CN complete nutrition

A QUICK GUIDE TO...

Protein

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What is protein?

Proteins are large molecules made up of long chains of amino acids.[1] Approximately 20 amino acids are found in nature. Some proteins are relatively small, containing roughly 50 amino acid units, others are much bigger containing hundreds to thousands of amino acids. Dietary proteins are broken down by digestive enzymes into their constituent amino acids. Some will directly enter the body's pool of amino acids and be used for protein synthesis; others may be converted to other amino acids by the process of transamination (transfer of the amino group). Excess amino acids will be deaminated, the amino group will be converted to urea and excreted by the kidneys, and the remainder will be converted to glucose.[2]

Types of protein

Proteins can be classified based on their biological value (low *vs.* high) or their origin (animal *vs.* plant).

The biological value of protein depends on the amino acid content. Proteins which contain all of the essential amino acids in amounts sufficient to generate protein synthesis are classed as 'high biological value' (HBV). In general, proteins which are derived from animal sources are HBV (meat and poultry, fish, eggs, milk).[2]

Foods which lack one or more of the essential amino acids are deemed 'low biological value', and this is the case for most plant protein. Since most plant proteins have different limiting amino acids, by consuming a diet with a wide variety of 'plants' it is possible to create HBV proteins. This is a cardinal principle of vegan diets; for example, the limiting amino acid in wheat is lysine, and the limiting amino acid in pulses is methionine, so by combining the two foods a full spectrum of amino acid is achieved thereby enabling protein synthesis.[2]

Sources of dietary protein

Meat is a good source of protein, vitamins (B12) and minerals (iron) in your diet. However, if you currently eat more than 90 g (cooked weight) of red and processed meat a day, the Department of Health advises that you cut down to 70 g, which is the average daily consumption in the UK. Eating high amounts of red and processed meats may increase the risk of bowel cancer.[3] Processed meat refers to that which has been preserved by smoking, curing, salting or adding preservatives. This includes sausages, bacon, ham, salami and pâtés.[3] Some meats are also high in saturated fat, which can raise blood cholesterol levels. A balanced diet can include protein from meat, as well as from non-animal sources such as beans and pulses. Aim for at least two portions of fish every week – one of which should be oily, such as salmon or mackerel. Pulses such as beans, peas and lentils are good alternatives to meat because they're lower in fat and higher in fibre.[4] See **Table One** for foods and their protein content.

The Dietary Reference Values for protein are based on estimates of need. For adults, an average requirement of 0.6 g of protein per kilogram bodyweight per day is estimated. The Reference Nutrient Intake (RNI) is set at 0.75 g of protein per kilogram bodyweight per day in adults. This equates to approximately 56 g/day and 45 g/day for men and women aged 19-50 years respectively.[1] The average daily intake of protein in the UK is 88 g for men and 64 g for women, which is more than sufficient.[1]

The role of protein

In the body, protein is constantly broken down and recycled resulting in a continuous requirement for new sources of protein.[2] Excessive intake leads to the formation of increased levels of urea and other compounds. Intake of excess protein does not increase muscle mass, strength or power. The proportion of protein in the diet does not need to be increased for athletes as their requirements for all nutrients is increased.[6]

Protein-rich foods tend to make people feel fuller than foods rich in carbohydrates or fat. Therefore, including a lean source of protein with a meal can help to minimise feelings of hunger and decrease overall energy intake.[1] This can help with weight maintenance and weight loss.

Pregnant women should receive an additional 6 g of protein a day and lactating women an additional 17.5 g protein a day compared with the total daily amount recommended for non-pregnant women. There is an extra requirement for growth in infants and children.[1] In the first four months of life protein requirements are as high as 2.0-2.2 g/kg body weight.[6]

The current Recommended Dietary Allowance (RDA) for the elderly population is 0.8 g/kg body weight under healthy circumstances. Some studies have suggested an intake up to 1.0 g/kg body weight a day is preferable as this allows for protein synthesis. For optimal absorption the protein intake should be spread out over the day. Under conditions of sickness requirements increase to 1.0-1.5 g/ kg body weight.[6, 7, 8, 9]

Protein requirements in different disease states varies. Body protein is lost extensively following burns, surgical trauma and intensive care unit admission. Trauma patients require on average 1.5 g/kg protein a day.[6, 10] All protein losses such as those from chest or abdominal drainage, skin damage or proteinuria should be fully replaced. In burns patients persistent muscle protein catabolism is a major problem; in Europe current practice is to provide 1.3-1.8 g/kg body weight protein, higher intakes are usually oxidised.[6, 11, 12]

Protein requirements vary from 0.6-0.8 g/kg body weight in stable patients with chronic kidney disease under conservative therapy, to 1.1-1.4 g/kg body weight in those undergoing haemodialysis, and up to 1.2-1.5 g/kg body weight in those having peritoneal dialysis.[6, 13, 14] Diabetes mellitus is highly prevalent in haemodialysis patients and associated with depletion of protein stores. Haemodialysis is a catabolic event with 10-13 g of amino acids being lost in the dialysate each day. In continuous ambulatory peritoneal dialysis (CAPD), 8-9 g of protein are lost in the dialysate every day.[6] Acute renal failure is characterised by profound protein catabolism. Several amino acids which would be classed as 'non-essential' in healthy subjects, such as tyrosine, arginine, cysteine and serine, can become *'conditionally essential'*. Protein requirements in those not undergoing renal replacement therapy are usually 0.8-1.2 g/kg, and with daily haemodialysis these increase to 1.2-1.5 g/kg daily.[6, 13, 14]

