

# WITH FOCUS ON PROTEIN QUALITY



Nutrison is food for special medical purposes and must be used under medical supervision.

# DIETARY PROTEINS ARE IMPORTANT FOR MUSCLE MASS AND STRENGTH

Both the amount but also the **quality** of dietary proteins matters.

## WHAT IS PROTEIN QUALITY?

Protein quality is a measure of how well the dietary amino acid pattern match human amino acid needs, defined by WHO/FAO.<sup>1,2</sup>

$$\text{Protein quality}^* = \text{Essential Amino Acid Score (based on limiting amino acid)} \times \text{Digestibility (\%)}$$

\*Protein quality defined by WHO/FAO 2007 and 2013 reports as PDCAAS/DIAAS<sup>1,2</sup>  
The Amino Acid Score is intended to predict protein quality in terms of the potential capacity of the food protein to provide the appropriate pattern of dietary indispensable amino acids.

The actual capacity of the protein to satisfy the amino acid needs will require the use of corrections for amino acid digestibility and availability.

### Essential amino acid

An essential amino acid, or indispensable amino acid, is an amino acid that can not be synthesized de novo (from scratch) by the organism, and thus must be supplied in its diet.

### Non-essential amino acid

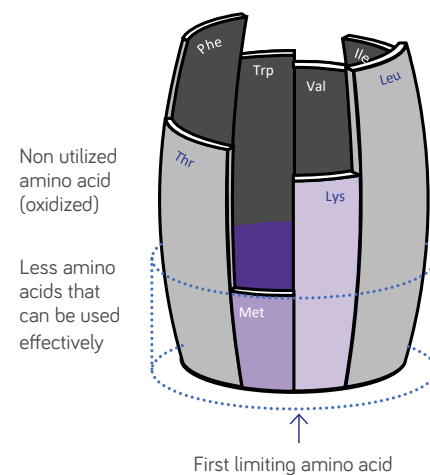
A Non-Essential amino acid, or dispensable amino acid, is an amino acid that can be synthesized de novo (from scratch) by the organism, and thus, theoretically, does not need to be supplied in the diet.

### Conditionally essential amino acid

A Non-Essential amino acid that can not be synthesized the novo in adequate amount (under certain conditions) and therefore can become rate limiting amino acid e.g. cancer, critical illness, gastrointestinal disorders, diabetes, inflammation etc.

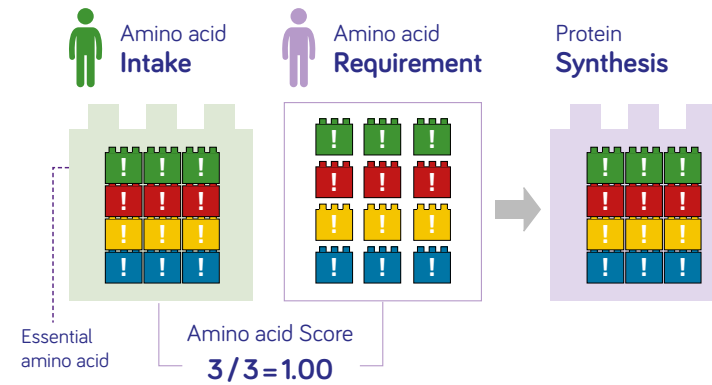
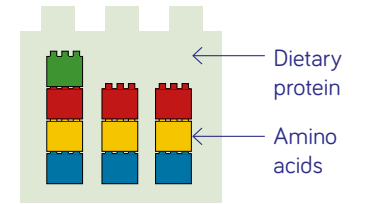
## HOW TO CALCULATE THE ESSENTIAL AMINO ACID SCORE

The essential amino acid score is calculated for all the individual essential amino acids in a dietary protein as the amount of each amino acid compared to the human requirement of the same amino acid. The essential amino acid with the lowest score is called the limiting amino acid and defines the essential amino acid score for the whole protein. Any surplus of the other essential amino acids goes to waste.

