Approaches to Cognitive Health: Favorite Practices and Materia Medica

Maria Noël Groves, RH (AHG)

Maria Noël Groves runs Wintergreen Botanicals Herbal Clinic & Education Center nestled in the pine forests of Bear Brook State Park in New Hampshire. Her business is devoted to education and empowerment via classes, health consultations, and writing, with the foundational belief that good health grows in nature. She writes for numerous publications and is the author of *Body into Balance: An Herbal Guide to Holistic Self Care* (Storey Publishing, 2016). www.WintergreenBotanicals.com

Cognitive issues, a growing concern for Americans, can really put a wrench in a person's quality of life. Alzheimer's disease and other forms of dementia typically begin to affect older adults as early as age 60, and up to 50% of Americans over age 85 exhibit signs of Alzheimer's (CDC 2011). But cognition isn't just an "old person's" process. Attention Deficit Hyperactivity Disorder (ADHD) has risen steadily over the past two decades and can affect all ages (CDC 2014). Less serious concerns – like menopausal brain fog, cognitive aging, and everyday memory glitches – affect many more. Memory and focus issues may seem inevitable, but a growing body of evidence shows us that we can slow, stall, and possibly even reverse many cognitive issues with diet and lifestyle changes, as well as herbal medicine.

Our cognitive wellbeing closely ties in with circulation, inflammation, oxidation, stress, and the vitality of the nervous system. Diet, lifestyle, and herbs are well-suited to address these concerns. One small yet inspiring clinical study found that customized, multifaceted programs reversed Alzheimer's symptoms and other cognitive impairments within six months in nine out of ten patients (Bredesen 2014). A holistic protocol addresses the individual's weak spots in an effort to prevent further dysfunction and bring the body back into balance.

Diet and Lifestyle Changes for Cognitive Support

Many aspects of the American lifestyle play a role in mental decline, including insufficient sleep, too much stress and multitasking, and not enough time allotted for relaxation, social time, and exercise. Adequate sleep, regular meditation, and exercise are three simple non-invasive lifestyle therapies with strong scientific evidence for their ability to benefit cognition. Numerous studies ¬¬link sleep deprivation and sleep disorders to reduced cognitive performance for children, college students, and adults (Hunter et al. 2016, Wang et al. 2016, Cohen-Zion et al. 2016, Kreutzmann et al. 2015, Inouye et al. 2000). Regular aerobic exercise can increase brain volume, stimulate the body to produce more neurons, and protect neurons from damage (Colcombe et al. 2006, Yuan et al. 2015). Aerobic exercise and resistance training also give a cognitive boost to high school students (Harveson et al. 2015). Elders who regularly read, play board games, play musical instruments, and dance have the lowest risk of developing dementia (Verghese et al. 2003).

Diet quality can also have a tremendous positive or negative effect on brain function. The Mediterranean-DASH Intervention for Neurodegenerative Delay (MIND) Diet has been shown to reduce the risk of cognitive decline and Alzheimer's by 54%. It emphasizes green leafy vegetables, all other vegetables, nuts, berries, beans, whole grains, fish, poultry, olive oil, and wine while avoiding red meat, butter

and margarine, cheese, pastries and sweets, and fried or fast food (Noe-Pagán 2015). Functional foods and dietary supplements can also be helpful to address nutrient deficiencies linked to poor cognitive health, including vitamin D, omega-3 fatty acids, B vitamins including vitamin B12, and iron. Food additives like colorings, sugar, and food sensitivities and allergies can also play a role in cognitive issues, particularly in ADHD (Sonuga-Barke et al. 2013).

Many pharmaceutical drugs negatively affect cognition and herbal practitioners should be on the lookout for memory lapses that could relate to medications. Drugs known to negatively affect cognition include anticholinergics, benzodiazepines, hypnotics, antihistamines, antipsychotics, and statins (AGS 2012, FDA 2015). While clients should not go off of medications without the doctor's approval, herbalists can empower their clients with the knowledge of potential side effects and the questions to ask the doctor to determine if they should cease or change medication.

