Different Protocols of Acute Exercise Induce Specific Changes in Skeletal Muscles: No evidence of Mitochondrial Biogenesis

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Introduction: Studies show that different exercise protocols lead to similar long-term adaptations that are related to increased mitochondrial content and volume through the activation of mitochondrial biogenesis, but the immediate response mechanisms to exercise are still unknown. **Objective:** Evaluate the mitochondrial physiology of permeabilized rat skeletal muscle fibres immediately after a single session of high intensity interval exercise (HIIE) or aerobic exercise (AER). **Material and Methods:** 4 months Wistar rats were divided into 3 groups: sedentary (SED), aerobic exercise (AER) and high intensity interval exercise (HIIE). The animals were sacrificed immediately after the exercise and the tibialis anterior (TA) and red gastrocnemius (RG) were extracted for analysis of high-resolution respirometry, hydrogen peroxide production (H2O2), western-blot and enzymatic activity. **Results and Discussion:** A single session of AER was able to reduce the ATP synthesis dependent oxygen flux in the TA, when stimulated by complex I and II substrates. On the other hand, there was an increase of the maximum velocity (V_{max}) for glycerol-phosphate oxidation and V_{max} and affinity (K_M) of palmitoyl-carnitine oxidation (PC). The exercise did not affect oxygen flux coupled to ATP synthesis in RG, but reduced its affinity for PC, decreasing the catalytic efficiency of oxidation for PC. Both exercise protocols were not able to change the electrons transfer system capacity of the mitochondria neither markers of mitochondrial content. The AER group had increased H_2O_2 production when compared to the SED and HIIE, being predominant the escape of electrons through reverse flux and complex III in TA, and only through complex III in RG. There was no changes in the activities of antioxidant enzymes. **Conclusions:** Mitochondria from different muscles submitted to distinct protocols exercise show alterations in the specific fluxes of substrate utilization and oxygen metabolism indicating that the dynamics of mitochondria are linked to the metabolic demand flexibilities.

Palavra-chave: exercise, muscle, mitochondria.
Fomento: CNPq, CAPES and FAPERJ.