**HIGH-INTENSITY EXERCISE DECREASES MUSCLE BUFFER CAPACITY VIA A DECREASE INTRACELLULAR PROTEIN BUFFERING IN HUMAN SKELETAL MUSCLE**

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We have previously reported a significant decrease in intracellular buffer capacity (Bm) following an acute bout of high-intensity exercise (45 s at 200% VO₂max) [1]. While we were unable to determine the mechanisms underlying this result, it is likely to be due to changes in the intracellular buffers that are measured using the in-vitro titration technique (i.e., phosphates, proteins and dipeptides). The aim of this study therefore, was to identify which intracellular buffers are affected by acute exercise and to investigate the effects of sex and training status on these changes.

Whole muscle and non-protein Bm were measured in well-trained, male team-sport athletes (n= 8, VO₂max = 55.6 +/- 5.5 mL/kg/min) before and after a 5-wk training program. In addition, we sought to verify our previous findings in both moderately-trained females (n=8, VO₂max: 45.4 +/- 4.1 mL/kg/min) and well-trained endurance athletes (n=6, VO₂max: 59.8 +/- 5.8 mL/kg/min). Biopsies of the vastus lateralis were obtained at rest and immediately after either a repeated-sprint test (team-sport athletes), 45 s at 200% VO₂max (moderately-trained females) or time-to-fatigue at 120% VO₂max (endurance athletes). Bm was determined in whole and deproteinized homogenates by repeatedly titrating over the pH range of 7.0-6.0 with 0.01 M HCl [3].

High-intensity exercise was associated with a significant decrease in Bm in moderately-trained females (-14%; 136 +/- 4 to 117 +/- 2 umol H⁺/g dw/pH; P<0.05), endurance trained males (-6%; 146 +/- 4 to 138 +/- 3 umol H⁺/g dw/pH; P<0.05) and in team-sport athletes both before (-6%; 147 +/- 4 to 138 +/- 3 umol H⁺/g dw/pH; P<0.05) and after training (-7%; 152 +/- 5 to 142 +/- 4 umol H⁺/g dw/pH; P<0.05). These changes were consistently observed in all subjects.

There were no changes in the non-protein buffering capacity which suggests that these changes were due to a decrease in protein buffering. Furthermore, there was a strong negative correlation between the estimated protein buffer capacity and the decrease in estimated protein buffer capacity following exercise (r=0.84; P<0.05). Consistent with previous research, there was a significant increase in Bm following training [2]. There was however, no significant change in protein buffering which suggests that the improvements in Bm can largely be attributed to increases in buffering by dipeptides or phosphate. This is consistent with previous reports that training appears to elevate the muscle carnosine content [3]. Short-term training did not appear to provide a protective effect against this post-exercise decrease in Bm. In conclusion, high-intensity exercise (constant-load and repeated-sprint) decreased Bm independent of sex or training status. Furthermore, this decrease was largely explained by a decrease in protein buffering.


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