Flavonoid

Flavonoids (or bioflavonoids) (from the Latin word flavus meaning yellow, their color in nature) are a class of plant and fungus secondary metabolites.

Chemically, they have the general structure of a 15-carbon skeleton, which consists of two phenyl rings (A and B) and heterocyclic ring (C). This carbon structure can be abbreviated C6-C3-C6. According to the IUPAC nomenclature, they can be classified into:

flavonoids or bioflavonoids

isoflavonoids, derived from 3-phenylchromen-4-one (3-phenyl-1,4-benzopyrone) structure

neoflavonoids, derived from 4-phenylcoumarine (4-phenyl-1,2-benzopyrone) structure

The three flavonoid classes above are all ketone-containing compounds, and as such, are anthoxanthins (flavones and flavonols). This class was the first to be termed bioflavonoids. The terms flavonoid and bioflavonoid have also been more loosely used to describe non-ketone polyhydroxy polyphenol compounds which are more specifically termed flavanoids. The three cycle or heterocycles in the flavonoid backbone are generally called ring A, B and C. Ring A usually shows a phloroglucinol substitution pattern.

Flavonoids are popular substances in the literature, with proven effects on cardiovascular, neoplastic and neurodegenerative diseases. Antioxidant effect is the most pronounced and studied one. Among thousands of flavonoids, quercetin (QUE) is a prototype with significant antioxidant effects.

Studies suggested that dietary intake or supplementation of natural flavonoids like hesperidin can be used for therapy of patients with brain injury and depression. However, the exact mechanisms by which hesperidin indicates its neuroprotective effects are not fully understood.

The purpose of a study of Kosari-Nasab et al. from Tabriz, was to explore the influence of hesperidin on depression-related symptoms in a mouse model of mTBI, and that what mechanisms are primarily involved in the antidepressant effects of this bioflavonoid.

Ten days after mTBI-induction, mice received oral hesperidin treatment (50 mg/kg/14 days), then animals were subjected to different depression tests including sucrose preference test, forced swim test, novelty-suppressed feeding test, and tail suspension test. We also measured levels of tumor necrosis factor (TNF)-α, interleukin-(IL)-1β, malondialdehyde (MDA), and brain-derived-neurotrophic-factor (BDNF) in the hippocampus.

Our results show that mTBI induction induced depressive-like behaviors in mice by increasing inflammatory cytokines (IL-1β and TNF-α) and oxidative stress marker (MDA), and reducing BDNF levels in the hippocampus. Interestingly, hesperidin treatment was effective to significantly reduce depression-related symptoms in mTBI-induced mice. In addition, hesperidin decreased the levels of IL-1β, TNF-α and MDA, and increased BDNF levels in the hippocampus. The major strength of our study is that four behavioral tests gave similar results.

This study suggests that antidepressant-like effect of hesperidin may be mediated, at least in part, by decreased neuroinflammation and oxidative damage, and enhanced BDNF production in the

hippocampus [1].

1)
Kosari-Nasab M, Shokouhi G, Ghorbanihaghjo A, Abbasi MM, Salari AA. Hesperidin attenuates depression-related symptoms in mice with mild traumatic brain injury. Life Sci. 2018 Oct 20. pii: S0024-3205(18)30665-9. doi: 10.1016/j.lfs.2018.10.040. [Epub ahead of print] PubMed PMID: 30352242.