

Oral presentation

## Fatty acids and oxidative stress

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Fatty acids are an important constituent of cellular membranes. The membranes are able to synthesize them with acetyl-CoA but are not capable of synthesizing essential fatty acids (linoleic acid and  $\alpha$ -linoleic acid), which are the precursors to, respectively, arachidonic acid and docosahexaenoic acid.

The cellular membrane, with its high content of unsaturated fatty acids, plays a protective, anti-inflammatory role and indirectly an antioxidant role, favouring physiological defence processes against free radicals.

Oxidative stress is a condition which modifies the normal intracellular balance between oxidant substances produced during aerobic metabolism and antioxidant system processes which perform the function of neutralisation, putting a series of protective mechanisms, of both an enzymatic and non enzymatic nature, in action. Enzymatic systems include dismutase (SOD), catalase (CAT), and glutathione peroxidase (GSH-Px). In non-enzymatic systems, the most important molecules are glutathione,  $\alpha$ -tocopherol (vitamin E), ascorbic acid (vitamin C), flavonoids, the phenol compounds and the minerals zinc (Zn), copper (Cu) and selenium (Sn).

Numerous physiological and pathological processes such as ageing, excessive diets, infections, inflammations, environmental toxins, pharmacological cures, emotional or psychological stress, radiation, smoke and alcohol increase the bodily concentration of oxidising substances, known as reactive oxygen species (ROS) or, more commonly, free radicals. These are chemical species which are highly reactive due to the presence of split electrons. An

increase in free radicals compromises the delicate homeostatic mechanisms which involve neurotransmitters, hormones, oxidising substances and numerous other mediators.

Due to their structure, which is rich in double bonds, polyunsaturated fatty acids render cellular membranes vulnerable to damage from free radicals, causing peroxidation. The damage induced by lipid peroxidation renders the cell unstable, and therefore compromises fluidity, permeability, signal transduction and causes receptor, mitochondrial DNA and nuclear alterations.

Oxidising stress from free radicals is one of the factors which contributes to an increase in the frequency of the cellular cycle and consequent premature cell death, leading to many degenerative illnesses in the central nervous system, as well as psychiatric disturbances. Peripheral systems undergo a process of atherogenesis and can lead to pathologies in the cardiovascular system.

This data is important for recognising that the integrity and functionality of biomolecules is closely correlated to integration with essential fatty acids and antioxidants, whether from a dietary-habit point of view or from a therapeutic point of view.