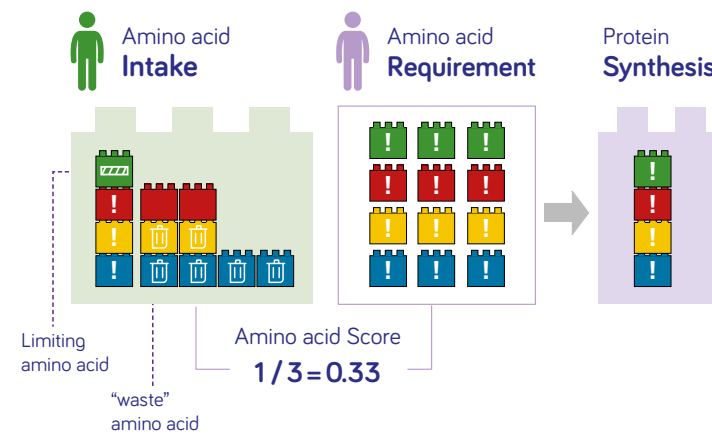


## LET'S SIMPLIFY

= 1 specific Amino acid



If the intake of essential amino acids is the same as the requirement the protein synthesis will be optimal. This is however a very unlikely situation.



If the intake of one of the essential amino acids is lower than required, only part of the protein synthesis can be met. In this case green amino acid is the limiting amino acid and the surplus of the rest of the amino acids go to waste.

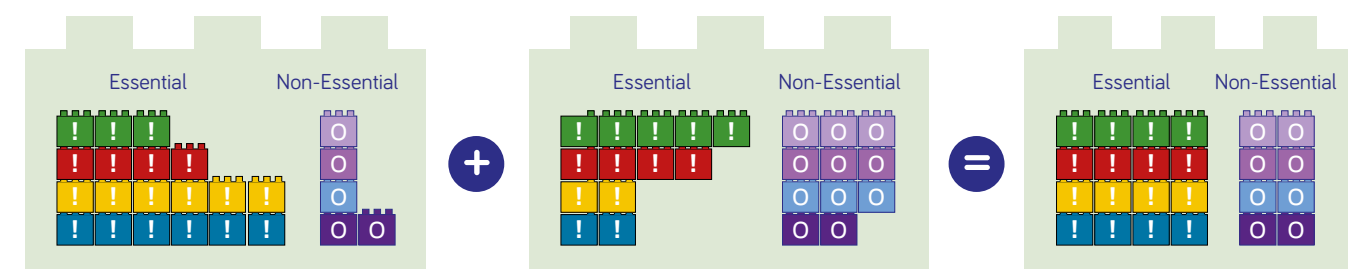
Under normal conditions Essential amino acids can be transformed to Non Essential amino acids. However, if a non-essential amino acid becomes conditionally essential e.g. due to disease, and this amino acid is not supplied in the diet, it will become the limiting amino acid. In this case, the essential amino acid score may be high even though the protein synthesis is low.

Dairy proteins are typically rich in essential amino acids and vegetable proteins are typically rich in some non-essential amino acids. Combining dairy protein with vegetable protein results in a hybrid protein with an improved protein quality both regards to both essential and non-essential amino acids that may become conditionally essential.

Protein 1  
**TYPICAL DAIRY**  
n = 24 Amino acids

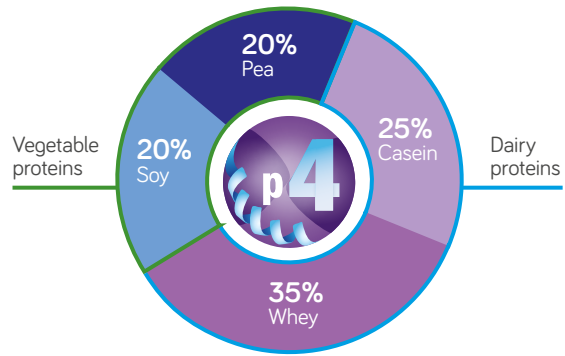
Protein 2  
**TYPICAL VEGETABLE**  
n = 24 Amino acids

Protein 1 + Protein 2  
**TYPICAL HYBRID (p4)**  
n = 24 Amino acids



## NUTRICIAS P4 PROTEIN BLEND

P4 is considered a hybrid protein and consists of 4 different proteins where of two dairy proteins; whey and casein and two vegetable proteins; soy and pea.

