.5°C of measured Tc in 90 of 108 cases (83%), with under-prediction in 9% of cases and over-prediction in 7% of cases. After 30 min of recovery, the CTM prediction was within ±0.5°C of measured Tc in 34 of 37 cases (92%), with the CTM predicting slower recovery in 8% of cases. The agreement between CTM-predicted and measured Tc supports the validity of the CTM, as well as the estimate of MET level, which averaged 5 METs, with a range of 4 to 6 METs for most MWD activities. The CTM can be used to predict Tc, and illustrate how heat strain can be mitigated by limiting duration of work, extending recovery time, or modifying factors that contribute to heat storage. The CTM is not a substitute for direct Tc measurement, but can improve planning for effective completion of missions, and assist handlers in timing of physical assessments.

These are the private views of the authors, not official U.S. Army or DoD policy.

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