British Journal of Nutrition (2016), **116**, 569–570

Letter to the Editor

Exceptional body composition changes attributed to collagen peptide supplementation and resistance training in older sarcopenic men

(First published online 6 June 2016)

The results reported by Zdzieblik *et al.*[1], on gains in fat-free mass (FFM: mean 4·2 (SD 3·3) kg) and loss of body fat (mean −5·5 (SD 3·2) kg) in older sarcopenic men receiving 15 g/d of collagen peptides while resistance training for 12 weeks, are extraordinary. The algebraic difference between the collagen peptide-supplemented and placebo groups in terms of FFM reported by Zdzieblik *et al.*[1] was approximately 1·3 kg, which is 2·7 and 5·6 times greater than the standardised mean differences reported in meta-analyses from Cermak *et al.*[2] and Finger *et al.*[3], which examined the impact of protein supplementation on resistance exercise-induced gains in FFM. Neither meta-analysis reported an impact of protein supplementation on loss of fat mass.

We note that the 4·2 kg gain in FFM in the collagen peptide-supplemented group is unrivalled by any study of protein supplementation in older resistance training sarcopenic men[2,3]. One study, in which men with COPD received 100 mg of testosterone enanthate (injected weekly), comes close to the findings of Zdzieblik *et al.*[1], but in this study men receiving testosterone and performing resistance training gained only 3·3 kg of FFM and lost 1·1 kg of fat mass[4]. Were the observed changes[1] in whole-body FFM representative of skeletal muscle tissue or are changes in other tissues responsible for the greater gains in whole-body FFM?

The constituent amino acid content and protein dose (15 g/d) of collagen peptides ingested contained only 0·4 g of leucine and 1·7 g of arginine, which stimulate muscle protein synthesis and blood flow, respectively[1]; however, this dose of leucine would have been insufficient to induce any effect on muscle protein synthesis[5,6]. In addition, 1·7 g of arginine would not have affected blood flow[6,7]. In their study, Zdzieblik *et al.*[1] proposed that the provision of collagen peptides could enhance creatine synthesis. We find this proposition unlikely given the daily provision of only 1·7 g of arginine and 3·3 g of glycine, as there is no evidence that muscle creatine production is substrate-limited. If this thesis were true, then supplemental protein from almost any source (containing similar quantities of arginine and glycine) would promote the same gains in muscle mass and this has not been seen[2,3].

Collagen peptide-supplemented subjects lost a reported 5·5 kg of fat mass. This loss of fat mass, in 12 weeks, is approximately 80 % of that seen in older men following a hypoenergetic diet (−3138 kJ/d) (−750 kcal/d) or −3·1 MJ/d) while exercising for 6 months[8]. There is no obvious mechanism for the magnitude of loss of fat mass. It is notable that neither meta-analysis of protein supplementation in older persons during resistance training reported an effect on fat mass loss[2,3].

In sum, the changes in body composition in these sarcopenic older men, who exercised three times weekly for 12 weeks and consumed 15 g of collagen peptides, are remarkable[1]. We find little in the way of plausible mechanistic evidence to suggest that either leucine and arginine or arginine and glycine, to allow the synthesis of muscle creatine, could be responsible for such changes. The simultaneous substantial loss of fat mass in these subjects, of a magnitude on par with that seen in much longer weight loss trials, is similarly noteworthy and deserves more explanation than is given by the authors in their article.

Acknowledgements

All authors contributed to the drafting and editing of this letter and all agreed on the final content.

S. M. P. reports having received grants, honoraria for speaking and expenses for travel from the US National Dairy Council and a grant from Pepsico. D. P.-J. has received research grant support from The Beef Checkoff and the National Dairy Council and compensation for advisory roles with The Beef Checkoff, the National Dairy Council and the Egg Nutrition Center. L. J. C. v. L. reports having received consulting fees from Nutricia.

All other authors report no conflicts of interest, financial or otherwise.

Stuart M. Phillips[1], Kevin D. Tipton[2], Luc J. C. van Loon[3], Lex B. Verdijk[3], Douglas Paddon-Jones[4] and Graeme L. Close[5]

[1]*Department of Kinesiology, McMaster University*
Hamilton, ON, Canada L8S 4K1

[2]*Health and Exercise Sciences Research Group*
Faculty of Health Sciences and Sport
University of Stirling, Stirling FK9 4LA, UK

[3]*Department of Human Biology and Movement Sciences*
School of Nutrition and Translational Research in
Metabolism (NUTRIM), Maastricht University
6200 MD Maastricht, The Netherlands

[4]Department of Nutrition and Metabolism
University of Texas Medical Branch
Galveston, TX 77555-1144, USA

[5]Research Institute for Sport and Exercise Sciences
Liverpool John Moores University
Liverpool L3 5UA, UK

email phillis@mcmaster.ca

doi:10.1017/S000711451600221X

References

1. Zdzieblik D, Oesser S, Baumstark MW, *et al.* (2015) Collagen peptide supplementation in combination with resistance training improves body composition and increases muscle strength in elderly sarcopenic men: a randomised controlled trial. *Br J Nutr* **114**, 1237–1245.
2. Cermak NM, Res PT, de Groot LC, *et al.* (2012) Protein supplementation augments the adaptive response of skeletal muscle to resistance-type exercise training: a meta-analysis. *Am J Clin Nutr* **96**, 1454–1464.
3. Finger D, Goltz FR, Umpierre D, *et al.* (2015) Effects of protein supplementation in older adults undergoing resistance training: a systematic review and meta-analysis. *Sports Med* **45**, 245–255.
4. Lewis MI, Fournier M, Storer TW, *et al.* (2007) Skeletal muscle adaptations to testosterone and resistance training in men with COPD. *J Appl Physiol (1985)* **103**, 1299–1310.
5. Moore DR, Churchward-Venne TA, Witard O, *et al.* (2015) Protein ingestion to stimulate myofibrillar protein synthesis requires greater relative protein intakes in healthy older versus younger men. *J Gerontol A Biol Sci Med Sci* **70**, 57–62.
6. Tang JE, Lysecki PJ, Manolakos JJ, *et al.* (2011) Bolus arginine supplementation affects neither muscle blood flow nor muscle protein synthesis in young men at rest or after resistance exercise. *J Nutr* **141**, 195–200.
7. Churchward-Venne TA, Cotie LM, MacDonald MJ, *et al.* (2014) Citrulline does not enhance blood flow, microvascular circulation, or myofibrillar protein synthesis in elderly men at rest or following exercise. *Am J Physiol Endocrinol Metab* **307**, E71–E83.
8. Frimel TN, Sinacore DR & Villareal DT (2008) Exercise attenuates the weight-loss-induced reduction in muscle mass in frail obese older adults. *Med Sci Sports Exerc* **40**, 1213–1219.