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Vegan and Omnivorous High Protein Diets Support Comparable Daily Myofibrillar Protein Synthesis Rates and Skeletal Muscle Hypertrophy in Young Adults

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Background: It remains unclear whether non-animal-derived dietary protein sources (and therefore vegan diets) can support resistance training-induced skeletal muscle remodeling to the same extent as animal-derived protein sources.

Methods: In Phase 1, 16 healthy young adults (m = 8, f = 8; age: 23 ± 1 y; BMI: 23 ± 1 kg/m^2) completed a 3-d dietary intervention (high protein, 1.8 g·kg bm^{-1}·d^{-1}) where protein was derived from omnivorous (OMNI1; n = 8) or exclusively non-animal (VEG1; n = 8) sources, alongside daily unilateral leg resistance exercise. Resting and exercised daily myofibrillar protein synthesis (MyoPS) rates were assessed using deuterium oxide. In Phase 2, 22 healthy young adults (m = 11, f = 11; age: 24 ± 1 y; BMI: 23 ± 0 kg/m^2) completed a 10 wk, high-volume (5 d/wk), progressive resistance exercise program while consuming an omnivorous (OMNI2; n = 12) or non-animal-derived (VEG2; n = 10) high-protein diet (~2 g·kg bm^{-1}·d^{-1}). Muscle fiber cross-sectional area (CSA), whole-body lean mass (via DXA), thigh muscle volume (via MRI), muscle strength, and muscle function were determined pre, after 2 and 5 wk, and postintervention.

Objectives: To investigate whether a high-protein, mycoprotein-rich, non-animal-derived diet can support resistance training-induced skeletal muscle remodeling to the same extent as an isonitrogenous omnivorous diet.

Results: Daily MyoPS rates were ~12% higher in the exercised than in the rested leg (2.46 ± 0.27%·d^{-1} compared with 2.20 ± 0.33%·d^{-1} and 2.62 ± 0.56%·d^{-1} compared with 2.36 ± 0.53%·d^{-1} in OMNI1 and VEG1, respectively; $P < 0.001$) and not different between groups ($P > 0.05$). Resistance training increased lean mass in both groups by a similar magnitude (OMNI2 2.6 ± 1.1 kg, VEG2 3.1 ± 2.5 kg; $P > 0.05$). Likewise, training comparably increased thigh muscle volume (OMNI2 8.3 ± 3.6%, VEG2 8.3 ± 4.1%; $P > 0.05$), and muscle fiber CSA (OMNI2 33 ± 24%, VEG2 32 ± 48%; $P > 0.05$). Both groups increased strength (1 repetition maximum) of multiple muscle groups, to comparable degrees.

Conclusions: Omnivorous and vegan diets can support comparable rested and exercised daily MyoPS rates in healthy young adults consuming a high-protein diet. This translates to similar skeletal muscle adaptive responses during prolonged high-volume resistance training, irrespective of dietary protein provenance. This trial was registered at clinicaltrials.gov as NCT03572127.