

Zeaxanthin and Brain Health

[Appl Microbiol Biotechnol](#). 2007 Apr;74(6):1350-7. Epub 2007 Jan 11.

Rare carotenoids, (3R)-saproxanthin and (3R,2'S)-myxol, isolated from novel marine bacteria (Flavobacteriaceae) and their antioxidative activities.

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We isolated three orange or yellow pigment-producing marine bacteria, strains 04OKA-13-27 (MBIC08261), 04OKA-17-12 (MBIC08260), and YM6-073 (MBIC06409), off the coast of Okinawa Prefecture in Japan. These strains were classified as novel species of the family Flavobacteriaceae based on their 16S rRNA gene sequence. They were cultured, and the major carotenoids produced were purified by chromatographic methods. Their structures were determined by spectral data to be (3R)-saproxanthin (strain 04OKA-13-27), (3R,2'S)-myxol (strain YM6-073), and (3R,3'R)-zeaxanthin (strains YM6-073 and 04OKA-17-12). Saproxanthin and myxol, which are monocyclic carotenoids rarely found in nature, demonstrated significant antioxidative activities against lipid peroxidation in the rat brain homogenate model and a neuro-protective effect from L-glutamate toxicity.

Publication Types:

- [Research Support, Non-U.S. Gov't](#)

PMID: 17216447 [PubMed - indexed for MEDLINE]

Carotenoid, tocopherol, and retinol concentrations in elderly human brain.

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BACKGROUND: Antioxidants, such as tocopherols and carotenoids, have been implicated in the prevention of degenerative diseases. Although correlations have been made between diseases and tissue levels of antioxidants, to date there are no reports of individual carotenoid concentrations in human brain. **OBJECTIVE:** To measure the major carotenoids, tocopherols, and retinol in frontal and occipital regions of human brain. **DESIGN:** Ten samples of brain tissue from frontal lobe cortex and occipital cortex of five cadavers were examined. Sections were dissected into gray and white matter, extracted with organic solvents, and analyzed by HPLC. **RESULTS:** At least 16 carotenoids, 3 tocopherols, and retinol were present in human brain. Major carotenoids were identified as lutein, zeaxanthin, anhydrolutein, alpha- cryptoxanthin, beta- cryptoxanthin, alpha- carotene, cis- and trans- β -carotene, and cis- and trans-lycopene. Xanthophylls (oxygenated carotenoids) accounted for 66-77% of total carotenoids in all brain regions examined. Similar to neural retina, the ratio of zeaxanthin to lutein was high and these two xanthophylls were significantly correlated ($p < 0.0001$). The tocopherol isomers occurred in the brain over a wider range of mean concentrations (0.11-17.9 nmol/g) than either retinol (87.8 - 163.3 pmol/g) or the identified carotenoids (1.8-23.0 pmol/g). **CONCLUSIONS:** The frontal cortex, generally vulnerable in Alzheimer's disease, had higher concentrations of all analytes than the occipital cortex which is generally unaffected. Moreover, frontal lobes, but not occipital lobes, exhibited an age-related decline in retinol, total tocopherols, total xanthophylls and total carotenoids. The importance of these differences and the role(s) of these antioxidants in the brain remain to be determined.

Publication Types:

- [Research Support, Non-U.S. Gov't](#)

PMID: 15129301 [PubMed - indexed for MEDLINE]

Plasma carotenoid and malondialdehyde levels in ischemic stroke patients: relationship to early outcome.

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An association between ischemic stroke and increased oxidative stress has been suggested from animal studies. However, there is a lack of evidence with respect to this association in humans. Here, the time course of plasma levels of six carotenoids, which are lipophilic micronutrients with antioxidant properties, as well as of malondialdehyde (MDA), a marker of lipid peroxidation, was followed in ischemic stroke patients. Plasma levels of lutein, zeaxanthin, beta-cryptoxanthin, lycopene, alpha- and beta-carotene, as well as MDA were measured by high-performance liquid chromatography in 28 subjects (19 men and nine women aged 76.9±8.7 years) with an acute ischemic stroke of recent onset (<24h) on admission, after 6 and 24 h, and on days 3, 5, and 7. Carotenoid and MDA levels in patients on admission were compared with those of age- and sex-matched controls. Plasma levels of lutein, lycopene, alpha- and beta-carotene were significantly lower and levels of MDA were significantly higher in patients in comparison with controls. Significantly higher levels of MDA and lower levels of lutein were found in patients with a poor early-outcome (functional decline) after ischemic stroke as compared to patients who remained functionally stable. These findings suggest that the majority of plasma carotenoids are lowered immediately after an ischemic stroke, perhaps as a result of increased oxidative stress, as indicated by a concomitant rise in MDA concentrations. Among the carotenoids, only lutein plasma changes are associated with a poor early-outcome.

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- [Research Support, Non-U.S. Gov't](#)

PMID: 12071344 [PubMed - indexed for MEDLINE]