

Exercise Leads to Increase in Smaller Lipid Droplet Morphology in Peripheral Region of Muscle Fiber

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ABSTRACT

In a previous study, we have shown that high fat overfeeding results in decreased smaller lipid droplet density in the peripheral region of skeletal muscle fiber. This decrease was associated with high fat overfeeding induced weight gain and insulin resistance. However, it is not clear whether an acute bout of exercise (elevated fat oxidation state) affects lipid droplet size. **PURPOSE:** To determine the effects of a single bout of endurance exercise on skeletal muscle lipid content and lipid droplet size. **METHODS:** Ten healthy male volunteers (Mean \pm SEM; age: 23.11 ± 0.98 ; BMI: 23.27 ± 0.50 kg/m²) participated in a single bout of endurance exercise on a cycle ergometer at 65% maximal aerobic capacity (VO_{2max}) for 1.5 - 2 hours (650 kcal). Muscle biopsies were obtained from the vastus lateralis immediately before and after exercise. Intramuscular lipid was accessed via immunohistochemistry technique and images were captured using confocal microscopy. Image analysis and lipid quantification was done using ImageJ software. **RESULTS:** One bout of long duration exercise led to an elevated fat oxidation state measured by RQ (0.94 ± 0.01 to 0.89 ± 0.008 , $p=0.003$). This long duration acute exercise did not change intramuscular lipid content (30.73 ± 2.69 to 30.23 ± 3.16 AU, $p=0.72$). However, there was a significant increase in smaller peripherally located lipid droplet density after one bout of exercise (0.58 ± 0.01 to 0.63 ± 0.02 AU, $p=0.01$). **CONCLUSION:** Exercise induced elevated lipid oxidation state is characterized by a shift in smaller lipid droplet morphology without a change in total lipid content. Future studies should investigate if smaller lipid droplet size is associated with better lipid oxidation capacity in human skeletal muscle.