TACSM Abstract

Dehydration and Resistance Exercise Increased Muscle and Immune Cell Oxidative Stress in Trained Men

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ABSTRACT

Dehydration induced osmotic stress and resistance exercise (RE) independently increase reactive oxygen species (ROS) could lead to cellular stress in skeletal muscle (SkM) and peripheral blood mononuclear cells (PBMCs). The proper cellular function of SkM and PBMCs is critical to SkM recovery upon damage. Moreover, increased circulatory ROS can stress vascular endothelium, impacting nutrient delivery to tissues. **PURPOSE**: To examine the combination of dehydration and single RE bout-induced [H_2O_2] in SkM, PBMCs, and in circulation in RE-trained men. **METHODS**: RE-trained men (n=11, 21±1yr, height: 175.9±6.2cm, body weight: 79.2±12.3kg, 18.4±6.7%fat) completed two identical RE bouts either hydrated (Urine specific gravity [USG] <1.020) or following a 24hr fluid restriction (USG ≥1.020). RE consisted of bilateral leg press and knee extensions (5 sets x 10 repetitions at 80% of 1 repetition maximum). The two conditions were conducted 2-3 weeks apart. Plasma osmolality (PO) was measured at PRE. SkM (vastus lateralis), PBMCs, and serum samples were collected before the RE bout (PRE) and 1hr and 3hr after RE and [H_2O_2] were measured. **RESULTS**: PO was significantly ($p \leq 0.05$) greater in DE (298.6±1.5mmol/kg, $p<0.0001$) compared to EU (285.9±1.2mmol/kg). For [H_2O_2], no condition x time interaction effect was observed in SkM, PBMCs, or in circulation. [H_2O_2] was greater in the DE vs. EU condition in SkM (DE: 1.17±0.07mM vs. EU: 0.88±0.06mM; $p<0.0001$) and PBMCs (DE: 1.03±0.03mM vs. EU: 0.87±0.03mM; $p=0.002$). [H_2O_2] increased from PRE (SkM: 0.85±0.07mM, PBMCs: 0.72±0.04mM) to 1hr (SkM: 1.03±0.08mM; $p=0.050$, PBMCs: 0.94±0.02mM; $p<0.0001$) and 3hr (SkM: 1.19±0.08mM; $p<0.0001$, PBMCs: 1.16±0.04mM; $p<0.0001$) in SkM and PBMCs. There was a further increase from 1hr to 3hr ($p<0.0001$) in PBMCs. No significant time or condition effects were observed for serum [H_2O_2]. **CONCLUSION**: Completing a bout of RE in a dehydrated state resulted in greater intracellular (SkM and PBMCs), but not circulating, ROS than in a hydrated state. This suggests that RE with adequate hydration could reduce intracellular stress. Despite a lack of circulating ROS in young adults, future research is needed to investigate whether individuals who experience chronic hypohydration (e.g., older adults) would have greater intracellular and systemic ROS.