Nootropic Herbs

We can categorize several herbs as nootropics, or "memory-enhancing" herbs. They work in a variety of ways. Some improve transmission or levels of desirable neurotransmitters, the electrical signals that allow the brain to maintain mood, cognitive abilities, and overall function. Many nootropic herbs improve circulation, which allows nutrients into the brain and waste to be more efficiently filtered out. Oxidation and inflammation are two processes known to worsen cognitive health and are associated with diseases like Alzheimer's, contributing to beta amyloid plaque and "tangles" in the neural forest that impair the neurotransmitter transmission. Therefore, herbs with antioxidant and anti-inflammatory properties also benefit the brain and have nootropic actions. Here are my three favorite nootropic herbs.

Centella asiatica (gotu kola)

Maria Noël Groves

Centella asiatica (gotu kola) leaf and whole plant

This ivy-like herb in the parsley family shows great promise for a wide range of cognitive issues. Revered since antiquity in the Ayurvedic healing tradition, Sanskrit texts claim that drinking gotu kola juice imparts immediate benefits, with long-term use contributing to near-photogenic memory. Traditional and scientifically validated actions include antianxiety, stress-relieving, and circulation-enhancing properties. Preliminary modern research on animals and humans is promising for this multifaceted adaptogen. Studies suggest that gotu kola works at least in part by improving mitochondrial function and acting as a neuroprotective, antioxidant, and anti-inflammatory, and by lessening beta amyloid plaque's negative effects (Gray et al. 2016, Gray et al. 2015, Gray et al. 2014, Shinomol et al. 2011). Working memory and mood improved for participants who took 750mg of gotu kola extract daily for two months (Wattanathorn et al. 2008); mentally retarded children showed better memory and overall mental ability, and healthy adults had a reduced startle response to loud noises (Shinomol et al. 2011).

Gotu kola is a good candidate to use in formula for all ages, including children; complimentary herbs for children include lemon balm, milky oat seed, bacopa, and hawthorn. Market quality varies widely, and gotu kola can be contaminated with *E.coli* and similar feces-related pathogens due to its favored sludgy growing conditions. Grow your own to eat daily as a nasturtium-like green,

juice, dry for tea, or make into tincture. It can be difficult to grow from seed but is easily divided and increasingly available from well-stocked medicinal herb growers. Gotu kola thrives in extremely rich soil, constant moisture, dappled sun, and plenty of warmth. Grow it as a groundcover or in hanging pots, and bring it indoors during winter in cold climates. When purchasing dried gotu kola, seek certified organic herb from reputable sources that test for microbes and contaminants. Both gotu kola and bacopa are sold under the ambiguous name "brahmi," so be sure to get the correct species. When in doubt, check the Latin name. Gotu kola has a good safety record, though it is likely inappropriate when trying to get pregnant. Three reports of gotu kola-induced liver toxicity all involve a Mexican weight loss product and are likely due to adulteration (Gardner and McGuffin 2013).

Bacopa monnieri (bacopa) aerial parts

This Ayurvedic herb shares many similarities with gotu kola, including the common name "brahmi." Both prefer moist soil, and both improve memory while relieving anxiety without sedation. Bacopa offers antioxidant, neuroprotective effects, reduces beta amyloid plaque, and limits acetylcholinesterase, an enzyme that decreases the levels of the important neurotransmitter acetylcholine (Shinomol et al. 2011, Peth-Nui et al. 2012, Aguiar and Borowski 2013). Bacopa boasts more clinical research than gotu kola, albeit with mixed results. In one review of six well-designed randomized, placebo-controlled studies, adults and elders who took 300 to 450mg of bacopa extract daily for 12 weeks had the greatest improvement in memory free recall with limited results in other cognitive tests (Pase et al. 2012). A more recent review of nine studies concluded that bacopa improved cognition, particularly speed of attention, as well as decreasing choice reaction time (Kongkeaw et al. 2014). A handful of studies found bacopa beneficial for school-aged children, particularly those with ADHD, with significant improvements in immediate memory, perception, reaction/performance times, learning, and memory tasks (Shinomol et al. 2011). More clinical bacopa research is underway (Kean et al. 2015; Stough et al. 2013).

Bacopa monnieri (bacopa)

Forest and Kim Starr (CC BY 2.0)

Bacopa appears to be safe and well tolerated by a variety of age groups. While it is possible to grow bacopa, plants can be hard to find. Check the Latin name, because other species do not necessarily offer the same benefits as *Bacopa monnieri*. Seek organic dried herb or products from reputable companies to use as a tincture or pill; the flavor is iffy for tea. Bacopa tincture turns to sludge within a few years, probably due to tannins binding to other constituents in the plant and precipitating out. Consider adding 10% glycerin and/or refreshing your stock every year or two.

