

by Linda Milo Ohr

Keeping Eyesight and Memory Sharp

Protecting eyesight and memory is important for everyone, particularly the aging population. While some ingredients such as lutein and phospholipids have been shown to benefit specifically the eyes or the brain, others such as omega-3 fatty acids are believed to benefit both. Here is a look at some memory- and eyesight-boosting ingredients.

Maintaining Memory

There are many facets to the brain health market that look at improved cognition, mental sharpness, and brain development. Memory is a major category with a myriad of ingredients showing potential to help maintain memory.

- **Omega-3 fatty acids.** Docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA) are important for brain function and development as well as for their potential to benefit depression, attention deficit hyperactivity disorder, and Alzheimer's disease. A common feature of these disorders is low levels of the marine or fish oil omega-3s EPA and DHA. Sometimes the omega-6 fatty acid arachi-

measured by magnetic resonance imaging. The self-reported 7-day dietary intake of EPA and DHA of the subjects at age 70 was positively associated with global gray matter volume and increased global cognitive performance score. The cross-sectional findings suggested that dietary intake of EPA and DHA may be linked to improved cognitive health in late life.

- **Blueberries.** Blueberries are high in antioxidant content, primarily anthocyanins. Anthocyanins give blueberries their color and are the major contributors to antioxidant activity, according to U.S. Highbush Blueberry Council, Folsom, Calif. (phone 916-983-0111, www.blueberry.org). Malin et al. (2011) suggested that a considerable degree of age-related object memory decline can be prevented and reversed by brief maintenance on blueberry-enriched diets in aging rats. Devore et al. (2012) indicated that greater long-term intakes of berries and flavonoids were associated with slower rates of cognitive decline in older women. Beginning in 1980, a semi-quantitative food frequency questionnaire was administered



Blueberries have been associated with slowing the rate of cognitive decline in older adults.

Photo courtesy of U.S. Highbush Blueberry Council

While some ingredients such as lutein and phospholipids have been shown to benefit specifically the eyes or the brain, others such as omega-3 fatty acids are believed to benefit both.

donic acid is reduced, too, according to Fats of Life (www.fatsoflife.com).

Titova et al. (2012) suggested that dietary intake of EPA and DHA may be linked to improved cognitive health in late life. The researchers tested whether older adults with a high dietary intake of EPA and DHA would have higher cognitive test scores and greater brain volume than those with low dietary intake of these fatty acids. The dietary intake of EPA and DHA was determined by a 7-day food protocol in 252 cognitively healthy 70-year-old adults. At age 75, the subjects' global cognitive function was examined and their brain volumes were

every four years to Nurses' Health Study subjects. The results showed that greater intakes of blueberries and strawberries were associated with slower rates of cognitive decline. The data also indicated that berry intake appeared to delay cognitive aging by up to 2.5 years.

- **Green tea.** Antioxidants from green tea, particularly epigallocatechin-3-gallate (EGCG), are believed to aid memory. Borgwardt et al. (2012) examined the effects of green tea extract on brain activation in humans. Functional magnetic resonance imaging was recorded while 12 healthy subjects performed a working memory task after

Keeping Eyesight and Memory Sharp continued...



the administration of a control beverage or 250 ml or 500 ml of a beverage with green tea extract. The results showed that green tea extract increased activation in the dorsolateral prefrontal cortex, a key area that mediates working memory processing in the human brain.

Kemin Industries Inc., Des Moines, Iowa (phone 515-559-5100, www.kemin.com), offers the *AssuriTEA*® line of water-extracted tea ingredients. *AssuriTEA Wellbeing* combines the complimentary antioxidant mechanisms offered by the polyphenols present in select green and black teas. *AssuriTEA Green* is a water-extracted, 100% natural, high-quality green tea that utilizes the whole tea leaf. It is an alternative for consumers who want the benefits of brewed green tea but in the convenience of an easy-to-use dietary supplement and/or food and beverage.

Taiyo International Inc., Minneapolis, Minn. (phone 763-398-3003, www.taiyointernational.com), offers *Suntheanine*, which is produced via a fermentation process that mimics the natural process in green tea leaves, resulting in a 100% pure L-isomer-theanine. It is not an extract of green tea; rather, it is a patented enzymatic fermentation process using the amino acids ethylamine and L-glutamine, which assures an isomerically pure L-theanine. Human clinical trials have shown *Suntheanine* to promote

an alert state of relaxation without drowsiness. Park et al. (2011) showed that a combination of green tea extract and L-theanine (LGNC-07) has potential as an intervention for cognitive improvement. The study examined 91 subjects with mild cognitive impairment. For 16 weeks, those in the experimental group took 1,680 mg of LGNC-07 and those in the control group received an equivalent amount of maltodextrin and lactose. The results showed that taking LGNC-07 led to improvements in memory by marginally increasing delayed recognition.

