



Academic review of optimal protein intake, sustainable dietary sources and the effect on appetite in ageing adults.



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Funding: this work is a part of the ‘Protein for life: onwards focused dietary framework for healthy ageing’ project, funded by the ‘Priming Food Partnership’ initiative supported by four UK’s councils: BBSRC, MRC, EPSRC and ESRC [Grant No: BB/P023886/1].





Introduction

- In the UK, it is projected that **by 2035 the majority of the population will be aged 40 or older.**¹
- Aside from financial implications, **dietary guidance is needed to maintain or improve the health and wellbeing** of those in this cohort.
- **Adequate intake of protein** is one of the key nutritional factors to maintain independence, by **preventing loss of muscle mass and strength** (sarcopenia), frailty and associated comorbidities in later life.²⁻⁴
- Due to health and environmental implications of animal proteins production, **more sustainable sources should be encouraged**, such as plant proteins.
- At present, both **academia and the food industry are failing to identify and address the needs of this ageing population**, with affordable, palatable and practical food solutions.

Review's aims

1. To summarise evidence regarding the **optimal quantity** and **daily distribution** of protein intake in ageing adults.
2. To present current knowledge about **sustainable proteins intake** in the **context of appetite control**.
3. To identify **areas for future research** and challenges in introducing novel food solutions to consumers.

¹ OFFICE FOR NATIONAL STATISTICS (ONS). Population Ageing in the United Kingdom, its Constituent Countries and the European Union. (2012).

² WOLFE RR. (2012). The role of dietary protein in optimizing muscle mass, function and health outcomes in older individuals. *Br J Nutr*, 108 Suppl 2:S88-93.

³ BAUER et al. (2013). Evidence-based recommendations for optimal dietary protein intake in older people: a position paper from the PROT-AGE Study Group. *J Am Med Dir Assoc*,14(8):542-59.

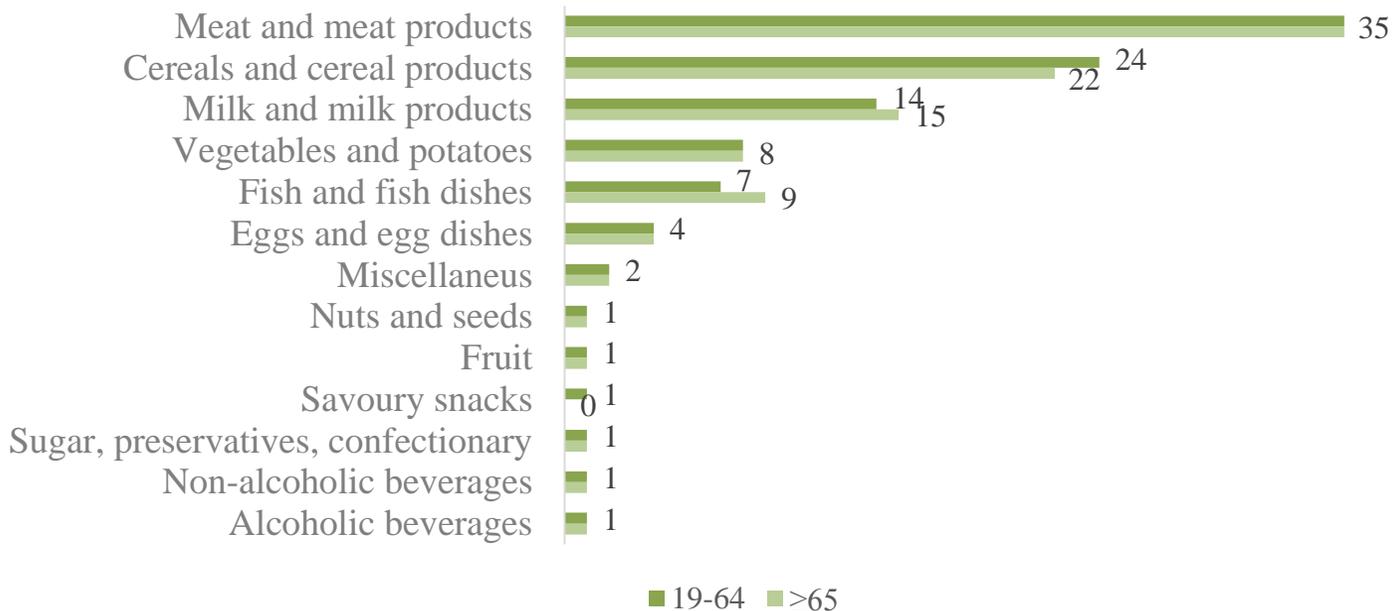
⁴ BRADLEE et al. (2017). High-Protein Foods and Physical Activity Protect Against Age-Related Muscle Loss and Functional Decline. *J Gerontol A Biol Sci Med Sci*, 25.