Camellia sinensis (green tea) leaf

Popularized by monks for its benefits during meditation and for overall wellbeing, green tea has become one of the most widely consumed beverages in the world. All beverages made from the tea plant offer similar benefits, but more processing of the leaf reduces antioxidants while increasing caffeine content. Along the continuum, white and green tea are less processed, while oolong and black tea are more so. Most of the research into tea's benefits have focused on green tea, but white tea probably works just as well. Green tea has been found to increase brain activity and working memory scores on cognitive tasks for a small group of healthy adults (Schmidt et al. 2014). In elderly patients with mild to severe dementia, taking a green tea supplement equivalent to two to

four cups of tea daily for three months improved dementia assessment scores and short-term memory (Ide et al. 2014). Although most of the clinical research of green tea is of a special extract, several epidemiological studies have found a correlation between populations who consume more green tea and better cognitive function. Green tea improves circulation and cardiovascular health, is rich in antioxidants, is neuroprotective, and boosts energy via caffeine while quelling anxiety via theanine. For those who don't tolerate caffeine, organic, naturally decaffeinated green tea offers similar benefits. The tea appears to be very safe except for caffeine-related issues. Green tea extracts, though often shown to be effective in studies, are also associated with liver toxicity (Gardner and McGuffin 2013). Green tea tinctures are less commonly used (except as a synergist in blends) and are best taken with a meal.

Melissa officinalis (lemon balm)

Maria Noël Groves

Mint-Family (Lamiaceae) Aromatic Herbs

Some of our most popular aromatic mint-family herbs have also been shown to boost memory and cognition, both via inhalation and via ingestion. Acetylcholinesterase (AChE) inhibiting activity of rosemarinic acid appears to be partly responsible for these benefits (Topcu and Kusman 2014, Vladimir-Knezevic et al. 2014). This enzyme breaks down acetylcholine, an important neurotransmitter that helps the body control muscles and also plays a role in arousal, attention, and motivation. Low acetylcholine levels are associated with poor memory and Alzheimer's disease, so inhibiting the enzyme allow more acetylcholine to remain in the brain. These mint family herbs also tend to improve mood, decrease inflammation, and have antioxidant effects (Kennedy and Scholey 2006). In addition to lemon balm and rosemary, which I discuss below, other mint-family herbs with good scientific evidence for memory and cognition include sage, spearmint, and peppermint. Research on these aromatic herbs gives new depth to age-old sayings like "wise sage" and "rosemary for remembrance."

Melissa officinalis (lemon balm) leaves

This gently uplifting yet calming herb seems to be particularly useful for memory and attention and is a great choice when hyperactivity or agitation interferes with focus. At the highest doses, lemon balm's calming effects occasionally hamper alertness, while the lower doses achieve both calming and uplifting actions. Since lemon balm's effects are noticeable within just an hour, you can easily play with the dose to find the right amount for the individual. In a randomized, double-blind study of 20 healthy volunteers, one 1,600mg capsule of crude organic dried leaf of lemon balm improved mental performance and calmness in just one hour. Lower doses of lemon balm were beneficial, but the subjects were not as fast on timed memory and rapid visual performance tasks (Kennedy et al. 2003). A similar study of young, healthy adults found better accuracy of attention and calmness yet greater alertness at modest doses rather than a high dose (Kennedy et al. 2002). In a placebo-controlled study, lemon balm essential oil cream applied to the arms and legs of patients with severe dementia significantly reduced agitation and improved quality of life, increasing the percentage of time engaged in constructive activities versus being socially withdrawn (Ballard et al. 2002). More recently, researchers made functional foods by adding lemon balm extract to drinks and yogurt and found that they produced anti-stress, mood-enhancing, and cognition-improving benefits within a few hours, including increased word recognition, decreased anger, and less anxiety. This study also found that lower-dose foods had better effects than high-dose foods in some cases (Scholey et al. 2014).

