COMPARISON OF BRAIN AND TYMPANIC TEMPERATURES DURING PASSIVE HEATING AND EXERCISE IN EWES

Karen Mittleman*, Stephen Bailey*, Juan Advísis§, and Denise Smithy

*Department of Exercise Science & Sport Studies, Rutgers University, New Brunswick, NJ USA
§Department of Animal Science, Rutgers University, New Brunswick, NJ USA
§Human Performance Laboratory, Skidmore College, Saratoga Springs, NY USA

INTRODUCTION

Tympanic temperature (Tty) is considered a valid index of brain temperature (1). However, several researchers have questioned its validity as a measure of brain temperature because it may be significantly influenced by ambient temperature (2, 3). In spite of this controversy, use of a portable, noninvasive, infrared thermometer to assess tympanic temperature has become widespread. Although infrared thermometry has been validated against other indices of core temperature during hypothermic conditions in humans (4), comparison of infrared thermometry to direct assessment of brain temperature has not been made. Furthermore, whether infrared Tt may provide a better index of elevated brain temperature when ambient temperature is held constant is unknown. Therefore, the purpose of the present investigation was to compare Tty using infrared thermometry with brain temperature (Tbr) during exercise and passive heating in ewes.

METHODS

Three adult Dorset ewes were chronically implanted with a multiple guide cannula assembly attached to the skull. Using roentgenograms, we determined the specific guide cannula for placement of a copper-constantan thermocouple into the 3rd ventricle for assessment of brain temperature (5). Tbr was validated against other indices of core temperature during hypothermic conditions in humans (4). In spite of this controversy, use of a portable, noninvasive, infrared thermometer to assess tympanic temperature has become widespread. Although infrared thermometry has been validated against other indices of core temperature during hypothermic conditions in humans (4), comparison of infrared thermometry to direct assessment of brain temperature has not been made. Furthermore, whether infrared Tt may provide a better index of elevated brain temperature when ambient temperature is held constant is unknown. Therefore, the purpose of the present investigation was to compare Tty using infrared thermometry with brain temperature (Tbr) during exercise and passive heating in ewes.

RESULTS

Data for all temperature measurements during passive heating and exercise are shown in Figure 1. During passive heating, Tbr did not change during heat exposure and increased during recovery. In contrast both measures of Tt increased during heat exposure and decreased during recovery. Tbr was not correlated to Tty1 (r = 0.20) or Tty2 (r = 0.28) (p > 0.05). During exercise a rise in temperature was observed for all 3 sites, however correlation coefficients between Tbr and Tty1 (r = 0.28) and Tty2 (r = 0.16) were not significant (p > 0.05). When comparing the two brands of infrared thermometers, Tty1 was significantly correlated to Tty2 during both passive heating (r = 0.86) and exercise (r = 0.82), although the values recorded from the Thermoscan®PRO-1 (Tty1) were consistently lower than the values recorded by the FirstTemp®Genius™ (Tty2).
Figure 1: Time course of $T_{br}$ (■), $T_{ty1}$ (●), and $T_{ty2}$ (○) responses (mean ± SEM) prior to (pre), during, and following (post) passive heating (left) and treadmill exercise (right) in 3 ewes.

CONCLUSIONS

Using an in vivo animal model, tympanic temperature measured by infrared thermometry is poorly correlated to direct measurement of brain temperature (3rd ventricle) during both passive heating and exercise. Whether $T_{ty}$ assessed by other techniques may more closely index $T_{br}$ or whether $T_{br}$ is related to other measures of core temperature (e.g., $T_{re}$, $T_{hR}$) remain to be determined.

REFERENCES