• Phosphatidylserine.

Phospholipids are natural building blocks of the human brain. Phosphatidylserine is a phospholipid said to help improve memory. Enzymotec USA Inc., a subsidiary of Enzymote Ltd., Morristown, N.J. (phone 973-912-9400, www.enzybioactive.com), offers *Sharp PS*®, a high-purity phosphatidylserine brand; *Sharp-PS*® SILVER, a patent-protected blend of phosphatidylserine and DHA for improving mental and cognitive abilities; and *Sharp-PS*® GOLD, which mimics the structure-function of human phosphatidylserine to better activate memory and mental performance.

• **Magnesium.** A form of magnesium called magnesium L-threonate, which is offered as *Magtein*™ from AIDP Inc., City of Industry, Calif. (phone 866-262-6699, www.magtein.com), can help memory and cognitive

Walnuts are nutrient dense, and their anti-inflammatory properties may have brain health benefits. Photo courtesy of California Walnut Commission

function. In August 2012, AIDP was granted U.S. patents for *Magtein*, covering magnesium compositions and uses for cognitive function and neurological disorders. Slutsky et al. (2010) showed that the ingredient increased brain magnesium levels and improved brain function. The researchers showed that *Magtein* could increase learning ability, working memory, and short- and long-term memory in young and aged rats by increasing the brain's magnesium level.

• **Cocoa flavanols.** Cocoa flavanols have widely varying positive effects on human health. Barry Callebaut AG, Zurich, Switzerland (phone +41-43-204-0404, www.barry-callebaut.com), developed a manufacturing method, *Acticoa*™, that protects the flavanols during the manufacturing process of chocolate. Camfield et al. (2012) showed chronic cocoa flavanol consumption was associated with increased neural efficiency in spatial working memory function in a study with 63 middle-aged subjects. The subjects consumed a chocolate drink containing 250 mg of cocoa flavanols (medium-cocoa flavanols drink) or 500 mg of cocoa flavanols (high-cocoa flavanols drink) or a placebo daily for 30 days. The results showed that the brains of the subjects who consumed the cocoa drink with a medium or a high concentration of cocoa flavanols were less strained than those in the control group without cocoa flavanols.

• **Walnuts.** Walnuts provide not only antioxidants but also alpha-linolenic acid, the plant-based omega-3 fatty acid. These nutrients offer anti-inflammatory properties and protect brain cells from oxidative damage, according to the California Walnut Commission, Folsom, Calif. (phone 916-932-7070, www.walnuts.org).

Valls-Pedret et al. (2012) showed that antioxidants present in walnuts and other Mediterranean dietary

patterns may help counteract age-related cognitive decline and reduce the incidence of neurodegenerative diseases, including Alzheimer's disease. Asymptomatic subjects at high cardiovascular risk enrolled in a primary prevention dietary-intervention trial. The researchers assessed food intake and cardiovascular risk profile, determined apolipoprotein E genotype, and used neuropsychological tests to evaluate cognitive function. Consumption of some foods was independently related to better cognitive function. The specific associations were total olive oil with immediate verbal memory, virgin olive oil and coffee with delayed verbal memory, walnuts with working memory, and wine with Mini-Mental State Examination scores. The researchers believed

that the high polyphenol content found in walnuts may be one of the key elements in helping to preserve cognition and fight age-related cognitive decline.

- **Citicoline.** Citicoline is a water-soluble compound that supplies precursors for the synthesis of phospholipids, including phosphatidylcholine, a major constituent of brain tissue. Kyowa Hakko USA, New York, N.Y. (www.cognizin.com), offers *Cognizin* citicoline, which helps maintain normal levels of acetylcholine, a chemical that regulates memory and cognitive function. McGlade et al. (2012) showed the ingredient's potential cognitive-enhancing effects in healthy adult female subjects. After 28 days of citicoline administration, the subjects taking 250 mg of citicoline

indicated improved performance on cognitive function tests, and those taking 500 mg of citicoline showed improvement and made significantly fewer errors on the tests compared to those in the control group.

