HOW MUCH PROTEIN DO WE NEED?

Individual protein needs vary according to age, energy intake, trauma, pregnancy and breastfeeding, illness, etc. In dietary recommendations, carb, protein and fat intakes are usually expressed as percentages (%) of total calories. While we theoretically need only about 5% of total calories to come from protein, the World Health Organisation recommends a minimum of 10%. In the average Irish/ UK diet about 15% of total calories come from protein. In fact, it's very hard to devise a diet (using real foods) that does not supply enough protein – as long as there are sufficient calories to 'protect' the protein from being used up as energy.

Protein requirements for sedentary/general population

Contrary to popular belief, the RDA doesn't represent an ideal intake. Instead, it represents the minimum intake needed to prevent malnutrition.

As a starting point, let's look at just general population:

- A minimum of 0.8 g per Kg of body weight e.g. *for a 65 kg adult: 65 x 0.8 = 52 g protein per day.*
- However, a more appropriate statistical analysis of the data used to establish the RDA suggests this number should be higher: 1.0 g/kg (link)

Protein requirements for obese individuals

Several meta-analyses involving people with overweightness or obesity suggest that 1.2–1.5 g/kg is an appropriate daily protein intake range to maximize fat loss. This range is supported by the European Association for the Study of Obesity, which recommends up to 1.5 g/kg for adults with obesity.

- Mathus-Vliegen EM, Obesity Management Task Force of the European Association for the Study of Obesity. Prevalence, pathophysiology, health consequences and treatment options of obesity in the elderly: a guideline. Obes Facts (2012)

Protein requirements for athletes

Furthermore, the calculation is further adjusted for sports nutrition - specifically to support performance/body composition.

- Systematic review of protein intake in in resistance trained lean athletes intake: https://www.ncbi.nlm.nih.gov/pubmed/24092765

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- Commentary on this paper: https://www.strongerbyscience.com/reflecting-on-five-years-studying-protein/
- Evidence-based recommendations for natural bodybuilding contest preparation: nutrition and supplementation https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4033492/

If you're physically active regularly, you need more protein daily than if you were sedentary

Source	Recommended amount	68kg (150lb) female	90kg (200lb) male
International society of sports nutrition	1.4-2.0g of protein	95-136g	126-180g
Other recent review	1.2-2.2	82-150g	108-200g

Protein needs can change due to:

- Demands of heavy physical work or training
- Injury/sickness
- Chronic stress, poor digestion or malabsorption
- If losing weight, protein can help correct negative energy balance (TEF) and satiety.

According to the most comprehensive meta-analysis to date on the effects of protein supplementation on muscle mass and strength, the average amount of protein required to maximize lean mass is about 1.6 g/kg, and some people need upwards of 2.2 g/kg (link). ***NOTE: only 4 of the 49 included studies were conducted in people with resistance training experience (the other 45 were in newbies***

Protein requirements and female athletes

There is evidence that estrogen is protective against muscle damage:

- women tend to experience less muscle soreness on average
- There is some data suggesting that female endurance athletes might need less protein compared to males due to the fact that women utilise less protein during exercise than men (most likely because of different hormone profiles/levels)
- There is also some evidence that a woman's propensity to use protein during endurance training varies throughout the menstrual cycle, which would be consistent with an effect of sex hormones on fuel utilisation.
    - Lamont LS et. al. Menstrual cycle and exercise effects on protein catabolism. Med Sci Sports Exerc. (1987) 19(2):106-10.

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- Because of low testosterone, women don't gain muscle as quickly as men
    - Volek JS et. al. Nutritional Aspects of Women Strength Athletes. Br J Sports Med. (2006) 40(9):742-8

With the above in mind and to factor in the differences in body fat percentage, along with potential issues of total caloric intake, females might look to adjust to 80% of the intake recommendations of men (NB, studies linked above are in majority using male subjects).

