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COIMBATORE-641 035, TAMIL NADU



19FTO302 - FOOD NUTRITION

UNIT III - CARBOHYDRATE, PROTEIN AND FAT

TOPIC Protein quality of foods – supplementary value of protein.

Next to carbohydrate and fat, protein is one of the macronutrients. Digestible carbohydrates are only a source of energy to the human body, whereas dietary fat is a source of energy as well as a source of the essential fatty acids linoleic acid (LA) and α -linolenic acid (ALA), which cannot be synthesized by the human body. Adequate intake (AI) levels for LA and ALA for adults were defined by EFSA as 4% and 0.5% of total energy intake (EI), whereas total fat intake was recommended to be between 20% and 35% of EI. Hence, while dietary fat is not only a source energy for the human body, 78–87% of fat is actually used as a source of energy at the recommended intake levels. Like carbohydrates and fat, protein can also be a source of energy. However, far more importantly, proteins are the main dietary source of nitrogen and indispensable amino acids (IAAs), which are required by the body for protein synthesis to enable e.g., tissue growth and maintenance.

Proteins play a crucial role in the growth, maintenance and physiological functions of the human body. All amino acids are important in the synthesis and functioning of muscles and organs, as well as in enzymes, hormones and the immune system. Amino acids are classified as dispensable amino acids (DAAs) and IAAs, based on whether or not the body can synthesize the particular amino acid. DAAs can be synthesized *de novo* by the human body, whereas IAAs cannot be synthesized by the human body and the only source of IAAs is dietary protein; hence, it is important to assure adequate dietary intake of IAAs. In addition, some DAAs, such as arginine, cysteine, glutamine, glycine, proline and tyrosine, can become conditionally indispensable, e.g., for premature neonates. In these cases, the body cannot produce sufficient levels of these amino acids and these amino acids thus become conditionally IAAs, and need to be supplied through dietary protein to compensate for insufficient synthesis in these stages of life. To meet the metabolic demand and to assure proper functioning of the human body, consumption of adequate amounts of protein is thus essential to meet both total nitrogen and IAA requirements.

The general dietary requirement for protein is defined as an estimated average requirement (EAR) and recommended dietary allowance (RDA). The EAR is the daily intake level for a nutrient that is estimated to meet the requirement for 50% of the target population, whereas the RDA, which is calculated as the EAR plus two times the standard deviation, meets the requirements for 97–98% of the population. For all adults above 18 years of age, the EAR for

protein is 0.66 g protein per kg body weight per day and the RDA is 0.83 g protein per kg body weight per day . EAR and RDA values for children less than 18 years and for pregnant and lactating women are higher than for the general adult population. Studies have also suggested that protein requirements for elderly adults could be higher, as summarized by, and that amino acid requirements can be amended to minimize aging-related health outcomes, but these findings have not yet been translated into clear recommendations by authorities. Further details on protein requirements throughout life cycle are described in further detail elsewhere. No upper limits for protein intake, or the intake of specific amino acids, have been defined to date. However, findings in the novel area of dietary protein restriction, as recently reviewed, warrant further consideration in future.

In addition to total protein intake, requirements for each IAA have also been define. The requirements for IAAs as defined by FAO and EFSA are presented in. Similar to RDA values for total protein, IAA requirements are highest for the 0.5–1-year-olds, and decrease progressively with increasing age. The decreasing requirements for each IAA with increasing age reflect the fact that in the early stages of life, the IAAs are required for growth, development and maintenance of the body, whereas in later stages of life, requirements for growth and development progressively decrease and requirements for IAAs are mainly based on maintenance. Considering the requirements for IAAs and the fact that protein is the only dietary source of IAAs, an RDA for protein thus does not only contain a quantitative aspect but also a qualitative aspect; i.e., the RDA of 0.83 g protein/kg bodyweight/d for adults is only sufficient to meet the requirements for target population if this intake also provides the levels of IAAs outlined in the. For a protein that cannot meet these IAA levels at the RDA for protein intake, either intake at the RDA level can lead to insufficient intake of one or more IAAs or higher intake levels than the RDA are needed to achieve recommended intake of IAA. Such aspects are central to the concept of protein quality.