

Concurrent Session 12

Resistant starch attenuates colonic DNA damage induced by dietary whey, soy and casein in rats

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Background - A previous study using rats demonstrated that high levels of dietary casein resulted in increased levels of colonic DNA damage and a reduced thickness of the colonic mucus barrier in the absence of resistant starch.

Objective - This study aimed to establish whether diets high in different forms of proteins, whey and soy proteins, would cause a similar increase in colonic DNA damage to that of casein, and whether inclusion of resistant starch in the diet would protect against such damage.

Design - Male Sprague Dawley rats (~200 g) were fed a diet containing 15% or 25% casein, whey and soy each with or without 48% high amylose starch (*Hi-maize*TM), and after four weeks rats were anaesthetised and tissues and gut contents were collected for measurements of colonic mucus thickness, DNA damage (comet assay) and short chain fatty acids.

Outcomes - In the absence of high amylose maize starch, high levels of dietary casein significantly increased the damage to colonocyte DNA compared with a low casein diet (comet tail moments for 15% vs. 25% casein; 388 ± 24 vs. 791 ± 54). In comparison, rats fed low levels of whey had similar levels of DNA damage to the low casein diet but the increase in DNA damage by the high dose was not as great for whey as it was for casein (tail moments for 15% vs. 25% whey; 357 ± 22 vs. 448 ± 25). However, DNA damage by the low soy diet was greater than for either the low dose casein or whey diets. High soy diets resulted in a large increase in DNA damage relative to the low dose (tail moments for 15% vs. 25% whey; 471 ± 51 vs. 997 ± 115). Addition of resistant starch to the diet increased the caecal and faecal SCFA pools and either fully (casein and whey) or partially (soy) abolished the increased DNA damage induced by the high levels of dietary protein, suggesting protection against genotoxic agents.

Conclusions - Different types of dietary proteins can have different effects on levels of colonic DNA damage and hence may represent different risks for development of colorectal cancer. Addition of resistant starch in the diet reduced protein-induced colonic DNA damage.

Whey protein supplementation and resistance training to enhance muscle growth in young and older adults

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Background - A major cause of age-related disabilities is progressive loss of skeletal muscle mass (sarcopenia). Protein ingestion and strength exercise have both been reported to increase protein synthesis through signalling cascades resulting in ribosomal activation via activating key components of the translation initiation complex. The extent at which supplemental protein ingestion and strength exercise training activate translation initiation in young and older individuals is poorly understood.

Objective - To determine whether whey protein isolate (WPI) consumed immediately after supervised strength-training exercise in younger and older men increases translation initiation activation.

Design - Skeletal muscle biopsy samples were taken from the thigh (*vastus lateralis*) from young (n=15) and older (n=15) men, after a single bout of exercise (untrained) and again following 12 weeks supervised resistance training with repeated WPI (25 g) or placebo supplementation. The anabolic response was measured by the increase in knee extensor strength, the activation of key translation initiation proteins and expression of genes regulating muscle hypertrophy/atrophy.

Outcomes - WPI supplementation significantly increased eccentric strength after training (25% greater than placebo) in young ($P = 0.03$), but not in older adults. Older participants consuming the WPI supplement demonstrated greater phosphorylation of the translational factor p70-S6K1 after 12 weeks training (2.9 fold increase, $P = 0.03$), when compared to the placebo group. This effect was not observed in the younger groups. Following exercise training older adults consuming WPI resulted in a 17.3 fold increase in Pax7 gene (marker of satellite cell activation) compared to a 2.6 fold increase in the placebo group post training. Only a small increase in Pax7 gene expression was observed in the young groups, with a 2.6 fold increase in the protein group and 1.9 fold increase in the placebo group.

Conclusions - These findings provide molecular evidence of enhanced activation of translation initiation with combining WPI intake and chronic resistance training in older participants. There were no beneficial actions of WPI on p70-S6K1 activation in young male subjects. Analysis of additional translation initiation factors and myogenic genes is ongoing.