Protecting Memory and Enhancing Brain Function

By Jim English

The human brain is one of the most elegant and complex structures ever conceived. Comprising over ten billion neurons and supportive cells, no other organized structure – organic or silicon – can begin to match the sheer complexity and processing power of the human brain. It regulates virtually all life systems while simultaneously generating the thoughts, dreams and feelings that define us and shape our perception of reality.

Every thought, concept, opinion, belief and emotion arises from the untold millions of chemical and electrical reactions that occur in the brain every second. Generating the power for this activity places a huge demand on the body’s energy reserves. Though it accounts for a mere two percent of the body’s weight, the brain greedily consumes more than twenty percent of the body’s available energy in the form of oxygen and glucose.

The Aging Brain

By age seventy most of us will lose about ten percent of our original brain cells to “normal” aging. This continual loss of brain cells can be further aggravated by age-related conditions, such as hypertension, hardening of the arteries, diabetes, cerebrovascular insufficiency, strokes and multi-infarct dementia.

Dementia, the loss of cognitive or intellectual functions, is marked by a profound impairment of memory and the loss of complex abilities required for problem-solving, decision making, spatial orientation, and even the ability to put simple words together to communicate.

Dementia is a permanent, progressive disease that mostly affects the elderly, who, over time, may lose the ability to function normally and require round-the-clock care. It is estimated that up to 8 percent of all people over 65 suffer from some form of dementia, and these numbers double every additional five years, with an estimated 20 percent to 50 percent of people in their 80s suffering from some form of dementia.
There are close to fifty different causes of dementia, including neurological disorders (Alzheimer's disease), vascular disorders (multi-infarct disease), inherited disorders (Huntington's disease), and infections (viruses such as HIV).

One factor shared by all of these disorders is a reduction in the flow of blood and oxygen to brain tissues. Reduced cerebral circulation also increases the production of free radicals, inflicting additional damage to cell membranes and accelerating brain cell death and speeding up mental deterioration.

**Hope for Aging Brains**
A number of nutritional compounds have been shown to aid in protecting the brain, prolonging cognitive abilities and slowing down the loss of cognitive functions that can appear in healthy individuals as young as fifty years of age. The safety and efficacy of the following supplements is also supported by numerous double-blind controlled trials in Europe and the U.S.

**Acetyl-L-Carnitine**
Acetyl-L-Carnitine (ALC) is a cognitive enhancer and neuroprotective agent that protects against a wide range of age-related degenerative changes in the brain and nervous system. ALC is an ester of carnitine that modulates cellular concentrations of free coenzyme A and acetyl-coenzyme A, two compounds integrally involved in numerous cellular functions, including the transfer of fatty acids across mitochondrial membranes for energy production.

ALC is found in various concentrations in the brain and its levels are significantly reduced with aging. ALC also significantly reduces damaged fats, such as lipofuscin, in the brains of aged rats. In addition to accumulating in the aging brain, lipofuscin also accumulates in the skin as “aging spots,” those brownish pigmented blemishes that accumulate in the backs of hands of many people over fifty. The reduction of these deposits following consumption of ALC may be evidence of a slowing in the aging process in the brain.
ALC also has the ability to cross into the brain where it acts as a powerful antioxidant, preventing the deterioration of brain cells that normally occurs with age. Because of this protective effect, ALC may be beneficial in the prevention and treatment of free-radical mediated diseases, such as Alzheimer's and Parkinson's disease.

ALC has been shown to improve age-related changes of dopamine receptors, including improved release and binding of dopamine. Research has shown that ALC can prevent dopaminergic neuron death caused by MPTP, a neurotoxin that mimics neurological symptoms similar to Parkinson's disease, by selectively killing dopaminergic neurons.

**Choline**

Choline is a precursor to acetylcholine, a cholinergic neurotransmitter that declines with advancing age. Individuals predisposed to Alzheimer's disease and other dementias, infants and children, diabetics, and athletes (who often have reduced plasma-choline levels after training or competition) may be at increased risk of choline deficiency.

Choline has been shown to have considerable potential for preserving the integrity of neuronal structures and in preventing some of the alterations in the central nervous system during aging.

Choline supplementation appears to prevent the age-induced decline of the dendritic network composed of neurons that fire impulses to the cells. Choline increases the number of dendritic spines in the cerebral cortex of old mice and improves the animals' learning performance.

**DMAE**

DMAE (dimethylaminoethanol) is a nutrient found abundantly in fish and in human brains. In the brain, DMAE is converted into choline, the precursor to acetylcholine. Because acetylcholine conducts nerve impulses within the brain, the increased acetylcholine synthesis seen after DMAE supplementation may improve memory and learning skills, elevate mood, prevent memory loss in elderly adults, and increase physical energy.