Note that the above is still not fully clear. For example, protein needs of female lifters, when expressed per kilogram of body mass, are similar to the protein needs of male lifters (perhaps a bit lower), when compared with the results of another recent study (here). However, the menstrual phase may affect protein needs in women. On one hand, some research indicates that muscle protein synthesis doesn't vary across the menstrual cycle (study). On the other hand, some research indicates that lysine requirements are higher during the luteal phase (study). It's possible that total protein requirements (and not just lysine requirements) are higher during the luteal phase.

Protein requirements for Injury

In general, an injured athlete decreases his/her physical activity and, thus, his/her energy requirements. Adequate energy intake should be the first nutritional consideration as negative energy balance accelerates muscle loss especially in disuse/immobility period. And overall calories reduction by nature would also mean eating less protein which also contributes to breakdown.

- *Calorie restriction accelerates the catabolism of lean body mass during 2 wk of bed rest. Biolo G, Ciocchi B, Stulle M, Bosutti A, Barazzoni R, Zanetti M, Antonione R, Lebenstedt M, Platen P, Heer M, Guarnieri G Am J Clin Nutr. 2007 Aug; 86(2):366-72.*
- Substantial skeletal muscle loss occurs during only 5 days of disuse. Wall BT, Dirks ML, Snijders T, Senden JM, Dolmans J, van Loon LJ Acta Physiol (Oxf). 2014 Mar; 210(3):600-11.

In conditions of energy restriction or sudden inactivity, as a result of surgery or injury, elevating protein intakes to 2.0 g/kg/day or even higher may be advantageous in preventing fat free mass (FFM) loss.

- *Strategies to maintain skeletal muscle mass in the injured athlete: nutritional considerations and exercise mimetics. Wall BT, Morton JP, van Loon LJ Eur J Sport Sci. 2015; 15(1):53-62.*
- *Dietary protein for athletes: from requirements to optimum adaptation. Phillips SM, Van Loon LJ J Sports Sci. 2011; 29 Suppl 1():S29-38.*

***Given the scope of the course, please note we've left out protein requirements for other areas such as for pregnant/lactating females / toddlers or children / elderly etc.*

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Protein requirements and masters athletes

Ageing is associated with sarcopenia, a syndrome characterized by a decline in skeletal muscle mass and associated declines in strength. This has the effect of reducing the capacity to perform functional task and sport, and can therefore reduce quality of life. This syndrome is not just for the "elderly."

The protein RDA for adults over 50 is currently the same as for younger adults: 0.8 g/kg. Some studies have suggested that 1.2 g/kg would be a more appropriate RDA. What's worth noting is a study that doubled protein intake from 0.8 to 1.6 g/kg has been shown to significantly increase lean body mass in elderly men. A similar observations has been made in elderly women who increase their protein intake from 0.9 to 1.4 g/kg.

- Nabuco HCG, et al. Effects of Whey Protein Supplementation Pre- or Post-Resistance Training on Muscle Mass, Muscular Strength, and Functional Capacity in Pre-Conditioned Older Women: A Randomized Clinical Trial. Nutrients. (2018)
- Mitchell CJ, et al. The effects of dietary protein intake on appendicular lean mass and muscle function in elderly men: a 10-wk randomized controlled trial. Am J Clin Nutr. (2017)

Discussing nutrition/training in ageing population is outside the scope of this course so I will park the above point here and leave you to do some further research. What is worth discussing briefly is age and protein requirements as a consideration for sport nutrition for Masters Athletes.

Muscle tissue is constantly in turnover, with muscle tissue being built (anabolism) and broken down (catabolism). Muscle loss occurs when catabolism exceeds anabolism. Older athletes of any age have increased protein requirements. This is due to the need for repair of the damage that training and competing have on muscle fibres, as well as the increased use of protein as an energy source, particularly in aging endurance athletes, and the need for increased protein to support increases in muscle mass that generally accompanies increased training intensities or weight training. Also important to note that there may be an age-related reduction in the absorptive capacity of the gut for amino acids.