- **Vinpocetine.** A product featured at the 2012 SupplySide West show, *ReQollect Solution* from Alchem USA Inc., Minnetonka, Minn. (phone 952-933-3822, www.alchem-international.com), is a form of concentrated liquid vinpocetine suited for use in beverages to enhance memory and alertness and in pre-workout formulations to improve focus and coordination. Manufactured from botanical sources, *ReQollect* is highly dispersible and has high clarity. The ingredient can be used in a wide range of beverage and liquid

Keeping Eyesight and Memory Sharp continued...



Key ingredients in green tea may improve memory. Research continues on the effects of green tea extracts on the brain. Photo © iStockphoto.com/4 kodiak

preparations. According to the company, poor blood circulation in the brain is one of the most significant mechanisms triggering cognitive decline, and the ingredient is said to increase blood circulation through the brain, enhancing the use of oxygen and glucose.

The Better to See You With

Vision changes as people get older. According to the National Institutes of Health's National Eye Institute, common eye diseases such as glaucoma, diabetic retinopathy, and age-related macular degeneration (AMD) threaten millions of Americans. Attention on AMD and beneficial nutrients increased through the Age-Related Eye Disease Study (AREDS), which determined that people at high risk of developing advanced AMD could lower their risk by about 25% by taking high levels of antioxidants and zinc (500 mg of vitamin C, 400 IU of vitamin E, 15 mg of beta-carotene, 80 mg of zinc as zinc oxide, and 2 mg of copper as cupric oxide). A more recent study, the AREDS2, was

launched in 2006, and it added lutein and zeaxanthin and the omega-3 fatty acids DHA and EPA to the original study formulation. The main objective is to determine if these nutrients will decrease a person's risk of progression to advanced AMD. The results from the AREDS2 are expected in 2013.

• **Omega-3 fatty acids.** Berson et al. (2012) showed that omega-3 fatty acids slowed the rate of visual acuity loss among subjects with retinitis pigmentosa who were receiving vitamin A palmitate. The researchers calculated dietary intake from questionnaires completed annually by 357 adult subjects from three randomized trials who were receiving vitamin A for 4–6 years. The data showed that mean annual rates of decline in distance and retinal visual acuities in adults with retinitis pigmentosa who were receiving vitamin A were slower over the 4–6 years among those consuming a diet rich in omega-3 fatty acids.

Ho et al. (2011) indicated that high dietary intake of nutrients with antioxidant properties reduced the risk of early AMD in those at high genetic risk. For 2,167 subjects from the population-based Rotterdam Study at risk of AMD, dietary intake was assessed at baseline using a semi-quantitative food frequency questionnaire, and genetic variants were also determined. Incident-early AMD was determined at three follow-up visits. Five hundred seventeen subjects developed early AMD. Significant synergy indices supported the possibility of biological interaction between genetic variants for AMD and zinc, beta-carotene, lutein, zeaxanthin, EPA, and DHA.

At the 2012 Health Ingredients Europe in Frankfurt, Germany, DSM Nutritional Products, Parsippany, N.J. (phone 800-526-0189, www.dsm.com), showcased its omega-3 offerings, the number of which have increased due to its acquisitions of Martek and Ocean Nutrition Canada.

At the show, the company launched *life'sDHA plus EPA™*, a vegetarian blend of two key omega-3s. The ingredient has the nutritional profile of fish oil formula and delivers numerous benefits for eye, heart, and brain health.

• **Antioxidants.** Lutein and zeaxanthin supply the eyes with macular pigment. These antioxidants are believed to protect the macula from damaging photo-oxidative effects. Evans (2012) showed that *FloraGLO®* lutein from Kemin Industries in a starch-based matrix was more bioavailable than another lutein in an alginate-based matrix. The researchers evaluated the bioavailability of lutein using a starch matrix *FloraGLO* lutein 5% and another commercial lutein in an alginate-matrix. They gave a single dose of 20 mg of lutein from either of the two formulations to 48 healthy subjects and measured lutein in the plasma at several time intervals. After 14 hours, total plasma lutein increased by 126% in those who took the starch matrix *FloraGLO* lutein 5% compared to only 7% in those who took the alginate matrix.

The results of this study indicated that not all lutein sources are equivalent, with their bioavailability dependent on the formulation. *FloraGLO* is a registered trademark of Kemin Industries Inc. In 2008, Kemin and DSM formed an exclusive strategic alliance in which Kemin supplies *FloraGLO* lutein exclusively through DSM.

