

Lipoic acid and vitamin D3 to prevent astrocytes aging

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Abstract

Brain aging is a complex multifactorial process characterized by gradual and continuous loss of neuronal functions. It is hypothesized that at the basis of brain aging as well as age-related diseases, there is an impairment of the antioxidant defense system leading to an increase of oxidative stress. In this study, two different biological aspects involved in brain aging and neurodegeneration have been investigated: oxidative stress and iron accumulation damage. In primary mouse astrocytes, the stimulation with 50 μM lipoic acid (LA) and 100 nM vitamin D (vitD) was first investigated in a time-course study to determine the dosages to be used in combination and then in a permeability test using an *in vitro* blood-brain barrier. In a second set of experiments, the role of oxidative stress was investigated pretreating astrocytes with 200 μM H₂O₂ for 30min. The ability of vitD and LA alone and combined together to prevent or repair the damage caused by oxidative stress was investigated after 24 h of stimulation by the MTT test, mitochondrial membrane potential measurement, and Western blot analysis. To induce neurodegeneration, cells were pretreated with 300 μM catalytic iron for 6 days and then treated with vitD and LA alone and combined for additional 6 days to investigate the protection exerted by combination, analyzing viability, ROS production, iron concentration, and activation of intracellular pathways. In our study, the combination of LA and vitD showed beneficial effects on viability of astrocytes, since the substances are able to cross the brain barrier. In addition, combined LA and vitD attenuated the H₂O₂-induced apoptosis through the mitochondrial-mediated pathway. The combination was also able to counteract the adverse conditions caused by iron, preventing its accumulation. All these data support the hypothesis of the synergistic and cooperative activity exerted by LA and vitD in astrocytes indicating a possible new strategy to slow down aging.

Biography

Uberti is a Research Associate in Physiology, overseeing a research project funded by the AGING Project. Throughout her career, she has mainly focused on the extraskelatal effects of vitamin D deficiency as well as the neurophysiological signatures of neurodegenerative diseases. She is also co-founder of the university spin-off noiVita s.r.l.s. and co-owner of several patents involving the use of natural extracts as food supplements. Member of the Italian Physiological Society and American Physiological Society, she has been the Academic Editor of numerous peer-review scientific journals.