Essential Fatty Acids (EFAs)

The term 'essential' in nutrition as applied to 'essential fatty acids' (EFAs) refers to those omega-6 and omega-3 polyunsaturated fatty acids which are required in the body for optimal human health and which must be consumed as such in the diet thereby rendering them as essential dietary nutrients. The term 'conditionally essential' has been used in referring to physiologically-essential fatty acids (i.e., essential at high levels in the body tissues and cells for functioning and health) and which can be formed to some limited extent in the body by metabolism but at insufficient rates in a significant portion of the population to sustain optimal health and functioning.

Linoleic acid (LA, 18:2n-6), a major component of omega-6 fatty acids in many fats and oils, has long been officially recognized as an EFA. It plays an essential role in the skin where it accumulates in a specific lipid component of the epidermal surface and cells to protect the body from excessive water loss and skin malfunctioning. In this way, LA is recognized as an EFA to prevent symptoms such as dermatitis of the skin (dryness and scalyness) which can result from long-standing LA deficiency. In addition, LA is catalyzed via desaturation plus elongation reactions in the liver (and to a lesser extent in other tissues) to produce the end product known as arachidonic acid (AA, 20:4n-6) which plays an essential role in reproduction including the regulation of pregnancy duration, and other cell membrane functions. Health and Welfare Canada in 1990 was one of the first federal organizations to make specific and official recommendations on the intakes of omega-6 fatty acids in human populations for health. They set a Recommended Nutrient Intake target of 3% of total dietary energy which converts into 7 and 9 g/day for women and men (aged 25-49 years), respectively. Due to the high intake of LA in North American society, any isolated reports of omega-6 deficiency including scaly skin and dermatitis are extremely rare.

The pioneering work of Dr. Brian Walker and his graduate student, Maxwell Lamptey, from the Department of Nutrition at the University of Guelph (Guelph, Canada) provided early evidence 30 years ago for the essential dietary role for alpha-linolenic acid (ALA) based on studies in experimental rodents. They demonstrated that the feeding of omega-3 enriched diets to female rats prior to mating and throughout pregnancy and lactation along with the feeding of similar diets to their progeny resulted in the pups showing superior learning capacity based on their performance in discrimination-learning testing as compared to the group that correspondingly received diets with negligible levels of omega-3 fatty acids. These authors also correlated the superior learning ability in the omega-3 fed animals to higher levels of docosahexaenoic acid (DHA, 22:6n-3) in the brain tissue. Subsequent studies from numerous laboratories have supported these early findings and have led to the conclusion that DHA is a physiologically-essential fatty acid required at high levels in brain tissue for optimal neurological performance and functioning.
Recognition of the metabolic conversion of dietary ALA to DHA for brain functioning has influenced the establishment of ALA as a dietary EFA. In 1990, Health and Welfare Canada officially recognized ALA (omega-3) as an essential nutrient for all Canadians and recommended minimal intakes at 0.5% of dietary energy of this essential nutrient. In absolute amounts, these recommendations translate into Recommended Nutrient Intakes of 1.1 and 1.5 g/day of ALA for adult women and men, respectively, aged 25-49 years of age. In 2002, the U.S. Food and Nutrition Board, instituted medicine of the national academies, in collaboration with Health Canada, made similar recommendations. The AI (Adequate Intakes) targets established by the U.S. Food and Nutrition Board were 1.1 and 1.6 g/day for women and men respectively, aged 19-50 years. The well-recognized ‘physiological essentiality’ for DHA in the brain and retina (eye) for optimal neuronal and visual performance, and the very limited conversion efficiency of ALA to DHA in humans has led to much concern regarding the reliability upon ALA only as an official EFA for ensuring adequate levels of DHA in the body and optimal health. These topics will be addressed extensively throughout subsequent sections. Recently, there has been a strong move towards considering DHA as a 'conditionally essential fatty acid' based on recognition of its physiological essentiality and the very limited and widely-variant conversion of ALA to DHA in human populations.


