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Effects of milk protein supplementation after resistance exercise on the ubiquitin proteasome system in young and elderly

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4 • FISILOGIA DO EXERCÍCIO/EXERCISE PHYSIOLOGY

**EFFECTS OF MILK PROTEIN
SUPPLEMENTATION AFTER RESISTANCE
EXERCISE ON THE UBIQUITIN-
PROTEASOME SYSTEM IN YOUNG AND
ELDERLY**

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INTRODUCTION:

Resistance exercise and amino acid availability are positive regulators of net muscle protein balance (NB = muscle protein synthesis (MPS) minus muscle protein break down (MPB))¹. Whether a person increases muscle mass, loses muscle mass, or remains stable, is dependent on changes in NB over time. Effects of feeding and exercise on MPS are relatively well studied, but few studies have focused on changes in MPB. However, the normal increase seen in MPB after resistance exercise (RE) has been shown to be reduced by the insulin response to feeding².

PURPOSE:

The purpose of this study was to investigate the acute effects of ingesting native whey, normal whey (WPC-80), or milk on different markers of the proteolytic systems after strength exercise in young (20-45yrs) and elderly participants (70+yrs). We hypothesized that intake of native whey would reduce the MPB response after RE compared with WPC-80 and milk. Furthermore, we hypothesized that the elderly participants would have a greater activation of atrogenes (stimulators of MPB) opposed to the younger, independent of protein supplement.

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METHODS:

This study was performed as a double blinded placebo controlled crossover trial. A total of 22 younger (20-35yrs; 12 males and 10 females) and 16 older (70-82yrs; 10 males and 6 females) participants volunteered. The participants were randomized to either a whey

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group (native whey and WPC-80) or a milk group. The whey group performed the testing procedure two times, in a randomized order; one with native whey and one with WPC-80. The milk group performed the testing only once. Muscle biopsies of vastus lateralis were sampled from participants at baseline and 1, 3 and 5 hours following an acute bout of RE. To test the effect of the different supplements on recovery of force-generating capacity after RE, participants performed maximal –isometric contractions with knee extensors (IMVC-test). The biopsy samples were analyzed with Western blotting with antibodies against ubiquitin and regulators of the ubiquitin-proteasome system (UPS).

RESULTS:

The analyses in this study are not completed. Analyses to be performed will be total ubiquitination and regulators of the UPS (atrogin-1 and MuRF1). Furthermore, translocation of FoxO3a (necessary for upregulation of atrogin-1 and MuRF1) will be analyzed. Preliminary results from the IMVC-test show that force-generating capacity of knee extensors was reduced by ~15% in young and elderly during RE, and gradually towards baseline levels the next day. There were no differences in recovery at 24 h between the younger groups (milk: 91%, WPC-80: 96%, and native whey: 95% of baseline). For the elderly groups there was a tendency ($p=0.078$) towards faster recovery with native whey compared to WPC-80 (milk: 95%, WPC-80: 91%, and native whey: 96% of baseline).

DISCUSSION:

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Based on a pilot study where we compared the absorption kinetics of amino acids and insulin response after intake of different whey fractions, intake of native whey may have more positive effect on MPB compared with WCP-80 and milk³. Studies have shown that there are no differences in basal MPB between younger and older. However, the normal inhibition of MPB by insulin seems to be reduced in the elderly⁴. Consequently, in this study we expect that the regulators of the UPS are more activated in the elderly group compared to the younger group.

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