



HerbClip™

Laura Bystrom, PhD
Mariann Garner-Wizard

Alexis Collins, MS
Shari Henson
Amy Keller, PhD

Blake Ebersole, MBA
Heather S Oliff, PhD

Executive Editor – Mark Blumenthal

Managing Editor – Lori Glenn

Consulting Editors – Wendy Applequist, PhD, Thomas Brendler, Lisa Anne Marshall, Allison McCutcheon, PhD, J. Erin Smith, MSc, Carrie Waterman, PhD

Assistant Editor – Tamarind Reaves

AMERICAN
BOTANICAL
COUNCIL

**File: ■ Cinnamon (*Cinnamomum* spp., Lauraceae)
■ Working Memory
■ Prediabetes**

HC 051653-556

Date: November 15, 2016

RE: Dietary Intake of Cinnamon Associated with Better Working Memory

Wahlqvist ML, Lee MS, Lee JT, et al. Cinnamon users with prediabetes have a better fasting working memory: a cross-sectional function study. *Nutr Res.* 2016;36(4):305-310.

People with diabetes or prediabetes have a higher risk for cognitive impairment. Evidence from experimental, clinical, and epidemiological studies indicates that consumption of culinary herbs and spices such as cinnamon (*Cinnamomum* spp., Lauraceae) bark, turmeric (*Curcuma longa*, Zingiberaceae) rhizome, and ginger (*Zingiber officinale*, Zingiberaceae) rhizome may improve working memory (WM). The authors hypothesize that culinary herb or spice usage is associated with improved WM in people with age-related and prediabetic cognitive impairment. The authors tested this hypothesis in an epidemiological study of patients with untreated, newly diagnosed prediabetes.

Patients (n = 99; aged ≥ 60 years) with a body mass index (BMI) of 18.5-30 kg/m² (non-obese) and fasting glucose between 100-125 mg/dL (prediabetic) were recruited from a health checkup program at Tri-Service General Hospital, National Defense Medical Center; Taipei City, Taiwan. Included patients had no history of diabetes medication usage, severe chronic disease, recent acute illness, or hospitalization in the 2 months preceding the study. Excluded patients had a history of heavy drinking in the preceding 2 weeks, consumed ginseng (*Panax* spp., Araliaceae) root or garlic (*Allium sativum*, Amaryllidaceae) cloves, or had kidney impairment.

After an overnight fast, patients were assessed using the mini-mental state examination (MMSE) and a modified WM test. Physical evaluations included BMI, body fat composition, fasting glucose, and homeostatic model assessment for insulin resistance (HOMA-IR). Trained dieticians administered 2 questionnaires. One queried patients regarding their clinical history, medicine usage, sociodemographic characteristics, and personal behaviors including physical activity, smoking, alcohol consumption, and betel nut (*Areca catechu*, Arecaceae) chewing. The second was a 32-item semi-quantitative food frequency questionnaire (SFFQ) to evaluate dietary intake 1 year prior to study initiation, with 5 additional questions on culinary herb and spice usage. The intake frequency of culinary herbs and spices was assessed on a 7-point scale ranging from

"never" to "6 or more times per day." Linear regression analysis was used to calculate the effect of variables on WM.

Six patients were excluded from the analysis; 4 did not fast, and 2 reported implausible dietary intake data. The cohort studied was composed of 47 men and 46 women with mean ages of 72.1 and 74.3 years, respectively.

The crude analysis indicated that cinnamon (but not ginger or turmeric) consumption had a significant effect on WM ($P < 0.05$). Increased education (number of years) and a higher MMSE score also were positively associated with WM ($P < 0.01$ and $P < 0.05$, respectively), while increased total fat mass (kg) was negatively associated with WM ($P < 0.05$). After adjustment for age and sex, only cinnamon use ($P < 0.05$), education ($P < 0.01$), and MMSE ($P < 0.01$) remained significant. When all variables were adjusted, cinnamon users still had significantly better WM than non-users ($P < 0.05$). Patients who consumed dietary cinnamon had significantly less frequent physical activity ($P = 0.04$), consumed more fresh ginger ($P = 0.02$), consumed more ginger in cooking ($P = 0.04$), and had better WM ($P < 0.001$) compared to patients who did not consume cinnamon. Although cinnamon users also more commonly consumed ginger, no synergistic effect on WM was detected.

The authors state, "Because we are reporting [cinnamon] usage in usual home food preparation, we are talking about no more than a gram or so per day, generally available and affordable." They do not report the criteria used to differentiate cinnamon users ($n = 15$) and non-users ($n = 78$).

The authors conclude that cinnamon intake is associated with better WM in patients with untreated prediabetes, and this correlation is not accounted for by education, dietary quality, or insulin resistance. According to the authors, studies that evaluate acute cinnamon intake have not shown an association between WM and cinnamon intake; they hypothesize that the effect on WM may be dependent on the duration of exposure. Limitations of the study include (1) the criteria used to define cinnamon users and non-users was not reported, (2) cinnamon (and other herbs and spices) intake calculations were based upon subjective recall of dietary habits over the past year, (3) neither the preparation form nor the quality of cinnamon consumed could be evaluated, and (4) since the study was conducted in a Taiwanese population, the results may not be transferable to other populations with Western-style diets. The results of this epidemiological study suggest that the effects of chronic cinnamon consumption on WM bears further research. The authors also recommend investigation of the additive or synergistic effect of culinary herb and spice consumption. The authors declare no conflict of interest.

—*Heather S. Oliff, PhD*

The American Botanical Council has chosen not to reprint the original article.

The American Botanical Council provides this review as an educational service. By providing this service, ABC does not warrant that the data is accurate and correct, nor does distribution of the article constitute any endorsement of the information contained or of the views of the authors.

ABC does not authorize the copying or use of the original articles. Reproduction of the reviews is allowed on a limited basis for students, colleagues, employees and/or members. Other uses and distribution require prior approval from ABC.