



Fundamental Support for Neurodegeneration and Cognitive Decline

Neurodegeneration occurs with ageing and may contribute to mild age related cognitive decline. Various lifestyle and other factors may contribute to differences in the extent of neurodegeneration seen in individuals, and the development of conditions such as memory loss, dementia, depression, anxiety, Parkinson's and Alzheimer's diseases. Subsequently there are various fundamental nutritional options to delay or decline the extent of damage and thus presentation of such diseases as (e.g. Parkinson's and Alzheimer's disease, Dementia). This article will discuss the impact of inflammation and hormone dysfunction upon the brain and nutritional options that integrative practitioners can use to support healthy brain ageing.

Inflammation

Underlying chronic inflammation, even at very low levels has been highlighted as a contributing factor, and risk factor for cardiovascular disease¹ as well as neurological conditions including depression,² multiple sclerosis,³ Alzheimer's disease⁴ and Parkinson's disease.⁵ Evidence also suggests that acute exacerbation of chronic neurodegenerative conditions such as Alzheimer's disease and multiple sclerosis can be caused by systemic inflammation, driving the progression of neurodegeneration.⁶

The inflammatory response in the brain is mediated by microglia (immune cells of the CNS). Chronic activation of microglia may cause neuronal damage through the release of potentially cytotoxic molecules such as pro-inflammatory cytokines, reactive oxygen intermediates, proteinases and complement proteins.⁷ Studies suggest that blood levels of CRP and IL-6 (inflammatory markers) are associated with a higher risk of Alzheimer's disease and cognitive decline during ageing.⁴ Over production of cytokines and other pro-inflammatory mediators are also suspected to be triggers in the neurodegeneration of the dopaminergic neurons in the substantia nigra of Parkinson's disease patients.⁸ It has also been suggested that inflammation may contribute to mitochondrial dysfunction, an important contributing factor to neurodegeneration.

Nutritional support to suppress chronic inflammation may help to protect against neurodegeneration. Omega three essential fatty acids are some of the most well researched anti-inflammatory nutritionals available.

*"DHA (docosahexaenoic acid) and its lipid mediators prevent neuroinflammation by inhibiting transcription factor NFkappaB, preventing cytokine secretion, blocking the synthesis of prostaglandins, leukotrienes, and thromboxanes and modulating leukocyte trafficking."*⁹

Omega 3 fatty acids play crucial roles in the development and function of the central nervous system. Epidemiological studies suggest a protective effect associated with increased fish consumption and intake of unsaturated fatty acids leading to low omega 6:omega 3 fatty acid ratios.^{10, 11}

The dietary ratio of AA to DHA may affect neurodegeneration associated with both acute neural trauma and neurodegenerative diseases. Deficiencies in the level of DHA, such as low serum levels and high dietary intake ratios of omega 6:omega 3 fatty acids have been linked to cognitive impairment and Alzheimer's disease. Other neuroprotective nutrients that may offer anti-inflammatory protection for the brain include L-theanine and phosphatidyl serine. Animal studies have demonstrated a neuroprotective and cognitive enhancing effect of L-theanine.¹²

Hormonal Dysfunction

Menopause and andropause are associated with the progression and onset of mild cognitive impairment and also some degenerative inflammatory disorders. As we know during menopause and andropause, levels of sex hormones may become imbalanced. Evidence indicates that hormonal imbalance and dysfunction may

significantly affect brain ageing and contribute to cognitive disorders.

Ovarian hormones have been indicated to protect against brain injury, neurodegeneration and cognitive decline. Oestrogens specifically have shown a specific role in inhibiting the neuroinflammatory cascade, protecting astrocytes and microglia from cell death and stimulating recovery of dopamine neuron functionality in Parkinson's disease.¹³ Animal studies suggest that progesterone, testosterone and oestradiol prevent neuronal loss in the central nervous system and that progesterone and its derivatives promote myelin formation and the remyelination and regeneration of injured nerves.^{14, 15}

Investigation of hormonal imbalance may be appropriate in cases of mild cognitive impairment and other neurodegenerative disorders. COMT (catechol-O-methyltransferase) activity may also be a useful avenue of investigation. This enzyme is involved in the metabolism of oestrogens and also some neurotransmitters including dopamine and norepinephrine. S-adenosyl methionine is the methyl donor required for activity of the COMT enzyme, supplementation of which has been shown to benefit some mental health conditions.

Sex hormones may also modulate neurotransmitter systems in the brain, including the cholinergic and dopaminergic systems; the destruction of which is associated with Alzheimer's disease and Parkinson's disease respectively.

Nutritional precursors may be beneficial to up-regulate the production of neurotransmitters, increasing their activity in the brain, and supporting symptoms of these neurodegenerative conditions. Small studies have indicated that *Mucuna pruriens*, a herb containing a significant amount of L-dopa may be beneficial in the support of Parkinson's disease symptoms.¹⁶

Melatonin has been shown to exhibit neuroprotective effects in ageing. Patients with Alzheimer's disease have been found to have more profound age related reductions in melatonin than others. The ability of melatonin and its kynurenine metabolites to interact directly with the electron transport chain by increasing the electron flow and reducing electron leakage are unique features by which melatonin is able to increase the survival of neurons under enhanced oxidative stress.¹⁷ Melatonin has been found to have many beneficial effects in experimental models of Alzheimer's disease, including improvement of cognitive function, anti-oxidative injury and inhibition of beta amyloid deposition.^{18, 19} Tryptophan is the precursor for the production of both serotonin and melatonin.²⁰ Nutritional supplementation of tryptophan and SAME (required for the methylation of serotonin to melatonin) may be of benefit in increasing low melatonin levels.

Other considerations in neurodegenerative disorders include heavy metal toxicity, deficiencies of nutrients such as B12 and folate, genetic predisposition and lifestyle factors such as smoking and imbalanced diet.

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