

Berryfruit and Walnut Supplementation in the Aging Brain: Implications for the Health Benefits of Cocoa

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Aging

Aging can be defined as a condition where *stressors* are not counteracted by protective functions leading to a dysregulation in development. In the neuroscience world it is characterized by losses in neuronal function accompanied by behavioral declines (decreases in motor and cognitive performance) in both humans and animals

Oxidative Stress Lifestyle Factors

Solar irradiation

• Enough energy to hydrolyze water & create oxygen radicals in body tissues

Cigarette smoking

• More than $\sim 10^{15}$ free radicals per puff

Environmental exposure

• Oxidative damage to DNA, lipids, proteins



OXIDATIVE STRESS AND INFLAMMATION THE EVIL "GEMINI TWINS" OF BRAIN AGING

- ◆ At rest the brain utilizes 20% of the body's oxygen.
- ◆ Markers to both inflammation and oxidative stress increase as a function of age and the brain becomes more sensitive to them.
- ◆ When coupled with genetic changes the brain becomes more vulnerable to diseases such as Alzheimer disease.

•Quenching the Fires of Brain Aging:



Diseases of Aging and Oxidative Stress

- ◆ Alzheimer Disease
- ◆ Parkinsons Disease
- ◆ CVD
- ◆ Vascular Dementia
- ◆ Cancer
- ◆ Arthritis

Possible Prevention of Alzheimer's Disease (Epidemiological Considerations) I. General

- ◆ Reductions in obesity^{1,2}
- ◆ Maintenance of normal zinc serum levels, especially in old age³
- ◆ ERT, but many inconsistencies in the reports
- ◆ NSAIDs used prior to development of AD⁴
- ◆ Statins⁵

1. Gustafson et al. *Arch Intern Med.* 2003;163:1524-1528 (B); 2. Otsuka et al. *Ann N Y Acad Sci.* 2002;977:155-161 (B); 3. Tully et al. *Neuroreport.* 1995;6:2105-2108 (B); 4. Zandi et al. *Neurobiol Aging.* 2001;22:811-817 (B); 5. Wolozin et al. *Arch Neurol.* 2000;57:1439-1443 (B); Adapted from Jansson. *Med Hypotheses.* 2005;64:960-967 (B).

Possible Prevention of Alzheimer's Disease (Epidemiological Considerations) II. Dietary Considerations

- ◆ Consumption of fish, fish oils, etc, containing n3 DHA or EPA¹
- ◆ Curcumin^{2,3}
- ◆ Melatonin⁴
- ◆ Folic acid, vitamin B complex, especially in persons with high homocysteine levels⁵
- ◆ Use of vitamin E, and/or vitamin C in enriched foods or supplements⁶
- ◆ Alpha lipoic acid and L carnitine supplements⁷
- ◆ High antioxidant fruits and vegetables⁸

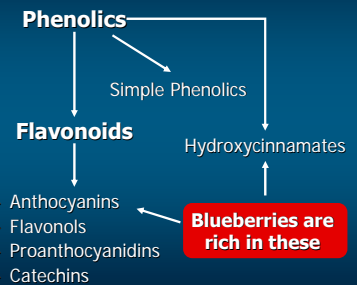
1. Young et al. *Reprod Nutr Dev.* 2005;45:1-28 (B); 2. Lim et al. *J Neurosci.* 2001;21:8370-8377 (B); 3. Ringman et al. *Curr Alzheimer Res.* 2005;2:131-136 (B); 4. Wu et al. *J Pineal Res.* 2005;38:145-152 (B); 5. Anello et al. *Neuroreport.* 2004;15:859-861 (B); 6. Zandi et al. *Arch Neurol.* 2004;61:82-88 (B); 7. Rogers et al. *Age Ageing.* 1999;28:205-209 (B); 8. Joseph et al. *Am J Clin Nutr.* 2005;81(1 suppl): 313S-316S (B); Adapted from Jansson. *Med Hypotheses.* 2005;64:960-967 (B).

ORAC (1 g fresh wt μmol trolox equiv/g)

Fresh Fruit		Veggies and Legumes	
Blueberries	2400	Kale	1770
Blackberries	2036	Spinach	1260
Cranberries	1750	Brussels sprouts	980
Strawberries	1540	Alfalfa sprouts	930
Raspberries	1220	Broccoli florets	890
Plums	949	Beets	840
Avocado	782	Red bell peppers	460
Oranges	750	Kidney beans	460
Red grapes	739	Onions	450
Cherries	670	Corn	402

ORAC= oxygen radical absorbance capacity.
Courtesy of , Ron Prior Ph.D.

Fruit Polyphenolics



Courtesy of W. Kalt, Ph.D.