

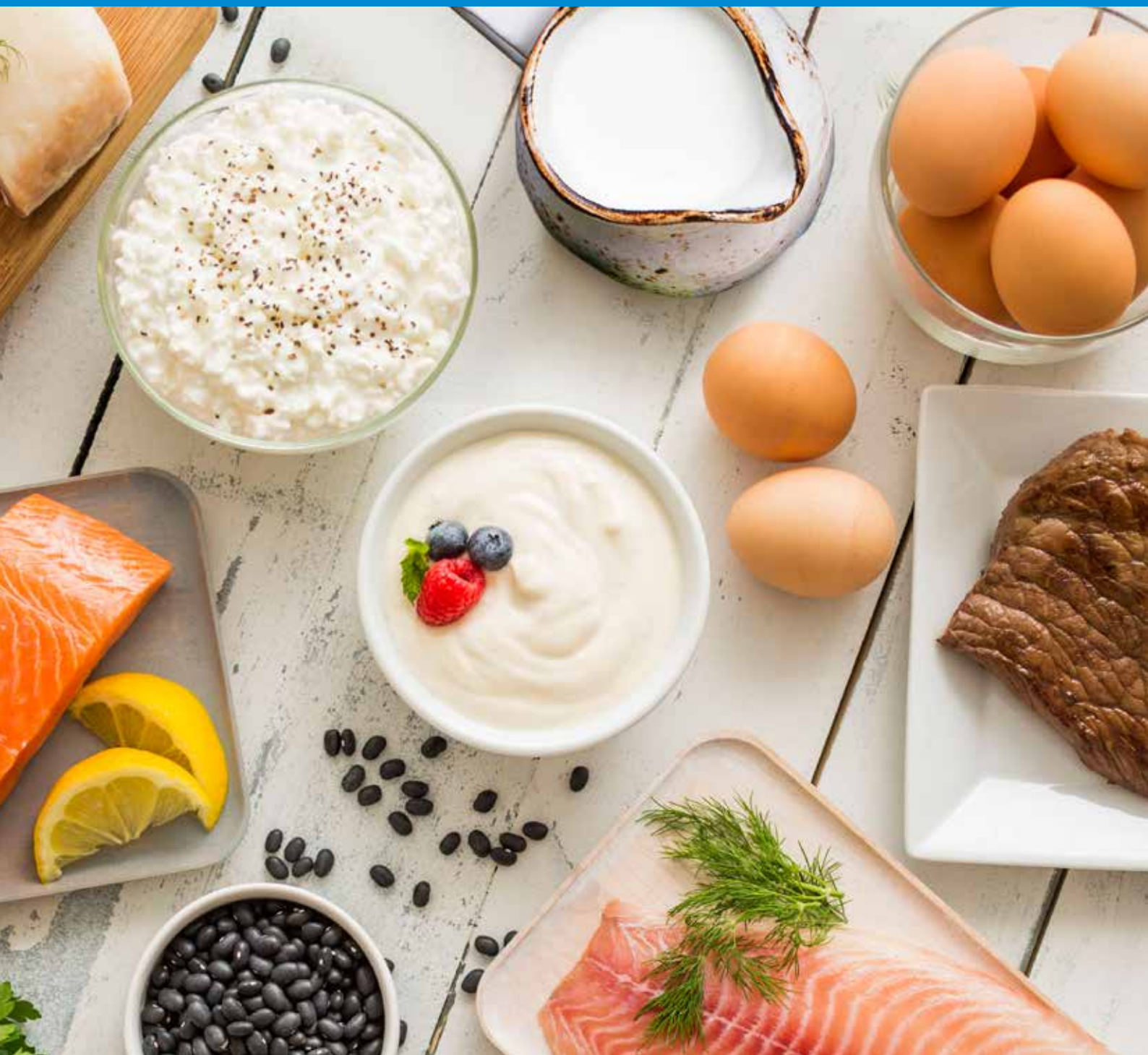


FrieslandCampina 

Institute

for dairy nutrition and health

The functions of essential amino acids



The functions of essential amino acids

Protein plays a role in building and maintaining body tissues, such as muscle and bone.¹ Proteins are made of smaller building blocks called amino acids.

There are **2** types of **amino acids**

The liver **can** produce **11** non-essential amino acids if dietary intake is insufficient

The body **cannot** produce the **9** essential amino acids (EAAs) and they need to be obtained from dietary sources. The 9 EAAs and their functions²:

Histidine

Necessary to produce histamine for immune response and sleep-wake cycles. Critical for maintaining myelin sheath, a protective barrier surrounding nerve cells.

