



9 essential amino acids your body can't live without.

Dairy is nature's ultimate source of protein.

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NUTRITION



Introduction

Dairy is nature's ultimate source of protein, containing all nine essential amino acids which the body can't make on its own.

Protein is a fundamental component of the body. Proteins are macromolecules, which are constructed in the body from chains of amino acids. Using the 20 primary amino acids, the body constructs an overwhelming abundance of protein chains, each with a different order coded by our genetic code. These chains interact and fold into specific three dimensional shapes to give specialised functionality.

ESSENTIAL AND NON-ESSENTIAL AMINO ACIDS

These components and tissues in the body are being broken down and re-built every day, resulting in protein turnover that requires a constant supply of amino acids in the diet. As such, all 20 amino acids are required by the body every day to use as building blocks for new proteins. Some of these amino acids can be formed within the body, assuming there are adequate substrate molecules, such as nitrogen.

These amino acids are called dispensable, or non-essential, amino acids – they are required by the body each day but because our body can make them, they are not essential to be supplied via our diet. Conversely, nine of the amino acids are classified as indispensable or essential (see Table 1). These amino acids cannot be formed within the body, so must be supplied via our diet, and are found within the proteins in foods we eat every day.

Essential (indispensable) amino acids	Non-essential (dispensable) amino acids
Isoleucine, leucine, lysine, valine, methionine, phenylalanine, threonine, tryptophan, histidine	Glycine, alanine, tyrosine, serine, cysteine, proline, glutamine, glutamic acid, asparagine, aspartic acid, arginine

Table 1: Essential and non-essential amino acids within the human diet (developed from Institute of Medicine, 2002)

Proteins play both a structural and functional role in every body cell, which makes protein the most abundant component in the body after water. Muscle, especially the contractile molecules in muscle that help us move, make up over 40% of our body protein while haemoglobin, a protein in blood responsible for transporting essential oxygen around the body, accounts for 16%. Protein also has an essential function in every cell including in membranes, transporters, enzymes, components of the immune system, and is also a precursor to hormones.

Food proteins vary depending on their amino acid content and contain varying concentrations of essential and non-essential amino acids. Some proteins, especially plant origin proteins, are incomplete, because they do not contain the all of essential amino acids at the recommended level, while others, especially animal sourced proteins, typically contain higher levels of essential amino acids and are often classified as complete. While few proteins are lacking in any amino acids, the most commonly consumed amino-acid-deficient protein is gelatin or collagen, often found in jellied products, beverages and bars, is deficient in the essential amino acid tryptophan. Other commonly consumed proteins like maize, wheat, and rice are also of lower quality as they contain lower levels of a number of essential amino acids, but especially lysine.

TO FULLY ENJOY THE BENEFITS OF AN ACTIVE LIFESTYLE, ALWAYS INCLUDE DAIRY PROTEIN IN A HEALTHY, EXERCISE-FOCUSED DIET

Essential amino acids must be consumed each day to replace the amino acids lost during normal metabolism, and to rebuild and repair the body. There are a number of methods of defining the ability of a dietary protein to meet our daily requirements for amino acids, with the most recent recommendation (Food and Agriculture Organisation, 2013) being the digestible indispensable amino acid score (DIAAS), replacing the older protein digestibility corrected amino acid score (PDCAAS) method. The DIAAS methodology improves the accuracy of the analysis of digestion, and provides updated amino acid requirements. A quality score above 1 indicates the protein provides adequate digested essential amino acids to meet body requirements, while a score below 1 indicates that the protein does not provide enough digested essential amino acids. As it is a new methodology, not many comparisons are available (Cervantes-Pahm et al., 2014; Rutherford et al., 2015; Shaheen et al., 2016) but milk has the highest score of the commonly consumed food proteins (Wolfe, 2015) with a DIAAS of score of 1.18 or untruncated PDCAAS of 1.25 (Rutherford et al., 2015), indicating that dairy provides excellent levels of all essential amino acids required by the body for growth and maintenance.



Conclusion

In summary, data from recognised protein quality methods reinforce the high nutritional quality of dairy protein and consolidate the view that protein from dairy sources is an excellent way to meet the body's protein and essential amino acid requirements, especially for people interested in quality nutrition to support exercise, healthy lifestyles, and keeping active as they age.





REFERENCES

Cervantes-Pahm S K, Liu Y, Stein H H (2014). Digestible indispensable amino acid score and digestible amino acids in eight cereal grains. *The British Journal of Nutrition*, 111, 1663–1672.

Food and Agriculture Organisation (2013). Dietary protein quality evaluation in human nutrition. Report of an FAO Expert Consultation. FAO Food and Nutrition Paper no. 92. Rome.

Institute of Medicine (2002). Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids. National Academies Press, Washington, DC.

Rutherford S M, Fanning A C, Miller B J, Moughan P J (2015). Protein digestibility-corrected amino acid scores and digestible indispensable amino acid scores differentially describe protein quality in growing male rats. *The Journal of Nutrition*, 145, 372–379.

Shaheen N, Islam S, Munmun S, Mohiduzzaman M, Longvah T (2016). Amino acid profiles and digestible indispensable amino acid scores of proteins from the prioritized key foods in Bangladesh. *Food Chemistry*, 213, 83–89.

Wolfe R R (2015). Update on protein intake: importance of milk proteins for health status of the elderly. *Nutrition Reviews*, 73, 41–47.

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