In clinically stable cirrhosis, an intake of 1.0-1.2 g/kg body weight protein is recommended for maintaining body composition. In malnourished patients requiring repletion, protein requirements increase to 1.6 g/kg body weight.[6, 15] In proven protein-intolerant patients, oral branched-chain amino acid (BCAA) supplementation may be helpful in achieving an adequate nitrogen intake.[6, 15]

Patients with severe acute pancreatitis are hypermetabolic, and their optimal goal of protein supply is 1.2-1.5 g/kg body weight, and in chronic pancreatitis the goal is 1.0-1.5 g/kg body weight.[6, 16]

The suggested protein intake is 1.0-1.5 g/kg per day in patients with chronic obstructive pulmonary disease (COPD).[6] Supplementation of BCAA could prevent cardiac muscle atrophy. Protein intake and BCAA supplementation stimulate protein synthesis, reduce protein breakdown and nitrogen loss both in skeletal muscle and in the myocardium.[6]

Table One: Foods & Typical Protein Content

Food	Portion size (g)	Protein provided (g)
Cooked meat (beef/pork/lamb/chicken/turkey)	60-90	20-30
Cooked white fish (cod/plaice) or canned fish	140	35
Cooked oily fish (salmon, mackerel, sardines)	140	28
2 eggs	120	12
Cheese	30	7.5
Yoghurt	125	5
4 tablespoons pulses	150	6
4 tablespoons of soya/tofu	100	8
1 tablespoon/handful of nuts or peanut butter	30	8

Source: Adapted from www.bda.uk.com/foodfacts/portion_sizes#Protein – what is a portion?[5]

Protein – Useful online resources

- www.nutrition.org.uk/nutritionscience/nutrients-food-and-ingredients/protein.html?limitstart=0
- https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/618167/government_dietary_recommendations.pdf
- www.nhs.uk/live-well/eat-well/
- www.vegsoc.org/protein
- www.vegansociety.com/sites/default/files/Protein_0.pdf

References: **1.** British Nutrition Foundation (2012). Protein. Accessed online: www.nutrition.org.uk/nutritionscience/nutrients-food-and-ingredients/protein (May 2018). **2.** Gandy J (Ed.) (2014). Manual of Dietetic Practice, 5th Edition. Wiley-Blackwell on behalf of the BDA. **3.** NHS Choices (2018). Eat Well. Red meat and the risk of bowel cancer. Accessed online: www.nhs.uk/live-well/eat-well/red-meat-and-the-risk-of-bowel-cancer/ (May 2018). **4.** NHS Choices (2016). Eat Well. Accessed online: www.nhs.uk/live-well/eat-well/ (May 2018). **5.** British Dietetic Association (2016). Protein - What is a portion? Accessed online: www.bda.uk.com/foodfacts/portion_sizes#Protein (May 2018). **6.** Sobotka L (Ed.) (2011). Basics in Clinical Nutrition Fourth Edition. ESPEN/GALEN. **7.** Wolf RR, Miller SL, Miller KB (2008). Optimal protein intake in the elderly. Clin Nutr.; 27(5): 675-684. **8.** Bauer J, et al. (2013). Evidence-Based Recommendations for Optimal Dietary Protein Intake in Older People: A Position Paper From the PROT-AGE Study Group. JAMDA; 14(8): 542-559. **9.** Deutz NEP, et al. (2014). Protein intake and exercise for optimal muscle function with aging: Recommendations from the ESPEN Expert Group. Clin Nutr.; 33(6): 929-936. **10.** Dickerson RN, et al. (2012). A reappraisal of nitrogen requirements for patients with critical illness and trauma. J Trauma Acute Care Surg.; 73(3): 549-557. **11.** Rodriguez NA, et al. (2011). Nutrition in Burns: Galveston Contributions. JPEN; 35(6): 704-714. **12.** William FN, et al. (2011). What, how, and how much should burn patients be fed? Surg Clin North Am.; 91(3): 609-629. **13.** Toigo G, et al. (2000). Consensus Report Expert Working Group report on nutrition in adult patients with renal insufficiency (part 1 of 2). Clin Nutr.; 19(3): 197-207. **14.** Toigo G, et al. (2000). Consensus Report Expert Working Group report on nutrition in adult patients with renal insufficiency (part 2 of 2). Clin Nutr.; 19(4): 281-291. **15.** Plauth M, et al. (1997). Consensus Statement ESPEN guidelines for nutrition in liver disease and transplantation. Clin Nutr.; 16: 43-55. **16.** Meier R, et al. (2002). ESPEN Guidelines on nutrition in acute pancreatitis. Clin Nutr.; 21(2): 173-183.