

Neurophysiological studies to counteract the oxidative stress in Age-related macular degeneration

As part of the central nervous system, the retina is particularly susceptible to alterations of its microenvironment, which can cause irreversible damage to vision. In addition, the retina, and especially the macula, is characterized by a state of physiological oxidative stress due to an elevated metabolism and high oxygen consumption. Hence, the maintenance of a correct and balanced microenvironment is fundamental in order to allow the health the retinal cells.

Age-related macular degeneration (AMD) occurs as a result of photoreceptors, retinal pigmented epithelium, Bruch's membrane and choriocapillaris complex alterations, which culminates in blood retinal barrier breakdown, activation of inflammatory events and retinal neurodegeneration.

AMD can be considered a multifactorial disease and the main risk factors include aging, cigarette smoke, high fat diet, light exposure, alcohol consumption, and specific genetic polymorphisms. All these events share oxidative stress as a common feature that can be considered the driving force of all the risk factors.

Based on the absence of effective therapies for the treatment of AMD, in recent years important experimental approach are focused on nanomedicine, which represents a promising research field due to the unmatched properties of nanoparticles. Cerium oxide nanoparticles (CeO_2 -NPs), a pure antioxidant, have been tested in our animal model of AMD and we demonstrated that the main features of AMD can be counteracted. Specifically, we have demonstrated their ability to preserve retinal function, to avoid the blood retinal barrier breakdown and debris accumulation, to counteract neovascularization and microglial activation.

Based on this evidence, it can be taken into consideration that CeO_2 -NPs may represent a promising therapeutical approach for AMD.