Muscle size and strength generally peaks at 20–30 years and begins to decline in middle age (~40 to 50 years), with an acceleration in older adulthood (generally >70–75 years). Decline in muscle mass is notably influenced by physical activity, with inactive and sedentary individuals experiencing a more rapid decline that is generally preceded by the development of "anabolic resistance" (i.e., a reduced ability to utilize dietary amino acids for muscle protein synthesis;

- Moore, 2014;
- Witard et al., 2018

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Although individuals can commence master athletics competition at 35 years (World Masters Athletics), the majority of research investigating metabolic and nutritional requirements in the older athlete are done in those aged >55 years. Of particular interest are investigations focused on the requirements for attaining and/or maintaining strength and/or power (field sports and sprinting) and endurance (track events ≥800 m).

The total protein intake for masters athletes trying to optimize strength and power gains during training should be ≥1.2 g·kg−1·day−1 (Morton, Traylor, et al., 2018). If energy intake is suboptimal and there is increased intensity/volume of exercise, or if the quality of the dietary protein is low (e.g., an unbalanced amino acid profile often associated with isolated plant-based proteins), this required amount can increase. As a general, it is important for the master athlete to try to consume high-quality protein (i.e., egg white, milk, fish, meats) or, if vegetarian, to try to get optimal amino acids balance via careful dietary review, ideally with a qualified sport nutritionist/dietitian. A broad distribution of protein ingestion also appears to positively influence net protein balance.

To optimize lean mass gains during resistance exercise, masters athletes should aim to consume meal protein intakes to meet a daily target of ~1.5 to 1.6 g·kg·day (Morton, Murphy, et al., 2018). Where possible this should be got from whole foods.

Several studies have found that male endurance athletes require 1.6–1.8 g·kg·day for optimal protein and/or amino acid homeostasis, with young women requiring ~25% lower intakes due to the estrogen-mediated decreases in amino acid oxidation (Witard et al., 2018). It is likely that postmenopausal master women would have protein requirements similar to that of men.

Protein considerations for adolescent athletes

In adults the balance between energy intake and energy demands is crucial in training, recovery, and performance. In young athletes the demands for training and performance remain but should be a secondary focus behind the demands associated with maintaining the proper growth and maturation.

As a general, adolescents have greater protein needs per kilogram body weight to satisfy their growth requirements. Total energy intake is important to consider in the assessment of protein requirements because inadequate energy intake will cause protein to be used as a substrate for energy, potentially reducing its availability for its primary functions (Campbell et al., 2007; Petrie et al., 2004). It appears that protein recommendations do not have to increase during periods of peak growth in adolescent athletes (Aerenhouts et al., 2013).

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Protein deficiency

When eating an adequate calorie diet, it is pretty difficult to **not** hit the minimum 10% target is. Therefore, in the Western World it is highly unlikely that a healthy client will be truly protein deficient, unless on a low calorie diet for some time. **But 'not deficient' does not equal 'optimal'.**

Signs of protein deficiency include failure to thrive (children), weight loss, lethargy, poor skin, hair and nails, low bone density (e.g. osteomalacia), reduced immunity to infections. Protein deficiency often associates with zinc deficiency.

If a person has a negative energy balance (i.e. burning more calories than consuming), then protein-rich tissue (mainly muscle) may be broken down to produce energy ('burning furniture to heat the home'). So severe, long-term calorie restriction will also show up as protein deficiency (e.g. famine starvation: protein-calorie malnutrition (PCM); anorexia nervosa).

Is too much protein harmful?

- At present, there is no data to show that in healthy people too much protein is harmful: Study 'A High Protein Diet Has No Harmful Effects: A One-Year Crossover Study in Resistance Trained Males': https://www.hindawi.com/journals/jnme/2016/9104792/
- Being in the upper range of recommendations is ok
- However, it is important to do a client assessment (or self-assessment) so as to be careful around those with kidney disease, certain metabolic diseases, liver disease, problems with gastric emptying. In this case, too much can be a bad thing.
- Another interesting read on this topic
- **Podcast:** Listen to this podcast by *IOPN* *'High Protein Diets in Context'* (55:31)

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