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CHANGES IN OXIDATIVE DAMAGE, INFLAMMATION AND [NAD(H)] WITH AGE IN CEREBROSPINAL FLUID AND INFLUENCE OF CAROTENOIDS

A growing body of evidence indicates that oxidative stress and inflammation play a central role in the degenerative changes of systemic tissues in aging. While age is the major risk factor for the development of most neurodegenerative disorders a number of lifestyle choices have been linked to either promotion or prevention of pathogenesis by increasing or decreasing oxidative stress and inflammation. The consumption of foods rich in carotenoids, possessing significant antioxidant and anti-inflammatory properties, has been linked to reduced risk of neuropathology. The objective of this study was to quantify and evaluate the relationship between plasma carotenoid concentrations and cerebrospinal fluid (CSF) markers of inflammation (IL-6), oxidative stress (F2-isoprostanes, 8OHdG, total antioxidant capacity) and nicotinamide adenine dinucleotide (NAD^+), in healthy humans across a wide age range (24-91 years). NAD^+ is required for cellular energy production, DNA repair and activation of the longevity enzymes (sirtuins). CSF of participants aged >45 years was found to contain increased levels of lipid peroxidation (F2-isoprostanes) ($p=0.04$) and inflammation (IL-6) ($p=0.00$) and decreased levels of both total antioxidant capacity ($p=0.00$) and NAD(H) ($p=0.05$), compared to their younger counterparts. After adjusting for age and gender total antioxidant capacity correlated positively with both α-carotene ($p=0.01$) and β-carotene ($p<0.001$) in plasma. An inverse correlation was seen between plasma lycopene and the plasma inflammatory cytokine IL-6 ($p=0.02$). An increase in plasma β-cryptoxanthin correlated with a decrease in CSF IL-6 ($p=0.04$). A significant positive correlation was found between plasma lycopene and both plasma ($p<0.001$) and CSF ($p<0.01$) [NAD(H)]. Surprisingly no statistically significant associations were found between the most abundant carotenoids, lutein + zeaxanthin and either plasma or CSF markers of oxidative stress. Taken together these data suggest a progressive age associated increase in oxidative damage, inflammation and reduced [NAD(H)] in the brain which may be moderated by the consumption of some carotenoids.