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Carotenoid Journey in the Human Body: From Food to Beneficial Effects

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Dietary carotenoids are found in many colored fruits/vegetables and also in green leafy vegetables. In addition to their major function as vitamin A precursors, carotenoids exhibit some biological actions as antioxidants, modulators of the immune response, and inducers of gap-junction communications (Olson, 1998). Between the diet and the site where their biological activities are fulfilled, carotenoids must be first absorbed, then delivered to the tissue target, and possibly metabolized into active species. The carotenoid journey in the human body will be discussed with an emphasis on the major advances that occurred in the carotenoid metabolism and absorption area during the last past years.

Major progresses in understanding carotenoid metabolism have been the cloning and characterization of two enzymes: a) the β-carotene 15, 15'-oxygenase(BCO) involved in the central cleavage (15,15'-double bond) of β-carotene to produce vitamin A and b) an enzyme that cleaves specifically the 9',10'-double bond of β-carotene to form β-apo-10'-carotenal and β-ionone (see review During et al., 2004). The identification of the later enzyme provides evidence for the occurrence of the eccentric cleavage pathway and suggests the existence of other enzymes (acting at other double bonds of the carotenoid molecule) in carotenoid metabolism. However, under normal physiological conditions, the central cleavage remains the major pathway and the human liver may have a 4-times larger capacity for metabolizing β-carotene than the small intestine. The cloning of BCO should help to understand how some nutritional factors such as vitamin A, unsaturated fats, minerals, and carbohydrates affect the BCO activity. Another major advance has been to demanstrate recently that intestinal carotenoid absorption is a facilitated process involving the scavenger receptor SR-BI. The possibility of the participation of other cholesterol transporters as well is not excluded and this hypothesis is currently under investigations. Thus, a better understanding of carotenoid metabolism and transport at the molecular levels will certainly help to fight vitamin A deficiency and certain chronic diseases (i.e. some cancers, cardiovascular diseases, and age-related macular degeneration) for which dietary carotenoids have shown beneficial reducing effects.

References

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