Optimal protein intake, distribution and sources

- The **Reference Nutrient Intake** (RNI) for protein may be **insufficient** in inhibiting age-related loss of muscle mass and strength.¹
- **Two to three meals a day**, each containing **~25-30 g of protein**, is optimal for the stimulation of 24-h muscle protein synthesis (MPS).²

Fig 1. Percentage contribution (%) of food groups to average daily protein intake in the UK in 2013/2014: adults aged 19-64 and ≥65 y.



Source: National Diet and Nutrition Survey Rolling Programme Years 2013-2014

- Animal-based foods have **complete composition of essential amino acids**, with high **digestibility** (>90%) and **bioavailability**.
- Solutions to maximise essential amino-acids content of plant foods include **amino-acid complementation** and consuming **higher amounts of plant-based products** on a more frequent basis.³
- **Leucine** is the amino-acid that plays a **key role in MPS**.⁴ Examples of plant food sources: seaweed, soy beans, pumpkin seeds, peanuts, lentils and barley flour). The recommended amount is **2.8-4g/meal**.¹

¹ BAUER et al. (2013). Evidence-based recommendations for optimal dietary protein intake in older people: a position paper from the PROT-AGE Study Group. *J Am Med Dir Assoc*, 14(8):542-59.

² BRADLEE et al. (2017). High-Protein Foods and Physical Activity Protect Against Age-Related Muscle Loss and Functional Decline. *J Gerontol A Biol Sci Med Sci*, 25.

³ GORISSEN & WITARD. (2017). Characterising the muscle anabolic potential of dairy, meat and plant-based protein sources in older adults. *Proc Nutr Soc*, 1-12.

⁴ NORTON LE et al. (2009). The leucine content of a complete meal directs peak activation but not duration of skeletal muscle protein synthesis and mammalian target of rapamycin signaling in rats. *J Nutr*, 139:1103-9.



Appetite

- Protein is more satiating than other nutrients.¹ The effects of plant proteins on appetite have not been investigated in depth.
- Available data points towards the **positive effects** of replacing animal proteins with plant-originated proteins **in normal weight and overweight/obese** individuals.
- **More studies are needed** to rule out the effect of protein-induced satiety and subsequent compromised energy intake in **underweight adults**.

Future research

- Exploring how to build **consumer's awareness** about the importance of sufficient protein intake for healthy ageing and **attitudes** towards plant-based foods.
- Meals high in animal proteins are scored higher than high-protein vegetarian alternatives on palatability scales.² It is crucial to explore **potential methods to increase the palatability** of plant-based foods.
- More evidence **regarding age-, BMI- and sex-related differences in appetite responses** to plant protein meals is needed.

¹ WEIGLE et al. (2005). A high-protein diet induces sustained reductions in appetite, ad libitum caloric intake, and body weight despite compensatory changes in diurnal plasma leptin and ghrelin concentrations. *Am J Clin Nutr*, 82(1):41-8.

² KRISTENSEN et al. (2016). Meals based on vegetable protein sources (beans and peas) are more satiating than meals based on animal protein sources (veal and pork) - a randomized cross-over meal test study. *Food Nutr Res*, 60:32634.