Isoleucine

Involved in healing/repair of muscle tissue. Important for immune function, hemoglobin production and energy regulation.

Leucine

Important for protein synthesis and muscle repair. Helps regulate blood sugar levels, stimulates wound healing and produces growth hormones.

Lysine

Involved in protein synthesis, hormone and enzyme production and absorption of calcium. Important for energy production, immune function and production of collagen and elastin.

Methionine

Important role in metabolism and detoxification. Necessary for tissue growth and absorption of zinc and selenium.

Phenylalanine

Precursor for neurotransmitters tyrosine, dopamine, epinephrine and norepinephrine. Integral role in structure and function of proteins and enzymes and production of other amino acids.

Threonine

Major part of collagen and elastin, which are important components of skin and connective tissue. Plays a role in fat metabolism and immune function.

Tryptophan

Maintain nitrogen balance, precursor to serotonin, a neurotransmitter that **regulates appetite, sleep and mood.**

Valine

Helps stimulate muscle growth and regeneration and involved in energy production.

Essential amino acid* (mg/g protein)	Lysine	Histidine	Isoleucine	Leucine	Valine	Methionine, including cysteine	Phenylalanine, including tyrosine	Threonine	Tryptophan	Total of essential amino acids
Reference diet** adult	48	16	30	61	40	23	41	25	7	291

Source: FAO/WHO/UNU Expert Consultation, 2007

** Both the sulphurous (methionine and cysteine) and the aromatic (phenylalanine and tyrosine) essential amino acids are strongly interlinked in the metabolism and so they are often totalled to compare proteins. Therefore sometimes 9 to 11 essential amino acids are mentioned.

** The reference pattern should provide adults with the necessary essential amino acids. Source: FAO, 2011.



Foods that are rich in all

9

EAA's include milk, yoghurt, cheese, meats, poultry, fish and eggs.³



Milk is considered a source of **high quality protein** as evidenced by its **high digestibility factor** and the surplus of **EAA** as compared to the reference **EAA pattern**.^{4,5}

Dietary protein must be **accessible** for **digestive enzymes** in the **gastrointestinal tract**.

This might sound obvious but in fact it is not. Industrial food processing, product composition, cooking, plant cell walls, interaction with reducing sugars, and enzyme inhibitors—especially in plant based foods—all affect digestibility and therefore lower availability of EAAs. **Thus, protein quality is not only determined by the levels of EAAs but also by their digestibility.**^{4,5}



Currently, the Protein Digestibility Corrected Amino Acid Score (PDCAAS) is used to **measure protein quality**.

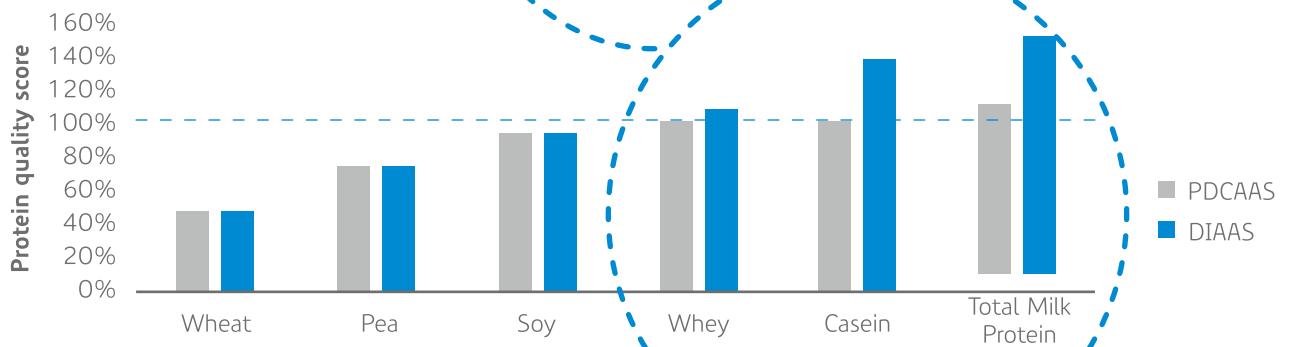


However, the Food and Agriculture Organization (FAO) recommends the use of the **newer Digestible Indispensable Amino Acid Score (DIAAS)**. This score takes into account the correction for digestibility differences between proteins through knowledge of the digestibility of each individual EAA and not on the digestibility of the entire protein.^{4,5}

According to both methods, **milk protein scores well above**

100%⁵⁻¹⁰

High protein quality⁵⁻¹⁰



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www.frieslandcampinainstitute.com
institute@frieslandcampina.com

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