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Consumption of whole eggs promotes greater stimulation of postexercise muscle protein synthesis than consumption of isonitrogenous amounts of egg whites in young men

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Abstract

Background: Protein in the diet is commonly ingested from whole foods that contain various macro- and micronutrients. However, the effect of consuming protein within its natural whole-food matrix on postprandial protein metabolism remains understudied in humans.

Objective: We aimed to compare the whole-body and muscle protein metabolic responses after the consumption of whole eggs with egg whites during exercise recovery in young men.

Design: In crossover trials, 10 resistance-trained men [aged 21 ± 1 y; 88 ± 3 kg; body fat: 16% ± 1% (means ± SEMs)] received primed continuous L-*[ring-²H₅]*phenylalanine and L-[1-¹³C]leucine infusions and performed a single bout of resistance exercise. After exercise, participants consumed intrinsically L-[5,5,5-²H₃]leucine-labeled whole eggs (18 g protein, 17 g fat) or egg whites (18 g protein, 0 g fat). Repeated blood and muscle biopsy samples were collected to assess whole-body leucine kinetics, intramuscular signaling, and myofibrillar protein synthesis.

Results: Plasma appearance rates of protein-derived leucine were more rapid after the consumption of egg whites than after whole eggs (*P* = 0.01). Total plasma availability of leucine over the 300-min postprandial period was similar (*P* = 0.75) between the ingestion of whole eggs (68% ± 1%) and egg whites (66% ± 2%), with no difference in whole-body net leucine balance (*P* = 0.27). Both whole-egg and egg white conditions increased the phosphorylation of mammalian target of rapamycin complex 1, ribosomal protein S6 kinase 1, and eukaryotic translation initiation factor 4E-binding protein 1 during postexercise recovery (all *P* < 0.05). However, whole-egg ingestion increased the postexercise myofibrillar protein synthetic response to a greater extent than did the ingestion of egg whites (*P* = 0.04).

Conclusions: We show that the ingestion of whole eggs immediately after resistance exercise resulted in greater stimulation of myofibrillar protein synthesis than did the ingestion of egg whites, despite being matched for protein content in young men. Our data indicate that the ingestion of nutrient- and protein-dense foods differentially stimulates muscle anabolism compared with protein-dense foods. This trial was registered at clinicaltrials.gov as [NCT03117127](https://clinicaltrials.gov/ct2/show/study/NCT03117127).

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