Last Word on Viewpoint: What is the relationship between the acute muscle protein synthetic response and changes in muscle mass?

Cameron J. Mitchell,1 Tyler A. Churchward-Venne,2 David Cameron-Smith,1 and Stuart M. Phillips3

1Liggins Institute, University of Auckland, Auckland, New Zealand; 2Department of Human Movement Sciences, NUTRIM School for Nutrition, Toxicology and Metabolism, Maastricht University Medical Centre, Maastricht, The Netherlands; and 3Exercise Metabolism Research Group, Department of Kinesiology, McMaster University, Hamilton, Ontario, Canada

TO THE EDITOR: We would like to thank all of the eminent scientists who provided commentaries (see Ref. 1) on our recent Viewpoint article (4). Several important points were brought up in the commentaries that warrant further comment. The technical challenge of measuring both muscle protein synthesis (MPS) and breakdown simultaneously in the same individual is a major limitation that precludes us from making statements about the effects of exercise and nutritional manipulations on net balance of myofibrillar proteins. However, we are highly confident that acute measures of MPS and changes in this variable (not muscle protein breakdown) are the primary influential factor affecting tissue remodelling and that measurement of only MPS does not mean we lack essential information as a measure of muscle anabolism. Support for our position, as reflected in our Viewpoint article, can be seen in the situations where MPS aligns with the relative long-term anabolic effect of different exercise and nutritional manipulations.

Many of the commentaries also brought up methodological considerations; it is vital to acknowledge that variation in acute measurement parameters and variations in lifestyle during resistance training could have a profound effect on the relationship between acute measurements of MPS and long-term adaption. There is no agreement between labs for the optimal FSR measurement conditions to truly capture the anabolic or remodelling response after a bout of resistance exercise. The timing and length of the measurements and the tissue fractions examined all play an important role, but the ideal parameters are debatable. It is also possible that variation in training-induced muscle hypertrophy due to lifestyle factors such as differences in diet, sleep, or physical activity could obscure relationships between acute responses of MPS and hypertrophy. However, we feel that it is unlikely that lifestyle factors are solely responsible for the lack of observed relationship (8).

The rapid adaptation of exercise-naive individuals to resistance training also deserves further comment, and we acknowledge that habituation to an exercise stimulus is rapid. For example, Murton et al. (5) recently demonstrated that the transcriptional response to the first bout of resistance training is drastically different and more variable between individuals compared with subsequent bouts. In addition, measures such as FSR also adapt rapidly to repeated bouts of exercise; however, the early time course of these adaptations is less well established (7). Conversely, the satellite cell response after an acute bout of exercise does not appear to differ markedly even after 16 weeks of training (2, 3). Regardless of the exact measurement used it is important to understand how repeated exercise bouts effect the response to an acute bout of exercise. Although acute measurements of MPS provide a useful measurement of potential anabolic effects of differential exercise and nutritional manipulations, it is clear that in their current form they are not related to individual variation in the muscle hypertrophic response with resistance exercise training. The development of longer term measurement strategies to assess cumulative MPS under “free-living” conditions (6) combined with “omic” technologies would, we hypothesize, help to explain the marked interindividual variability in the hypertrophic response to prolonged resistance training.

DISCLOSURES

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AUTHOR CONTRIBUTIONS


REFERENCES


Address for reprint requests and other correspondence: S. M. Phillips, The Dept. of Kinesiology, McMaster Univ., 1280 Main St. West, Hamilton Ontario L8S 4L8, Canada (e-mail: phillis@mcmaster.ca).