Studies suggest DMAE may work by inhibiting choline metabolism in peripheral tissues, causing free choline to accumulate in the blood, enter the brain and stimulate choline receptors. As the immediate precursor to choline, DMAE assists in the building and repair of cell membranes, particularly in the brain and central nervous system.

Animal studies have demonstrated that DMAE stimulates brain neurons and improves working memory performance. In one study, rats treated with DMAE demonstrated significant improvements in remembering how to negotiate a maze. In another study, mice trained to negotiate a maze demonstrated improved
memory retention when treated with DMAE.

DMAE’s ability to stimulate acetylcholine synthesis has led researchers to explore its effects in senile dementia and Alzheimer’s. In a promising study, 14 senile dementia patients were treated with DMAE for four weeks. The dosage was gradually increased to 600 mg, three times daily, during the first two weeks, with no adverse effects. Although the patients experienced no improvement in cognitive function or memory, ten of the 14 patients experienced reduced depression, irritability and anxiety and increased motivation and initiative.

**Phosphatidylserine**

Phosphatidylserine (PS) is a naturally-occurring phospholipid nutrient that has been shown to improve cognitive functions and enhance mental ability. PS is essential to the healthy functioning of the human brain where it affects an assortment of nerve cell functions, including: conduction of nerve impulses; accumulation, storage and release of neurotransmitters; the activity and number of receptors involved in synaptic discharge; and the biological maintenance of cellular ‘housekeeping’ functions.

Supplementation with PS has been proven to slow, halt, or in many cases, even reverse cognitive degeneration due to Age-Related Cognitive Decline (ARCD), and dementing illnesses like Alzheimer’s disease.

> PS has been scientifically established to be among the most effective substances to consistently result in dramatic cognitive improvements and enhancements of other higher brain functions.

PS is extremely bioavailable and crosses the blood-brain barrier with ease. Once in the brain, the PS molecule as a unit merges smoothly into the nerve cell membrane where it is available to facilitate cell-level energy and homeostasis, as well as enhance neurotransmitter production, release, and action. PS also serves as a precursor reservoir for the related phospholipids, phosphatidylethanolamine and phosphatidylcholine.

Findings from many controlled clinical trials indicate that PS consistently ameliorates memory loss and other cognitive decline related to aging. In 14 double-blind clinical trials, conducted with subjects aged 50 and older, PS benefited all degrees of cognitive impairment. In one trial subjects with age-related cognitive decline (ARCD), PS reversed the decline of name-face acquisition skills by a statistical 12 years; i.e., from average scores attained by 64-year-old subjects to average scores attained by 52-year-olds. As the investigators noted, it’s as if they had “rolled back the clock” measuring “cognitive biological age” by roughly 12 years, in terms of overall cognitive status.
**Ginkgo Biloba**

A number of clinical studies have shown that Ginkgo biloba can protect brain cells from damage caused by free radicals while improving blood circulation and oxygen delivery, particularly through the microcapillaries. In one study, researchers measured a fifty-seven percent increase in blood flow through capillaries within sixty minutes of giving Ginkgo to volunteers.

A second study by German scientists involved 60 patients diagnosed with cerebral insufficiency and depression. Patients receiving Ginkgo extract began to show marked improvement after only two weeks, with a significant reduction of many of their symptoms.

In another clinical trial of 166 patients over the age of sixty, researchers found that patients suffering from cerebral insufficiency showed a significant improvement following three months of treatment, confirming the efficacy of Ginkgo extract in cerebral disorders due to aging.

Researchers have also found that Ginkgo can be especially helpful when given to Alzheimer's patients at the first sign of symptoms. In one published study, German scientists gave a daily dose of 120 mg of Ginkgo to twenty elderly patients exhibiting various early symptoms of dementia. The results were dramatic, and the patients receiving Ginkgo showed impressive improvements on a variety of clinical tests, as compared to patients receiving a placebo.
In one large study published in 1996, German researchers tested Ginkgo extract on a group of 222 patients, aged fifty-five or older, who were diagnosed with mild to moderate dementia caused by either Alzheimer’s disease or multi-infarct dementia. Patients were given either 240 milligrams of Ginkgo biloba extract, twice a day before meals, or a placebo, for the duration of the six-month long trial.

At the conclusion of the study the researchers reported that patients receiving Ginkgo showed a remarkable overall improvement in their condition, including a 300 percent increase in memory and attention as compared to those receiving the placebo pills.

The researchers concluded their report by stating that, in cases of dementia, Ginkgo extract could improve a patient's quality of life while preserving independence and postponing the need (and expense) of full-time care.

**Gotu Kola**

Gotu kola (*Centella asiatica*), also known as centella and pennywort, is native to areas such as Sri Lanka and South Africa. The leaves of the plant have been used around the world for centuries to treat nervous disorders, epilepsy, senility and premature aging.

