**Generation and transfer of charge in biological structures**

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The general principle uniting all living organisms is the energy and electrons transfer. A biological membrane (BM) containing carotenoids with semiconducting properties is considered. Charge transfer in BM is realized by the donor-acceptor mechanism through charge transfer complexes (CTC) of carotenoids with lipids. Antioxidant properties of carotenoids are described: the radical transfers an unpaired electron to the carotene, and then, through CTC, to the active center of the enzyme-cofactor system, followed by the formation of an inactive product of the enzymatic reaction. An important role is played by inorganic cofactors: chlorophyll Mg2+, forming CTC with xanthophylls. In the porphyrin structure, Mg2+ forms a chelate complex with astaxanthin, preserving the conjugated system of bonds and providing efficient migration of energy and electrons along BM. The mechanism of H+, O2, e- formation in the FS-II photosystem is described: atomic oxygen is formed from water by photoenzymatic reaction. Further, H2O2 is formed from the interaction of oxygen with water. Subsequent oxidation of H2O2 on the Mn4CaO5 forms O2, H+, e- . Here, Mn4+ is reduced to Mn2+, and then oxidized to Mn4+ upon transfer of the reducing equivalents of PS-I. For efficient collection of solar energy, chloroplast thylakoids are stacked into granules, which are connected by lamellas providing energy to PS I and PS II. Studies of the two-electrode enzymatic system were carried out, and the formation of β-carotene CTC with lipids was also studied