

What are amino acids?

Amino acids (AAs) are organic compounds that combine to form proteins and are often referred to as the 'building blocks' of life.¹

There are a total of 20 AAs that comprise muscle protein; 9 of which are considered to be 'essential', meaning they cannot be produced by the body in physiologically significant amounts, and therefore must be consumed through diet. The other 11 are non-essential AAs, meaning they can be synthesised by the body and do not need to be provided through diet.²



Mycoprotein contains all 9 essential AAs:³

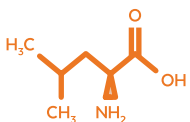
- Histidine
- Isoleucine
- Leucine
- Lysine
- Methionine
- Phenylalanine
- Threonine
- Tryptophan
- Valine

- Important for absorption of minerals (e.g., zinc and selenium)
- Help regulate blood sugar levels
- Facilitate wound healing
- Produce growth hormones

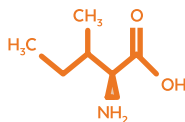
Branched-chain AAs (BCAAs)

A group comprising of 3 essential AAs:

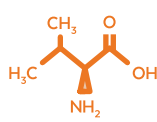
Leucine



Isoleucine



Valine



They provide the basis for protein synthesis and energy production; in fact, BCAAs make up to one third of muscle protein. Of these, leucine is the most heavily researched and appears to offer the biggest physiological benefit.⁴

Role of AAs in the body

AAs perform a number of important and varied functions in the body. Some of these are listed below:⁵

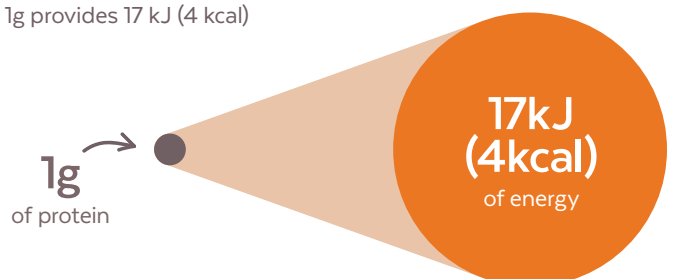
- Precursors for neurotransmitters such as dopamine, epinephrine (adrenaline) and norepinephrine (noradrenaline)
- Help stimulate muscle growth and regeneration
- Involved in energy production and the regulation of appetite, sleep and mood
- Components of proteins that make up skin and connective tissue
- Play a role in fat metabolism and immune function

Why is protein important?

All cells and tissues contain protein; it is essential for growth and repair of cells, and maintenance of good health.² For synthesis of new muscle protein, all 20 AAs must be present in adequate amounts.⁶

Protein provides the body with approximately 10-15% of its dietary energy and it is the second most abundant compound in the body, following water. The amount of protein we need changes during a lifetime.⁷

Protein also provides energy; 1g provides 17 kJ (4 kcal)



Reference Nutrient Intake (RNI)

RNI is the amount of a nutrient that is enough to ensure that the needs of 97.5% of the population are being met.⁷

The RNI of protein is set at 0.75 g per kg of bodyweight per day for adults.⁷

Protein Digestibility-Corrected AA Score (PDCAAS)

The PDCAAS has been adopted by the Food and Agriculture Organization of the United Nations (FAO) and World Health Organization (WHO) as the preferred method for the measurement of the protein value in human nutrition.⁸

Assessing protein nutritional quality takes into account the AA profile of foods, its digestibility, and its ability to supply essential AAs in amounts required by humans.

The PDCAAS for mycoprotein is 0.99, compared with beef at 0.92.

Essential AA content of mycoprotein vs other protein foods (g amino acids per 100g)

Essential amino acids	Mycoprotein	Cows milk (i)	Egg (ii)	Beef (iii)	Soy isolate*	Soy concentrate* (acid wash)	Peanuts (v)	Wheat (vi)
Histidine	0.39	0.09	0.30	0.66	0.6	0.4	0.65	0.32
Isoleucine	0.57	0.20	0.68	0.87	1.1	0.8	0.91	0.53
Leucine	0.95	0.32	1.10	1.53	1.8	1.3	1.67	0.93
Lysine	0.91	0.26	0.90	1.60	1.4	1	0.92	0.30
Methionine	0.23	0.08	0.39	0.50	0.3	0.2	0.32	0.22
Phenylalanine	0.54	0.16	0.66	0.76	1.1	0.9	1.30	0.68
Tryptophan	0.18	0.05	0.16	0.22	0.3	0.2	0.25	0.18
Threonine	0.61	0.15	0.60	0.84	0.8	0.7	0.88	0.37
Valine	0.60	0.22	0.76	0.94	1.1	0.8	1.08	0.59

*Soy isolate and concentrate data are adjusted to same water content as mycoprotein @ 75%

(i) Whole fluid milk [3.3% fat] (ii) Raw fresh eggs (iii) Ground beef (regular, baked-medium) (iv) A+B) Soya derivatives used in the production of textured soy products (v) Raw peanuts [all types] (vi) Durum wheat

What are the symptoms of essential AA deficiency?

Each of the essential AAs plays a different role in the body, therefore the symptoms of deficiency vary accordingly.⁹

Essential AA deficiency causes a number of disease states, nutritional deficiencies, fatigue and accelerated aging. Many pathological conditions like depressed immune system, weight loss, pressure sores, diarrhoea, hair and skin depigmentation, and muscle weakness may be associated with an AA deficiency.¹⁰

Where to find mycoprotein

Mycoprotein is the unique whole food at the heart of every single Quorn product. There is a huge range of great tasting Quorn® products and ingredients available, all of which can easily be used to recreate your favourite recipes with a nutritious and sustainable twist.

Visit www.quornnutrition.com and www.quorn.com for more information about mycoprotein, products and recipes.

References:

1. MedlinePlus. Amino acids.
Available at: <https://medlineplus.gov/ency/article/002222.htm>. Accessed January 2020.
2. British Nutrition Foundation. Protein.
Available at: <https://www.nutrition.org.uk/nutritionscience/nutrients-food-and-ingredients/protein.html?start=1>. Accessed January 2020.
3. Quorn. Protein Guidelines. Why the time is right for an update.
Available at: https://www.mycoprotein.org/files/Protein_White_Paper_140619.pdf. Accessed February 2020.
4. Precision Nutrition. All about BCAAs.
Available at: <https://www.precisionnutrition.com/all-about-bcaas>. January 2020.
5. Healthline. Essential amino acids: definition, benefits and food sources.
Available at: <https://www.healthline.com/nutrition/essential-amino-acids#roles-in-your-body>. Accessed January 2020.
6. Wolfe RR. J Int Soc Sports Nutr. 2017;14:30.
7. British Nutrition Foundation. Nutrition requirements.
Available at: https://www.nutrition.org.uk/attachments/article/234/Nutrition%20Requirements_Revised%20Oct%202016.pdf. Accessed January 2020.
8. Schaafsma G. J Nutr. 2000;130:1865S-7S.
9. Medical News Today. What to know about essential amino acids.
Available at: <https://www.medicalnewstoday.com/articles/324229.php>. Accessed January 2020.
10. Ehsan Shakerzadeh, in Boron Nitride Nanotubes in Nanomedicine, 2016.
Available at: <https://www.sciencedirect.com/topics/medicine-and-dentistry/amino-acid-deficiency>. Accessed January 2020.