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File: ■ Bacopa (*Bacopa monnieri*)
■ Cognition
■ Memory

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RE: Systematic Review Suggests Bacopa Extracts Improve Free Recall Memory

Pase MP, Kean J, Sarris J, Neale C, Scholey AB, Stough C. The cognitive-enhancing effects of *Bacopa monnieri*: a systematic review of randomized, controlled human clinical trials. *J Altern Complement Med.* 2012;18(7):647-652.

Bacopa (Bacopa monnieri) has been used in Ayurveda since the 6th century for treating various mental conditions and as a potent memory enhancer. Similarly, it is currently used for cognitive enhancement. *Bacopa's* mechanisms of action include antioxidant activity, beta-amyloid scavenging, neuroprotection, modulation of acetylcholine levels, and modulation of cholinergic neuron density. According to the authors, this is the first report to systematically review the cognitive-enhancing benefits of *bacopa* in humans.

The following databases were searched through April 2011: Scopus, PubMed, and the Cochrane Library. The following key words and truncations were used: cognit or memory or neuropsycholog or neurocognit or executive function with bacopa or brahmi or bacoside or water hyssop. Included studies were randomized, controlled trials conducted in adult humans with no cognitive impairment; bacopa was a monotherapy; methodologic quality was ≥ 5 on the modified Jadad scale; efficacy was based on valid tests of cognitive outcomes; and bacopa treatment lasted for ≥ 4 weeks. All languages were included.

Each trial was analyzed for methodologic quality using a purpose-designed modified Jadad scale. The original Jadad scale is out of 5 points. This modified version is out of 10 points. For the modified score, 1 point was given when each of the following criteria was satisfied, with higher scores reflecting superior methodologic quality: (1) Was the study randomized? (2) Was randomization detailed and appropriate? (3) Was the study double-blind? (4) Was the blinding detailed and appropriate? (5) Was there a control group? (6) Was the control described in detail and appropriate? (7) Were the exclusion criteria adequate? (8) Was the dosage used a therapeutic amount? (9) Were withdrawals and dropouts described? and (10) Were the data reported clearly and adequately? The data gathered from each study included general study descriptives as well as all cognitive outcomes and their reported significance. Only results from the

longest time points for each study were included. Cognitive outcomes from each study were grouped into the true cognitive abilities by 2 neuroscientists.

A total of 64 studies were located; only 6 met all inclusion criteria. All of the studies were randomized, double-blind, placebo-controlled, parallel-group studies with a 12-week duration. Study populations were described as comparable in age range, and all subjects were healthy. One study recruited a sample with subjective memory complaints, but the patients did not have cognitive impairment. The average quality of trials was high, with a modified Jadad mean score of 8.5. Three studies evaluated KeenMind® (Flordis; Crows Nest, New South Wales, Australia), 2 evaluated BacoMind® (Natural Remedies Pvt. Ltd.; Bangalore, India), and 1 evaluated Mediherb® Bacopa (Mediherb; Warwick, Queensland, Australia). Dosages of these dry extracts (herb to extract ratio of 20:1, except Mediherb Bacopa, 50:1) ranged from 300 to 450 mg/day. All 3 products use different extraction solvents and methods, different plant parts, and different dosage equivalents to dried herbs. None of the studies included cognitive tests for abilities in auditory perception or in producing and retrieving ideas, words, and figural creations.

Two studies evaluated reasoning abilities, and bacopa was not effective in this domain. One study evaluated language behavior and number facility, and bacopa was not effective in this domain. Five studies used 9 cognitive tests of visual perceptual abilities, and in 1 study bacopa was effective for reduced reaction time, while in 1 other study bacopa was effective for rapid visual information processing tasks. Three studies evaluated mental speed, and bacopa was only effective for inspection time. All of the studies evaluated memory; the majority of tests were in the domain of free recall memory (auditory verbal learning test was used most frequently). Across all of the studies, bacopa improved free recall memory in 9 of 17 tests in this domain.

The authors conclude that some evidence suggests that bacopa is efficacious in improving free recall of information in subjects without memory impairment. The authors believe that bacopa could potentially be prescribed as a memory enhancer. However, longer-term studies are needed with manipulation of dosage sizes, as well as studies that evaluate reasoning, mental speed, idea production, language behavior, and number facility.

It is particularly impressive that the included studies had such a high modified Jadad score. It would be of value to see how the studies would score on the regular Jadad score, which is used more frequently in systematic reviews. It is interesting that the products tested were relatively different, and yet they still benefited the same clinical domain.

—Heather S. Oliff, PhD

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