Lemon balm is a popular, safe herb for youngsters, and it's no surprise that studies have also found it useful for ADHD in children, especially in combination with valerian (Berdonces 2001, Ross 2015). In one study, lemon balm and valerian reduced school children's poor ability to focus from 75% to 14%, hyperactivity from 61% to 13%, and impulsiveness from 59% to 22% (Gromball et al. 2014). I prefer a 1:2 fresh leaf tincture made with 70% to 95% alcohol. Refresh the stock every few years, as it loses potency and lemon flavor more quickly than most tinctures. Homemade tinctures tend to be more effective than store-bought, probably due to freshness. Teas, capsules, standardized extracts, and even topical preparations also offer benefits, so you can easily match the remedy to the client's preference. Note that true lemon balm essential oil, while amazing, is also incredibly expensive and often adulterated.

Rosmarinus officinalis (rosemary) leaf

Ancient Greek students who braided rosemary into their hair during exams were onto something. Rosemary inhibits AChE, improves circulation, and is a potent antioxidant and anti-inflammatory herb. More is not necessarily better. A food-like dose of 750mg of rosemary improved memory speed in older adults, but higher doses actually worsened memory (Pengelly et al. 2012). An aromatherapy study compared rosemary inhalation to lavender inhalation and a "no odor" control. The rosemary group was significantly more alert and performed better on memory tests while lavender – a noted sedating herb – worsened working memory performance and memory and attention reaction times (Moss et al. 2003). Even when rosemary is ingested, the aroma likely plays a role in its action. In a negative study on young adults with low energy wearing nose clips that blocked their sense of smell, 1.7g rosemary capsules did not significantly improve energy, attention, or fatigue mood states (Lindheimer et al. 2013).

Rosemary is an ideal synergist in memory formulas as 5% to 15% of the blend, especially when stagnation, inflammation, poor circulation, or weak digestion are also present in the client. In a study comparing the neuroprotective properties of bacopa and rosemary, the combination was significantly more beneficial than either alone (Ramachandran et al. 2014). I encourage clients to use a sprig or two of rosemary daily in tea, water, or food. It's easy to grow in the garden, at least as an annual, and it can be grown in pots indoors with careful attention. Tincture rosemary fresh, 1:2 in 95% alcohol. Several commercial memory formulas include rosemary as an ingredient.

Rosmarinus officinalis (rosemary) and *Citrus* × *limon* (lemon) slice infusion

Maria Noël Groves

Nerve Trophorestorative Herbs

These herbs have tonic, protective, and restorative effects for the nervous system, including cognition, memory, and attention. The two remedies below have very different modes of action and clinical indications, but all are worth considering in cognition protocols.

Rhodiola rosea (rhodiola) root

Many of the herbs we have discussed previously – gotu kola, bacopa, lemon balm, green tea – also offer calming effects. Rhodiola, on the other hand, is much more stimulating. As a stress-modulating adaptogen and neuroprotective herb, rhodiola boosts both physical and mental energy, and I find it helpful for clients who need a little kick in the pants, as well as for women with menopausal brain fog. Rhodiola boasts a long history of use in Hungary and Siberia, where taking it regularly is believed to help you live to be 100 years old. In spite of research suggesting rhodiola benefits people with anxiety, I

find it too stimulating for anyone prone to agitation, anxiety, insomnia, or mania, and I recommend it far away from bedtime. Combining rhodiola with caffeine synergizes its energizing effects, for better or worse. Rhodiola is fast-acting and can be taken as needed or in lower doses for long-term use.

Hundreds of studies have been done on rhodiola, yet only a small percentage are randomized clinical trials. Those testing the herb's ability to alleviate mental and stress-induced fatigue have generally been positive (Ishague et al. 2012). In one study, students performed better during stressful exams while taking rhodiola (Spasov et al. 2000). In another, hospital night shift workers were less fatigued and had better mental function (Darbinyan et al. 2000). Rhodiola is generally taken in 100 to 400mg capsules daily or as a 1:5 dry plant tincture made with 50% to 60% alcohol. Although some herbalists report upset stomach as a side effect (presumably from rhodiola's astringency), I have not seen this in practice and I frequently use this plant, usually in formula. North American growers are beginning to cultivate this finicky, high-altitude plant, but the commercial rhodiola supply still tends to come from China.

