Gender differences in the consumption of intramyocellular lipids (IMCL) during exercise

Project: 290

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Background: Skeletal muscles cover their energy needs from circulating and intracellular supplies. It is still unclear if gender differences exist in the utilization of these sources and to what extent intramyocellular lipids (IMCL) are used absolutely and relatively to total fat oxidation. Magnetic resonance spectroscopy offers a unique tool to follow depletion of the major intramuscular energy stores.

Purpose: Determination of IMCL before and after an endurance exercise in males (M) and females (F) as well as total fat oxidation.

Methods: 9 trained M and F exercised on a bicycle ergometer at 50 % maximal voluntary workload (Wmax) for 3 h. IMCL measurements in the M. vastus intermedius were done by a 1.5 Tesla MR-system. Oxygen uptake (VO2) and carbon dioxide production were determined by using open circuit spirometry. Fat oxidation was calculated by a formula including indirect calorimetry.

Results: IMCL levels at rest showed significant differences ($p<0.05$) between M (7.2±2.9 mmol/kg wet weight) and F (4.7±1.7 mmol/kg wet weight). During the 3 h IMCL depletion in M was also higher (4.2±1.6 mmol/kg wet weight, $p=0.001$) compared to F (1.8±0.6 mmol/kg wet weight). Relative power output [energy used/W] 4.5±0.4 vs. 4.7±0.3, heart rate [% of maximum heart rate] 71±7 vs. 75±3, oxygen uptake [% VO_{2max}] 62±7 vs.65±5, and RER (0.88 vs. 0.86) were not significantly different between M and F. The amount of fat oxidation (0.56±0.16 vs. 0.43±0.14 $g \cdot min^{-1}$) and its relative contribution to total energy used (37±9 vs. 42±14 %) in M and F, respectively, were not significantly different.

Conclusion: While all standardized parameters and the contribution of total fat were similar in both genders, IMCL levels at rest and their depletion were significantly higher in M. It can either be caused by a gender-specific substrate selection or differences in the long-term diet and training habit.