Annals Physiol. Anthrop. Vol 5. No. 3 1986

13 The effect of enhanced respiratory heat loss on exercising subjects under heat stress

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This study was designed to explore the contribution of the respiratory system to body heat balance during exercise under hot (37.7°C) and humid (90 - 95% RH) environmental conditions. Eight male subjects cycled twice at 45 50% of their maximum workrate until exhaustion, In random order, they inspired either cool (3.6k 6.4°C) or ambient air. The expired air temperature was **20.2 + 6.5**°C and 38.1 ± 0.6°C under cool and hot air inspiration, respectively. During cool air inspiration the expired air was 40 - 50% saturated with water vapor while during ambient air inspiration the expired air was almost fully saturated (90 - 100% RH). Analysis by partial calorimetry indicated that under ambient air inspiration 89% of the total heat loss occurred via sweat evaporation and 11% through respiration. Comparison with cool air inhalation treatment showed that Respiratory Heat **Loss** (RHL) accounted for 55% of the total heat loss while sweat evaporation made up the remaining 44%. This change in proportion was mediated by an 8.3-fold increase in RHL during cool air inhalation. Mean body temperature was calculated from partial calorimetry and the prediction equation of Hardy and Dubois (1937) based on changes of skin and core temperature. Both methods of analysis showed that a diminished elevation of the mean body temperature of 0.4OC occurred by increasing RHL eightfold during 23 minutes of exercise while breathing cool air. However, only 45% ***01*** the diminished elevation of mean body temperature was directly attributed to the increased RHL.

Data from this investigation suggest that the respiratory system is an important component in the human body heat balance during wol gas inhalation during work in a hot alien environment. This idea has implications in vocations such as mining and foundry labour.