Hericium erinaceus (lion's mane) mushroom

The gourmet lion's mane mushroom can be cultivated and wildcrafted and tastes a bit like crab or lobster when sautéed in butter with garlic. Preliminary research suggests that it contains nerve growth factors and helps nerve cells regenerate, healing or reducing nerve damage from stroke-related ischemia or peripheral nerve injury, improving cognition, and fighting dementia (Mori et al. 2008, Samberkar et al. 2015, Sabaratnam et al. 2013, Raman et al. 2015, Lee et al. 2014, Wong et al. 2014). Cognitive function significantly improved in Japanese elders with mild cognitive impairment compared to those taking a placebo; subjects took four 250mg tablets of dry lion's mane powder daily for 16 weeks, with some effects seen at eight weeks (Mori et al. 2009). The effects diminished once treatment ended, which suggests that you need to keep taking lion's mane for cognitive issues related to aging. Lion's mane is worth considering when cognitive issues relate to damaged nerves from injury, aging, or pathogens like Lyme disease. Although most of the research revolves around lion's mane, herbalists report similar results with other species of *Hericium*.

Formulating for Cognitive Wellbeing

These herbs are just a few of the useful and promising herbal therapies for cognitive wellbeing. There are a number of other herbs that we could consider. For example, *Ginkgo biloba* (ginkgo) standardized leaf extract offers nootropic, microcirculation-enhancing, and antioxidant properties; it is among the best studied herbs for dementia and Alzheimer's disease, although study results have been mixed. I prefer the previously mentioned herbs for a wider range of constitutions and cognitive issues.

Added to these herbal cognitive aids, many of our favorite adaptogenic and nervine herbs work beautifully and supportively in a formula, including: *Avena sativa* (milky oat seed), *Ocimum sanctum* syn *O. tenuiflorum* (holy basil or tulsi) leaf, *Withania somnifera* (ashwagandha) root, *Ganoderma* spp. (reishi) mushroom, *Crataegus* spp. (hawthorn) leaf/flower/berry, and *Hypericum perforatum* (St. John's-wort) flowers and buds. A good cognitive formula balance would include 50-70% primary cognitive herbs with 30-40% supportive herbs and 1-10% flavorful synergists geared towards the individual's constitution (such as cacao, rosemary, nutmeg, turmeric, or ginger).

I often add flower essences directly to my herbal formulas – three to five drops each of one to five different essences. Some of my favorite flower essences for cognitive issues include comfrey (deep healing from traumatic injuries), lowbush blueberry (resiliency), lavender (calm), red maple (physical vigor and circulation), nasturtium (increased life force), celandine (clarity), cosmos (integration of information), and dill (relieving sensory overload). Even though flower essences represent a different realm of herbal medicine and are generally not well researched, they take up little space in the bottle and add a little something special to the mix (Tolf 2015). As herbalists, we are fortunate to have a wide range of natural remedies at our disposal to assist clients as they also make diet and lifestyle changes in support of cognitive health.

REFERENCES

Aguiar S, Borowski T. 2013. Neuropharmacological review of the nootropic herb Bacopa monnieri. Rejuvenation Research. 16(4):313-26.

AGS. 2012. AGS Beers Criteria for Potentially Inappropriate Medication Use in Older Adults. American Geriatric Society; [accessed 2016 Feb 24]. https://www.dcri.org/trial-participation/the-beers-list/.

Ballard C, O'Brien J, Reichelt K, Perry E. 2002. Aromatherapy as a safe and effective treatment for the management of agitation in severe dementia: the results of a double-blind, placebo-controlled trial with Melissa. The Journal of Clinical Psychiatry. 63(7):553-8.

Berdonces J. 2001. Attention deficit and infantile hyperactivity. Revista de Enfermería. 24(1):11-4.

Breseden D. 2014. Reversal of cognitive decline: a novel therapeutic program. Journal of Aging. 6(9):707-17.

CDC. 2011. Dementia/Alzheimer's Disease. Centers for Disease Control; [accessed 2016 Feb 24]. http://www.cdc.gov/mentalhealth/basics/mental-illness/dementia.htm.

CDC. 2014. ADHD Throughout the Years. Online. Centers for Disease Control; [accessed 2016 Feb 24]. http://www.cdc.gov/ncbddd/adhd/timeline.html.

Cohen-Zion M, Shabi A, Levy S, Glasner L, Wiener A. 2016. Effects of Partial Sleep Deprivation on Information Processing Speed in Adolescence. Journal of the International Neuropsychological Society. 19:1-11.

Colcombe S, Erickson K, Scalf P, Kim J, Prakash R, McAuley E, Elavsky S, Marquez D, Hu L, Kramer A. 2006. Aerobic exercise training increases brain volume in aging humans. The Journals of Gerontology. Series A, Biological Sciences and Medical Sciences. 61(11):1166-70.

