

Thermal and Fluid Balance in Competitive Cycling

Fox, N., Burns, D. DeSales University, Center Valley, PA

nf9901@desales.edu, Doug.Burns@desales.edu

PURPOSE: Unlike in a laboratory, air flow during cycling competition is affected by the athlete's position relative to other racers. The purpose of this study was to examine the contributions of evaporative and conductive/convective cooling during race conditions. **METHODS:** Nine professional or Category I male cyclists who competed in summer evening criterium races volunteered to participate in data collection during a race. Prior to racing, the cyclist voided his bladder, and his unclothed body weight was determined to ± 5 g. Heat flow was recorded every 5 s during the race from two sensors attached to the left upper chest and back. Speed, temperature and humidity of the air flowing past the rider was recorded every 5 s during the race by a miniature weather logger attached to the bicycle handlebar. The weight of the cyclist's dry clothing and hydrant bottles were recorded. Following the race, the weight of the cyclist, his clothing, and remaining hydrant were recorded. The rider voided his bladder and the weight of urine was recorded. Regional sweat samples were collected from patches on the right upper back and chest for later analysis of electrolyte content. **RESULTS:** Race time averaged 1:09:41 at a ground speed of 42.3 Km/hr and air speed of 25.1 Km/hr. Riders averaged 1.704 ± 0.409 Kg (SD) fluid loss as evaporated sweat, equivalent to 3852 ± 923 KJ of heat loss. Skin heat loss averaged 435.1 ± 116.0 W generating a loss of 1824 ± 496 KJ over the course of the race. Evaporative heat loss was 67.6 ± 8.7 % and convective/conductive loss was 32.4 ± 8.7 % of total heat loss. Total sweat loss averaged 1.96 ± 0.43 L carrying with it 2.00 ± 0.89 g Na^+ and 0.29 ± 0.11 g K^+ . Neither evaporative nor conductive/convective heat losses correlated with air speed, temperature or humidity ($r < 0.6$). **CONCLUSIONS:** Despite moving through the air much faster than other endurance athletes, racing cyclists still depend largely on evaporative loss in warm weather. Fluid loss in excess of 2% of body mass occurred even in this relatively short race. Racers need to replenish fluids during the race to prevent dehydration, especially in races of several hours in length.