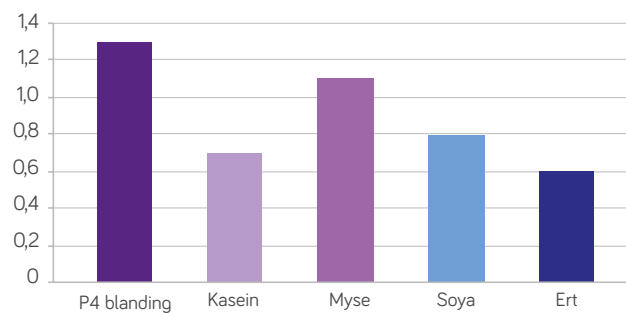


## RELEVANCE OF PROVIDING A BETTER BALANCED AMINO ACID PATTERN

P4 protein blend has higher essential amino acid score than the individual protein sources and it is better balanced with regards to conditionally essential amino acids.

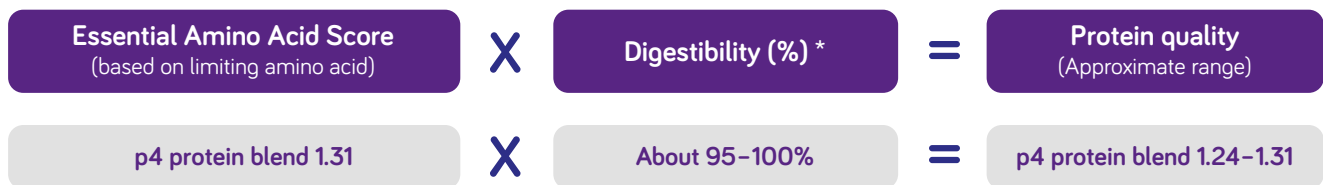
### Essential Amino Acid Score

(basert på WHO/FAO referanse standard)<sup>1,2</sup>



\*Essensiell aa chemical score kalkulert ved hjelp av følgende formel: AA score = mengde aa per test Protein (mg/g) / mengde aa per protein i WHO/FAO 2007 referanse mønster (g/100 g) for voksne.

## PROTEIN QUALITY FAO 2013<sup>1</sup> values for protein quality: ≥ 1 = ideal/high protein quality | 0,75-0,99 = good protein quality



\*Minor differences in digestibility of amino acids btw protein sources typically used in medical nutrition but overall amino acid digestibility is 95-100%.<sup>3</sup>

## SUMMARY

- P4 protein blend has higher **Essential Amino Acid Score vs. individual proteins**.<sup>1,2</sup> More amino acids from P4 could be effectively used for protein synthesis.
- P4 protein blend has **higher content of non-essential amino acids vs. dairy proteins** e.g., glycine and arginine. This could be required for protein synthesis and physiological and metabolic function under conditions of illness or metabolic stress.
- **P4 blend has excellent protein quality and provides a better balanced amino acid pattern for likely functional gain compared to individual proteins.**



1. FAO Dietary protein quality evaluation in human nutrition. Report of an FAO Expert Consultation. FAO food and nutrition paper no. 92. Rome (Italy); 2013. 2. WHO/FAO/UNU Protein and Amino Acid Requirements in Human Nutrition. Report of a Joint WHO/FAO/UNU Expert Consultation. WHO technical report series no. 935 (Geneva, Switzerland); 2007 3. Rutherford SM, Fanning AC, Miller BJ & Moughan PJ. Protein digestibility-corrected amino acid scores and digestible indispensable amino acid scores differentially describe protein quality in growing male rats. J Nutr. 2015;145(2):372-9