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File: ■ Green Tea (*Camellia sinensis*)
■ L-Theanine
■ Memory Improvement
■ Mild Cognitive Impairment

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RE: Green Tea/L-Theanine Combination Increases Memory and Attention in Subjects with Mild Cognitive Impairment

Park S-K, Jung I-C, Lee WK, et al. 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*. 2011;14(4):334-343.

Mild cognitive impairment (MCI) is defined as "a deficit in memory performance with normal cognitive function in the absence of a diagnosis of Alzheimer's disease (AD)."¹ From 10-15% of patients with MCI will progress to AD within a year, whereas 1-2% of the normal elderly population showed AD conversion.² In Korea, home to these authors, the incidence of MCI in persons older than 65 years is estimated to be 24.08%.³ LGNC-07 (LG Household & Health Care, Ltd.; Korea), a combination of green tea (*Camellia sinensis*) extract and the amino acid L-theanine, has been reported to have beneficial effects on cognition in animal studies. The authors conducted a randomized, double-blind, placebo-controlled clinical study to investigate whether LGNC-07 can improve cognition in patients with MCI.

The study was conducted at Daejeon University Oriental Hospital in the Republic of Korea from January 1, 2008 to March 31, 2009. Enrolled in the study were 91 subjects (25 men and 66 women) with subjective memory complaints (SMCs) that included MCI. The subjects were aged between 40 and 75 years, were literate in Korean, had a score of 21 to 26 on the Korean version of the neuropsychological test Mini Mental State Examination (MMSE-K), and were classified as being at stage 2 or 3 on the 7-stage Global Deterioration Scale (GDS) used to measure the progression of AD.

During the first visit, the investigators collected medical and personal information (demographic information, disease history, chest x-ray, and electrocardiogram). The authors report no significant differences among the subjects in gender, age, height, weight, blood pressure, or pulse rate.

The subjects were randomly assigned to either the placebo (n = 45) or treatment (n = 46) group and were instructed to take two 430 mg capsules of treatment or placebo

twice daily 30 minutes after meals for 16 weeks.

Treatment capsules contained 360 mg of green tea extract, 60 mg of L-theanine, 5.7 mg of silicon dioxide, and 4.3 mg of magnesium stearate. No further information regarding LGNC-07 was provided in the article. The placebo contained the same ingredients except for the green tea extract and L-theanine, which were replaced with 258 mg of maltodextrin and 162 mg of lactose. After a 15-day washout period, the subjects began the study.

Neuropsychological tests were performed at baseline and at 8 and 16 weeks after treatment. The MMSE-K measures various cognitive functions (memory, orientation, language, and attention/concentration), with scores ranging from 0 (no cognitive impairment) to 30 (severe impairment). The GDS, which assesses clinical symptoms and severity of AD (or dementia), describes 7 major, clinically distinguishable dementia stages (ranging from no cognitive decline to very severe cognitive decline). At baseline, the MMSE-K and GDS scores showed no significant differences between groups.

In addition, the subjects completed the Rey-Kim Memory Test (a standardized Korean version of the Rey Auditory Verbal Learning Test) to determine verbal memory and visuospatial memory, as well as the Stroop color-word reading test to assess selective attention to reflect prefrontal cortex activation.

No significant adverse events were observed during the study, and blood level analyses remained in the normal range.

On the Rey-Kim Memory Test, both LGNC-07 and placebo groups had increased MQ (memory quotient) after 16 weeks, but no significant differences were reported between the 2 groups. However, LGNC-07 marginally improved K-A (delayed recognition) at week 8 ($P = 0.0572$) compared with placebo. This suggests that the potential mechanism of its effect on memory improvement is through memory retrieval, say the authors.

On the Stroop color-word reading test, no increase was seen in the correct count of word reading at 16 weeks in either group. Color reading was improved only by LGNC-07 ($P = 0.099$) compared with the baseline measurement.

In a subset of subjects with MMSE-K scores of 21 to 23, the use of LGNC-07 was associated with a significant MQ increase at week 16 ($P = 0.478$) compared with placebo. Also, LGNC-07 improved K-C (immediate recall) and K-C (delayed recall) after 16 weeks compared with baseline measurements ($P < 0.05$). Also, in this subset, LGNC-07 treatment significantly increased Stroop word reading at 8 weeks ($P = 0.0306$) compared with the placebo group. Stroop color reading was improved by LGNC-07 at 16 weeks compared with baseline measurements ($P < 0.05$). The placebo group did not show significant improvement over the course of the study. "The finding that the subgroup whose MMSE-K was between 21 and 23 showed a better response to LGNC-07 needs to be carefully considered," write the authors.

From the initial study group, 24 subjects were selected randomly to receive electroencephalograms (EEGs) to measure the electrical activity of the brain. EEGs were recorded hourly for 3 hours in eye-open, eye-closed, and reading states after a single dose of LGNC-07 or placebo. In subjects in the LGNC-07 group, brain theta

waves, an indicator of cognitive alertness, increased significantly in the temporal, frontal, parietal, and occipital areas after 3 hours in the eye-open and reading states. In the eyes-closed state, theta activity decreased in those subjects, especially in areas other than the frontal area. From color-coded brain maps, it was evident that the activity increased within 1 hour of LGNC-07 ingestion and lasted for up to 3 hours. "Increased theta activity supports the findings from the neuropsychological test," say the authors.

The authors point out that early diagnosis and treatment of SMCs is important, as subjects with those complaints have a higher risk for dementia. They also cite studies showing the potential of the ingredients of LGNC-07 to improve memory.

The authors conclude that LGNC-07 improved cognitive function by increasing memory and attention in subjects with MCI whose MMSE-K score was between 21 and 23. It also increased theta activity during active mental states, which supports its effect on the neuropsychological tests. "As a natural ingredient with a long history of consumption, LGNC-07 should be considered as a potential nutraceutical candidate for enhancing cognitive performance," write the authors.

Considering the growth of the age-related population and the risk of dementia, this study is useful in seeking to prevent cognitive dysfunctions. Also, the findings are in line with a recent study by Kakuda on the effect of L-theanine-rich green tea powder to suppress cognitive impairments.⁴ Further, a long-term study with normal, healthy, elderly volunteers would be helpful to identify the synergetic effects of an L-theanine combination with green tea.

—Shari Henson

References

¹Larrieu S, Letenneur L, Orgogozo JM, et al. Incidence and outcome of mild cognitive impairment in a population-based prospective cohort. *Neurology*. 2002;59(10):1594-1599.

²Petersen RC, Smith GE, Waring SC, Ivnik RJ, Tangalos EG, Kokmen E. Mild cognitive impairment: clinical characterization and outcome. *Arch Neurol*. 1999;56(3):303-308.

³Seoul National University Hospital. Nationwide study on the prevalence of dementia in Korean elders. Seoul: Seoul National University Hospital; 2009.

⁴Kakuda T. Neuroprotective effects of theanine and its preventive effects on cognitive dysfunction. *Pharmacol Res*. 2011;[epub ahead of print]. doi:10.1016/j.phrs.2011.03.010.

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