OmniActive Health Technologies Inc., Morristown, N.J. (phone 866-588-3629, www.omniactives.com), offers *Lutemax 2020*, a combination of lutein and zeaxanthin isomers. With its enhanced levels of zeaxanthin isomers, *Lutemax 2020* contains a healthier ratio of lutein to zeaxanthin, improving nutrient availability to the human eye. **FT**



*Linda Milo Ohr,
Contributing Editor,
Denver, Colo.
• linda.ohr@gmail.com*

REFERENCES

- Berson, E.L., Rosner, B., Sandberg, M.A., Weigel-DiFranco, C., and Willett, W.C. 2012. ω -3 intake and visual acuity in patients with retinitis pigmentosa receiving vitamin A. *Arch. Ophthalmol.* 130(6): 707-711.
- Borgwardt, S., Hammann, F., Scheffler, K., Kreuter, M., Drewe, J., and Beglinger, C. 2012. Neural effects of green tea extract on dorsolateral prefrontal cortex. *Eur. J. Clin. Nutr.* 66: 1187-1192.
- Camfield, D.A., Scholey, A., Pipingas, A., Silberstein, R., Kras, M., Nolidin, K., Wesnes, K., Pase, M., and Stough, C. 2012. Steady state visually evoked potential (SSVEP) topography changes associated with cocoa flavanol consumption. *Physiol. Behav.* 105(4): 948-957.
- Devore, E.E., Kang, J.H., Breteler, M.M., and Grodstein, F. 2012. Dietary intakes of berries and flavonoids in relation to cognitive decline. *Ann. Neurol.* 72(1): 135-143.
- Evans, M., Beck, M., Elliott, J., Etheve, S., Roberts, R., and Schalch, W. 2012. Effects of formulation on the bioavailability of lutein and zeaxanthin: a randomized, double-blind, cross-over, comparative, single-dose study in healthy subjects. *Eur. J. Nutr.* doi: 10.1007/s00394-012-0447-9.
- Ho, L., van Leeuwen, R., Witteman, J.C., van Duijn, C.M., Uitterlinden, A.G., Hofman, A., de Jong, P.T., Vingerling, J.R., and Klaver, C.C. 2011. Reducing the genetic risk of age-related macular degeneration with dietary antioxidants, zinc, and ω -3 fatty acids: the Rotterdam study. *Arch. Ophthalmol.* 129(6): 758-766.
- Malin, D.H., Lee, D.R., Goyarzu, P., Chang, Y.H., Ennis, L.J., Beckett, E., Shukitt-Hale, B., Joseph, J.A. 2011. Short-term blueberry-enriched diet prevents and reverses object recognition memory loss in aging rats. *Nutrition.* 27(3): 338-342.
- McGlade, E., Locatelli, A., Hardy, J., Kamiya, T., Morita, M., Morishita, K., Sugimura, Y., and Yurgelun-Todd, D. 2012. Improved attentional performance following citicoline administration in healthy adult women. *Food Nutr. Sci.* 3(6): 769-773.
- Park, S.K., Jung, I.C., Lee, W.K., Lee, Y.S., Park, H.K., Go, H.J., Kim, K., Lim, N.K., Hong, J.T., Ly, S.Y., and Rho, S.S. 2011. A combination of green tea extract and l-theanine improves memory and attention in subjects with mild cognitive impairment: a double-blind placebo-controlled study. *J. Med. Food.* 14(4): 334-343.
- Slutsky, I., Abumaria, N., Wu, L.-J., Huang, C., Zhang, L., Li, B., Zhao, X., Govindarajan, A., Zhao, M.-G., Zhuo, M., Tonegawa, S., and Liu, G. 2010. Enhancement of learning and memory by elevating brain magnesium. *Neuron.* 65(2): 165-177.
- Titova, O.E., Sjögren, P., Brooks, S.J., Kullberg, J., Ax, E., Kilander, L., Riserus, U., Cederholm, T., Larsson, E.M., Johansson, L., Ahlström, H., Lind, L., Schiöth, H.B., and Benedict, C. 2012. Dietary intake of eicosapentaenoic and docosahexaenoic acids is linked to gray matter volume and cognitive function in elderly. *Age.* doi: 10.1007/s11357-012-9453-3.
- Valls-Pedret, C., Lamuela-Raventós, R.M., Medina-Remón, A., Quintana, M., Corella, D., Pintó, X., Martínez-González, M.Á., Estruch, R., and Ros, E. 2012. Polyphenol-rich foods in the Mediterranean diet are associated with better cognitive function in elderly subjects at high cardiovascular risk. *Journal of Alzheimer's Dis.* 29: 773-782.