Darbinyan V, Kteyan A, Panossian A, Gabrielian E, Wikman G, Wagner H. 2000. Rhodiola rosea in stress induced fatigue – a double blind cross-over study of a standardized extract SHR-5 with a repeated low-dose regimen on the mental performance of healthy physicians during night duty. Phytomedicine. 7(5):365-71.

FDA. 2015. FDA Expands Advice on Statin Risks. Food and Drug Administration; [accessed 2016 Feb 24]. http://www.fda.gov/ForConsumers/ConsumerUpdates/ucm293330.htm#2.

Gardner Z, McGuffin M. 2013. American Herbal Products Association's Botanical Safety Handbook. New York, NY: CRC Press.

Gray N, Harris C, Quinn J, Soumyanath A. 2016. Centella asiatica modulates antioxidant and mitochondrial pathways and improves cognitive function in mice. Journal of Ethnopharmacology 180:78-86.

Gray N, Morré J, Kelley J, Maier C, Stevens J, Quinn J, Soumyanath A. 2014. Caffeoylquinic acids in Centella asiatica protect against amyloid- toxicity. Journal of Alzheimer's Disease. 40(2):359-73.

Gray N, Sampath H, Zweig J, Quinn J, Soumyanath A. 2015. Centella asiatica attenuates amyloid- -induced oxidative stress and mitochondrial dysfunction. Journal of Alzheimer's Disease. 45(3):933-46.

Gromball J, Beschorner F, Wantzen C, Paulsen U, Burkart M. 2014. Hyperactivity, concentration difficulties and impulsiveness improve during seven weeks' treatment with valerian root and lemon balm extracts in primary school children. Phytomedicine. 21(8-9):1098-103.

Harveson A, Hannon J, Brusseau T, Podlog L, Papadopoulos C, Durrant L, Hall M. 2015. Acute exercise and cognition in high school youth. Shape America; [accessed 2016 Mar 3]. https://shapeamerica.confex.com/shapeamerica/2015/webprogram/Paper20342.html.

Hunter S, Gozal D, Smith D, Philby M, Kaylegian J, Kheirandish-Gozal L. 2016. Effect of sleep-disordered breathing severity on cognitive performance measures in a large community cohort of young school-aged children. American Journal of Respiratory and Critical Care Medicine. Mar 1 [Epub ahead of print].

Ide K, Yamada H, Takuma N, Park M, Wakamiya N, Nakase J, Ukawa Y, Sagesaka Y. 2014. Green tea consumption affects cognitive dysfunction in the elderly: a pilot study. Nutrients. 6(10):4032-42.

Inouye S, Bogardus S, Baker D, Leo-Summers L, Cooney L. 2000. The Hospital Elder Life Program: a model of care to prevent cognitive and functional decline in older hospitalized patients. Journal of the American Geriatrics Society. 48(12):1697-706.

Ishaque S, Shamseer L, Bukutu C, Vohra S. 2012. Rhodiola rosea for physical and mental fatigue: a systematic review. BioMed Central Complementary and Alternative Medicine. 29;12:70.

Kean J, Kaufman J, Lomas J, Goh A, White D, Simpson D, Scholey A, Singh H, Sarris J, Zangara A, Stough C. 2015. A randomized controlled trial investigating the effects of a special extract of Bacopa monnieri (CDRI 08) on hyperactivity and inattention in male children and adolescents: BACHI Study Protocol. Nutrients. 7(12):9931-45.

Kennedy D, Scholey A. 2006. The psychopharmacology of European herbs with cognition-enhancing properties. Current Pharmaceutical Design. 12(35):4613-23.

Kennedy D, Scholey A, Tildesley N, Perry E, Wesnes K. 2002. Modulation of mood and cognitive performance following acute administration of Melissa officinalis (lemon balm). Pharmacology, Biochemistry, and Behavior. 72(4):953-64.

Kennedy D, Wake G, Savelev S, Tildesley N, Perry E, Wesnes K, Scholey A. 2003. Modulation of mood and cognitive performance following acute administration of single doses of Melissa officinalis (Lemon balm) with human CNS nicotinic and muscarinic receptor-binding properties. Neuropsychopharmacology. 28(10):1871-81.

Kongkeaw C, Dilokthornsakul P, Thanarangsarit P, Limpeanchob N, Norman-Scholfield C. 2014. Meta-analysis of randomized controlled trials on cognitive effects of Bacopa monnieri extract. Journal of Ethnopharmacology. 151(1):528-35.

