Food Fax®

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Protein Wars Part 1 of 4

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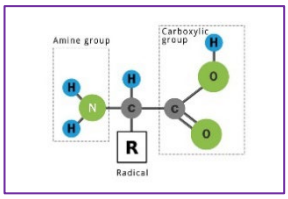
☼ Feeding the animal kingdom

All members of the animal kingdom must consume an adequate amount of protein on a daily basis to maintain health. Cell replenishment and physical growth is impossible without it. Protein replacement in the average adult requires daily intake of 0.6-0.8 g of protein per kg body weight (kbw). Experts agree that term infants require more than twice that amount - 1.5 to 2.5 g per kbw - to both support the growth of the musculoskeletal system and maintain it. Pre-term infants require much higher intake at 3.5 to 4.5 g protein per kbw. Two of the three major indices which determine normal growth of a newborn infant - head circumference, body length and body weight - are based on the skeletal structure alone.

☼ The workhorse plant kingdom

Protein is comprised of individual units called amino acids, which consist of a nitrogen-rich basic amine group (--NH-2), a carboxyl acid group (--COOH) and an organic R group which is unique to each amino acid. The name "amino acid" stems from the nitrogen in the amine group.

Schematic of an amino acid



Essential, Conditionally Essential, Nonessential Amino Acids

Table 1: Essential and nonessential amino acids

Essential	Conditionally Essential	Nonessential
Histidine	Arginine	Alanine
Isoleucine	Cysteine	Asparagine
Leucine	Glutamine	Aspartate
Lysine	Glycine	Glutamate
Methionine	Proline	Serine
Phenylalanine	Tyrosine	
Threonine		
Tryptophan		
Valine		

Through photosynthesis, plants transform solar radiant energy, minerals (particularly nitrogen from the soil), carbon dioxide, water and pigments into almost 500 unique amino acids, each differentiated by its exclusive organic R group. The most important are the 22 alpha-amino acids which create protein, (only 20 of which are specified by the universal genetic code). Nine of these cannot be created by animals. They must be consumed, and thus are called "Essential Amino Acids" (EAA).

Recent research has revealed that many amino acids function beyond protein synthesis: in cell signaling, gene expression and metabolic regulation.

☼ Amino acid patterns and protein quality

The protein quality of a food is determined by how closely its amino acid pattern aligns with that required to sustain the health of the animal consuming it. A particular grain may contain all 22 alpha-amino acids. However, its amino acid pattern must be such that all nine EAA's are present in the relative proportions which meet the amino acid requirements of the member of the animal kingdom consuming the grain. For example, the amino acid and protein quality requirements of humans is published by the Food and Agriculture Organization, in consultation with leading government agencies and nutritionists. The EAA lysine is relatively low in wheat but high in oats. The low lysine content of wheat results in an amino acid pattern that does not meet the FAO's amino acid requirements of humans. However, complementing wheat with oats would result in a dietary selection which would adequately support protein synthesis in humans.

There is currently no plant-based EAA pattern which perfectly aligns with the amino acid requirements for humans. In contrast, animal-based protein – dairy, meat, eggs – is aligned with amino acid requirements as a complete protein, wherein the animal has synthesized the EAA's in its plant-based diet into complete protein.

☼ Flaws in protein measurement in food

The growing prevalence of plant-based protein in the Western food supply requires an assessment of how the protein in food is both rated and measured. For 75+ years, the protein measurement of a food, such as that declared in a Nutrition Facts table, has been limited to quantity, in which the nitrogen content of the food's amino acids is multiplied by a factor of 6.25. Protein quality is not addressed, resulting in some stakeholders begging for better: Converting Nitrogen into Protein - Beyond 6.25. Lastly, reliance on nitrogen measurement alone to measure protein harkens back to the scandals of 2007 and 2008, in which dog food and infant formula was, respectively, laced with melamine, which is 67% nitrogen, to artificially inflate the food's declared protein content, resulting in deaths and sickness. See: Protein safety and quality: Melamine. **FF**