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ORIGINAL RESEARCH COMMUNICATION

Inadequate protein intake affects skeletal muscle transcript profiles in older humans [1,2,3]

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Background: Inadequate dietary protein intake causes adverse changes in the morphology and function of skeletal muscle. These changes may be reflected in early alterations in muscle messenger RNA levels.

Objective: This study assessed whether inadequate protein intake differentially affects skeletal muscle transcript concentrations and expression profiles in older adults.

Design: Twenty-one older men and women (aged 55–80 y) consumed controlled diets that provided 1.2 g protein · kg^{-1} · d^{-1} (adequate protein) for 1 wk and then were randomly assigned to consume either 0.5 g protein · kg^{-1} · d^{-1} [inadequate protein (IP) group; n = 11] or 1.2 g protein · kg^{-1} · d^{-1} (control group; n = 10) for a second week. RNA was isolated from fasting-state vastus lateralis biopsy samples obtained at the end of each period, and transcript levels in the IP group were measured by using microarray anlysis. Changes in selected transcript levels were confirmed by real-time polymerase chain reaction in both groups.

Results: Analysis of variance showed 529 differentially expressed transcripts (P < 0.05) after inadequate protein intake. Using the false discovery rate (FDR) correction to adjust for multiple comparisons, we observed that 85 transcripts were differentially expressed: 54 were up-regulated and 31 were down-regulated. The differentially expressed transcripts were in functional classes for immune, inflammatory, and stress responses (predominantly up-regulated); contraction, movement, and development (up-regulated); extracellular connective tissue (up-regulated); energy metabolism (down-regulated); protein synthesis (down-regulated); and proliferation (down-regulated). Diet-related differences in the expression of 9 transcripts were cross-validated by using real-time polymerase chain reaction.

Conclusion: The results document changes in skeletal muscle transcript levels induced by short-term inadequate protein intakes in older humans that might precede adverse metabolic, functional, and structural events, including muscle wasting.

Key Words: Dietary protein • aging • skeletal muscle • transcript profile • microarray • gene expression

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