Kreutzmann J, Havekes R, Abel T, Meerlo P. 2015. Sleep deprivation and hippocampal vulnerability: changes in neuronal plasticity, neurogenesis and cognitive function Neuroscience. 309:173-90.

Lee K, Chen J, Teng C, Shen C, Hsieh M, Lu C, Lee K, Lee L, Chen W, Chen C, Huang W, Kuo H. 2014. Protective effects of Hericium erinaceus mycelium and its isolated erinacine A against ischemia-injury-induced neuronal cell death via the inhibition of iNOS/p38 MAPK and nitrotyrosine. International Journal of Molecular Sciences. 15(9):15073-89.

Lindheimer J, Loy B, O'Connor P. 2013. Short-term effects of black pepper (Piper nigrum) and rosemary (Rosmarinus officinalis and Rosmarinus eriocalyx) on sustained attention and on energy and fatigue mood states in young adults with low energy. Journal of Medicinal Food. 16(8):765-71.

Mori K, Inatomi S, Ouchi K, Azumi Y, Tuchida T. 2009. Improving effects of the mushroom Yamabushitake (Hericium erinaceus) on mild cognitive impairment: a double-blind placebo-

controlled clinical trial. Phytotherapy Research. 23(3):367-72.

Mori K, Obara Y, Hirota M, Azumi Y, Kinugasa S, Inatomi S, Nakahata N. 2008. Nerve growth factor-inducing activity of Hericium erinaceus in 1321N1 human astrocytoma cells. Biological and Pharmaceutical Bulletin. 31(9):1727-32.

Moss M, Cook J, Wesnes K, Duckett P. 2003. Aromas of rosemary and lavender essential oils differentially affect cognition and mood in healthy adults. The International Journal of Neuroscience. 113(1):15-38.

Noe-Pagán C. 2015. The MIND Diet May Help Prevent Alzheimer's. WebMD; [accessed 2016 Feb 25]. http://www.webmd.com/alzheimers/features/mind-diet-alzheimers-disease.

Pase M, Kean J, Sarris J, Neale C, Scholey A, Stough C. 2012. The cognitive-enhancing effects of Bacopa monnieri: a systematic review of randomized, controlled human clinical trials. Journal of Alternative and Complementary Medicine. 18(7):647-52.

Pengelly A, Snow J, Mills S, Scholey A, Wesnes K, Butler L. 2012. Short-term study on the effects of rosemary on cognitive function in an elderly population. Journal of Medicinal Food. 15(1):10-7.

Peth-Nui T, Wattanathorn J, Muchimapura S, Tong-Un T, Piyavhatkul N, Rangseekajee P, Ingkaninan K, Vittaya-Areekul S. 2012. Effects of 12-Week Bacopa monnieri consumption on attention, cognitive processing, working memory, and functions of both cholinergic and monoaminergic systems in healthy elderly volunteers. Journal of Evidence-Based Complementary and Alternative Medicine. 2012:606424.

Ramachandran C, Quirin K, Escalon E, Melnick S. 2014. Improved neuroprotective effects by combining Bacopa monnieri and Rosmarinus officinalis supercritical CO2 extracts. Journal of Evidence-Based Complementary and Alternative Medicine. 19(2):119-27.

Raman J, Lakshmanan H, John P, Zhijian C, Periasamy V, David P, Naidu M, Sabaratnam V. 2015. Neurite outgrowth stimulatory effects of myco-synthesized AuNPs from Hericium erinaceus (Bull.: Fr.) Pers. on pheochromocytoma (PC-12) cells. International Journal of Nanomedicine. 10:5853-63.

Ross S. 2015. Valerian root and lemon balm extracts: a phytomedicine compound improves symptoms of hyperactivity, attention deficits, and impulsivity in children. Holistic Nursing Practice. 29(6):391-5.

Sabaratnam V, Kah-Hui W, Naidu M, Rosie-David P. 2013. Neuronal health - can culinary and medicinal mushrooms help? Journal of Traditional and Complementary Medicine. 3(1):62-8.

