From cell to society: a nutritional intervention to offset the age-related loss in lean tissue mass

Society is aware of obesity. Defined by the WHO, obesity is an abnormal or excessive fat accumulation that may impair health. A 40y person with normal BMI will progress to obesity at 70y through an annual gain in body mass of ~ 1.2 kg. Our recent body composition data indicate that body mass is likely to underestimate the gain in fat mass because, from the 4th decade of life onwards, a commensurate annual loss of lean tissue (muscle) mass ~ 0.5-1kg occurs. This age-related loss of lean tissue mass is termed sarcopenia. A ‘silent’ disease, society remains largely unaware of sarcopenia and related health risk.

Our primary research focus is an understanding of the mechanism(s) by which nutrition and physical activity interact to regulate lean tissue mass, principally skeletal muscle. From a nutritional perspective, we employ cell-based studies of muscle tissue in vitro to inform how protein and other nutrients, present following digestion and absorption in the circulation in vivo, influence muscle protein synthesis (MPS) and regulate muscle tissue mass. It is now understood that a protein containing meal shifts the balance towards a higher rate of protein synthesis in muscle tissue (MPS) rather than breakdown (MPB). Given that we eat 3 main meals per day that’s ~1000 opportunities per annum to prevent or delay the onset of sarcopenia!

But how much protein should we eat per meal? Again, it is reasonably well accepted that about 30g of protein is ‘optimal’ for most adults. However, a principal finding from the analysis of ‘habitual’ dietary intake indicates only 1 (i.e. dinner) out of the 3 main meals per day contains an optimal amount of protein. Breakfast and lunch are normally deficient. So, most of us are losing the opportunity to optimally regulate protein synthesis by about 2/3 of what is possible! The proposed solution was to use the information gained from our cell-based studies to formulate a supplement added to the subject’s diet at breakfast and lunch and thereby optimize MPS at every meal of the day (Fig. 1).

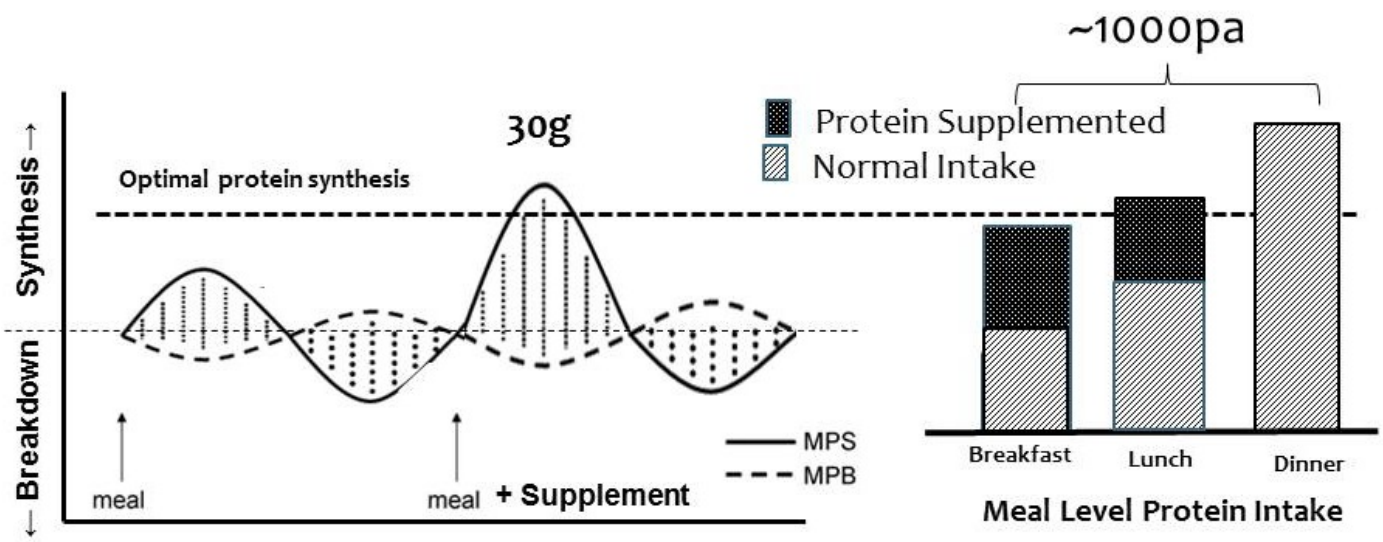

Fig. 1.

Of course, the proof of the pudding is in the eating, so we recruited a sample of older men and women (50 to70y) to undertake a randomized, placebo-controlled intervention. The subjects were given foil sachets containing a supplement to add to their normal breakfast and lunch. We disguised the samples using flavouring so that subjects did not know whether they received the placebo (that contained the same amount of energy, but no protein) or the milk-based protein formulation. Encouragingly, the results were positive. Those who consumed a meal-level supplement of a milk-based protein for 6 months maintained a net gain in whole body lean tissue mass of +0.6kg compared to those who received only the extra energy but no protein. This magnitude of change in lean tissue mass is enough to offset the age-related change in lean tissue mass and delay the onset of sarcopenia.

The priority now is to educate and inform society!

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Publication

Protein Supplementation at Breakfast and Lunch for 24 Weeks beyond Habitual Intakes Increases

Whole-Body Lean Tissue Mass in Healthy Older Adults.
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