Role of L-Carnosine in prevention of Neurodegeneration

The brain’s rich supply of oxygen, glucose, membrane lipids and metals may explain why it is also richly endowed with L-Carnosine. L-Carnosine is able to attenuate cellular oxidative stress and can inhibit the intracellular formation of reactive oxygen species (ROS) and reactive nitrogen species (RNS), through its distinctive combination of antioxidant and antiglycating properties.

L-Carnosine in the brain helps:

- Suppress oxidative stress
- Lipid peroxidation
- Pathological protein-sugar interactions
- Copper-zinc toxicity
- Sustain the long lives of neurons
- Prevent oxidatin of lipids in the membranes of brain cells
- Decrease the risk of neurodegeneration and slowing down the initiated process in diabetes

Thus, L-Carnosine with its unique action can find therapeutic usefulness in the following age related conditions:

- Diabetes
- Neurological degeneration in diabetes
- Cellular senescence (ageing) in general
- Cross-linking of the eye lens (macular degeneration)
- Cross-linking of skin collagen (skin ageing)
- Cardiovascular conditions

References:
1. Clinical Diabetes October 2003 vol. 21 no. 4 186-187
3. Experimental Gerontology, Vol. 34, No. 1, pp. 35–45, 1999
7. V. Prakash Reddy and Ayesha Bayaz. Inhibitors of the Maillard reaction and AGE breakers as therapeutics for multiple diseases. Drug Discovery Today 2006; 11, Numbers 13/14
8. Alan R. Hipkiss, Carol Brownson, Martin J. Carrier. Carnosine, the anti-ageing, anti-oxidant dipeptide, may react with protein carbonyl groups. Mechanism of Ageing and Development 2001; 122: 1431–1445
Diabetes mellitus - Type II diabetes is increasing at an alarming rate and is considered as one of the main threats to human health in the 21st century in both developed and developing nations. In diabetes, hyperglycemia plays an important role in the pathogenesis of diabetic complications in coronary, cerebrovascular and peripheral systems thereby leading to increased morbidity and mortality.

**Glycation in Diabetes**
- Is a non-enzymatic reaction between proteins and sugars
- Irreversibly alters the configuration of proteins
- Leads to formation of AGE’s
- Results in diabetic complications

**Glycation has been implicated in**
- Connective tissue collagen
- Arterial collagen
- Kidney glomerular basement membrane
- Eye lens crystallins
- Nerve myelin proteins
- Circulating LDL

**AGE’s and diabetic complications**
- In normal body, AGE’s start developing early in embryos at a constant and slow rate and gradually accumulate with time
- Increased availability of glucose accelerate formation of AGE’s in Diabetes
- AGE’s are important pathogenic mediators for all diabetic complications conventionally grouped into micro or macroangiopathies
- AGE’s lead to altered gene expression and protein function leading to cellular dysfunction and damage
- AGE’s accelerate hardening of arteries, creates cataracts in eyes, causes wrinkling of the skin and contributes to muscle and nerve damage in brain

**People with Diabetes are**:
- 30-40 times more likely to undergo amputation
- 25 times more likely to develop blindness
- 17 times more likely to develop kidney disease
- 2-4 times more likely to develop myocardial infarction
- Twice as likely to suffer a stroke than Non-Diabetics

**L-CARNOSINE - Nature’s Cell-life Protector**
L-Carnosine is a powerful nutrient that helps defend the body’s proteins against crippling effects of glycation
- L-Carnosine is a 100% natural substance, a dipeptide formed of two amino acids (B-alanyl-L-histidine)
- It is normally made in human body and is found at high levels in brain, innervated tissues, the lens of the eyes and skeletal muscle tissues

**L-CARNOSINE - A Multifunctional Nutrient**
By preventing formation of dangerous AGE’s carnosine helps the body’s proteins retain their youthful vigour and function. Moreover, studies have demonstrated that L-Carnosine is a potent anti-oxidant. L-Carnosine’s multifunctional properties makes this critical nutrient an essential stepping stone of every diabetes management program.

**Mechanisms of L-Carnosine protection include**:
- Proton buffering agent
- Heavy metal chelating agent
- Free-radical scavenger (prevents glycation and carbonylation of proteins)
- Preventing the modification of biomacromolecules thereby keeping their native functionality under oxidative stress

L-Carnosine is able to attenuate cellular oxidative stress and can inhibit the intracellular formation of reactive oxygen species and reactive nitrogen species through its distinctive combination of antioxidant and antiglycating properties.

The effects of L-Carnosine on glycosylation have been found to be particularly beneficial in reducing the risk of diabetic complications. L-Carnosine is effective in protecting the nerves, arteries and kidneys against sugar-related damage.

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AGE’s - Advanced Glycation End Products