Samberkar S, Gandhi S, Naidu M, Wong K, Raman J, Sabaratnam V. 2015. Lion's mane, Hericium erinaceus and tiger milk, Lignosus rhinocerotis (higher Basidiomycetes) medicinal mushrooms stimulate neurite outgrowth in dissociated cells of brain, spinal cord, and retina: an in vitro study. International Journal of Medicinal Mushrooms. 17(11):1047-54.

Schmidt A, Hammann F, Wölnerhanssen B, Meyer-Gerspach A, Drewe J, Beglinger C, Borgwardt S. 2014. Green tea extract enhances parieto-frontal connectivity during working memory processing. Psychopharmacology. 231(19):3879-88.

Scholey A, Gibbs A, Neale C, Perry N, Ossoukhova A, Bilog V, Kras M, Scholz C, Sass M, Buchwald-Werner S. 2014. Anti-stress effects of lemon balm-containing foods. Nutrients. 6(11):4805-21.

Shinomol G, Muralidhara, Bharath M. 2011. Exploring the role of "Brahmi" (Bacopa monnieri and Centella asiatica) in brain function and therapy. Recent Patents on Endocrine, Metabolic and Immune Drug Discovery. 5(1):33-49.

Sonuga-Barke E, Brandeis D, Cortese S, Daley D, Ferrin M, Holtmann M, Stevenson J, Danckaerts M, van der Oord S, Döpfner M, Dittmann RW, Simonoff E, Zuddas A, Banaschewski T, Buitelaar J, Coghill D, Hollis C, Konofal E, Lecendreux M, Wong I, Sergeant J. 2013. Nonpharmacological interventions for ADHD: systematic review and meta-analyses of randomized controlled trials of dietary and psychological treatments. American Journal of Psychiatry. 170(3):275-89.

Spasov A, Wikman G, Mandrikov V, Mironova I, Neumoin V. 2000. A double-blind, placebo-controlled pilot study of the stimulating and adaptogenic effect of Rhodiola rosea SHR-5 extract on the fatigue of students caused by stress during an examination period with a repeated low-dose regimen. Phytomedicine. 7(2):85-9.

Stough C, Scholey A, Cropley V, Wesnes K, Zangara A, Pase M, Savage K, Nolidin K, Lomas J, Downey L. 2013. Examining the cognitive effects of a special extract of Bacopa monniera (CDRI08: Keenmnd): a review of ten years of research at Swinburne University. Journal of Pharmacy and Pharmaceutical Sciences. 16(2):254-8.

Tolf C. 2015. Lichenwood Herbals Flower Essences. Lichenwood Herbals; [accessed 2016 Mar 3]. http://www.lichenwood.com/essencesaf.html.

Topcu G, Kusman T. 2014. Lamiaceae family plants as a potential anticholinesterase source in the treatment of Alzheimer's disease. Bezmialem Science. 1:1-25

Verghese J, Lipton R, Katz M, Hall C, Derby C, Kuslansky G, Ambrose A, Sliwinski M, Buschke H. 2003. Leisure activities and the risk of dementia in the elderly. The New England Journal of Medicine. 348(25):2508-16.

Vladimir-Kneževi S, Blažekovi B, Kindl M, Vladi J, Lower-Nedza A, Brantner A. 2014. Acetylcholinesterase inhibitory, antioxidant and phytochemical properties of selected medicinal plants of the Lamiaceae family. Molecules. 19(1):767-82.

Wang G, Ren F, Liu Z, Xu G, Jiang F, Skora E, Lewin D. 2016. Sleep patterns and academic performance during preparation for college entrance exam in Chinese adolescents. Journal of School Health. 86(4):298-306.

Wattanathorn J, Mator L, Muchimapura S, Tongun T, Pasuriwong O, Piyawatkul N, Yimtae K, Sripanidkulchai B, Singkhoraard J. 2008. Positive modulation of cognition and mood in the healthy elderly volunteer following the administration of Centella asiatica. Journal of Ethnopharmacology. 116(2):325-32

Wong K, Kanagasabapathy G, Naidu M, David P, Sabaratnam V. 2014. Hericium erinaceus (Bull.: Fr.) Pers., a medicinal mushroom, activates peripheral nerve regeneration. Chinese Journal of Integrative Medicine. Aug 26 [Epub ahead of print].

Yuan T, Ferreira Rocha N, Paes F, Arias-Carrión O, Machado S, de Sá Filho A. 2015. Neural mechanism of exercise: neurovascular responses to exercise. CNS and Neurological Disorders Drug Targets. 14(10):1304-6.