Gotu kola has also been employed as an energy tonic and as a treatment for high blood pressure and mental disorders. In Ayurveda, the traditional science of health in India, gotu kola is used to “strengthen both the white and grey matter of the brain”, stimulate learning, memory and alertness, and calm or sedate anxiety when necessary. In traditional Chinese medicine gotu kola was believed to enhance longevity, and was referred to as the “fountain of youth” herb.

Due to the actions of its main ingredients, asiaticoside and madecassoside, gotu kola may aid in delaying chronic venous insufficiency, a condition that occurs when valves in the veins that carry blood back to the heart are weak or damaged, allowing blood to pool and collect in the veins of the legs.

As a brain tonic, gotu kola is said to aid intelligence and memory. In one study conducted in 1992 by K. Nalini at Kasturba Medical College, gotu kola showed an impressive improvement in memory in rats treated with the extract (orally) daily for 14 days. The retention of learned behavior in the treated animals was 3 to 60 times better than that in control animals.

**Huperzine A**

Huperzine-A is a natural supplement derived from an ancient traditional Chinese herbal remedy, *Qian Ceng Ta*, that offers hope to those looking to protect aging brain cells. In addition to benefiting patients suffering from Alzheimer’s, Huperzine’s memory-enhancing properties suggest that it may be an effective agent for improving memory and learning in healthy humans as well.
Alzheimer’s is characterized by the destruction of nerve cells in key areas of the brain devoted to higher mental function. Most noticeable is the loss of presynaptic cholinergic neurons that results in a dramatic decrease in brain levels of acetylcholine, a neurotransmitter involved in memory and intracellular communication. Research has shown that levels of acetylcholine are deficient in the brains of patients with Alzheimer’s disease, and what little acetylcholine is produced is quickly broken down by the enzyme, acetylcholinesterase (AchE), contributing to the loss of memory and other cognitive functions.

Huperzine is a nutritional supplement that readily crosses the blood-brain barrier to prevent acetylcholinesterase (AchE) from destroying acetylcholine. By inhibiting AchE and increasing acetylcholine concentrations in the brain, Huperzine A has been shown to be effective in alleviating some of the symptoms associated with acetylcholine deficiencies.

Researchers have demonstrated that patients suffering from Alzheimer’s and various other memory disorders gain significant benefit from huperzine, both in terms of memory and life quality. In one study, researchers found that 58 percent of Alzheimer’s patients experience significant improvement in both cognitive and memory function when given 200 mg of Huperzine per day.

Huperzine’s memory-enhancing properties suggest that it may be an effective agent for improving memory and learning in healthy humans as well.

These findings suggest that Huperzine not only protects from the effects of Alzheimer’s and senile memory deficits, but also provides a unique and exciting supplement for supporting memory in the healthy aging human as well.

**Vinpocetine**

Vinpocetine is a powerful memory-enhancing nutrient that facilitates cerebral metabolism by improving cerebral microcirculation, stepping up brain cell ATP production, and increasing utilization of glucose and oxygen. Vinpocetine also selectively increases blood flow to the brain, particularly to impaired areas, without affecting blood flow to the rest of the body.

Because of its selective effects on improving cerebral circulation, vinpocetine is often used for the treatment of cerebral circulatory disorders such as memory problems, acute stroke, aphasia (loss of the power of expression), apraxia (inability to coordinate movements), motor disorders, dizziness and other cerebrovestibular (inner-ear) problems, and headache.

In studies involving 882 patients with neurological disorders ranging from stroke to cerebral insufficiency, vinpocetine was found to confer significant improvements in 62 percent of the patients.
In one of the studies, cerebral insufficiency patients were asked to memorize a list of ten words. Without vinpocetine the subjects were able to memorize an average of six words. After a month of treatment the average went up to ten words.

Reactive oxygen species (ROS) are believed to play a crucial role in the neuronal damage occurring in ischemic injury (stroke) and neurodegenerative disorders. In studies designed to examine the antioxidant effects of vinpocetine to prevent the formation of ROS and lipid peroxidation in brain synaptosomes, researchers found that vinpocetine significantly decreased oxidative stress and inhibited ROS formation up to 83 percent.

The researchers concluded that the antioxidant effects of vinpocetine contributed to reducing neuronal damage in pathological situations.

**Summary**

Baby boomers and aging adults face a loss of cognitive powers and impaired mental functions. Research supports the role of a number of potent anti-aging therapies to slow brain aging and preserve cognitive function. Rather than waiting for signs of an irreversible decline in mental abilities or other more serious cognitive problems, it would be prudent to take steps to support the brain's ability to heal and self-repair. In short, we can take steps now to slow age-dependent brain cell changes, preserve vital functions, and maintain mental health and vigor.