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File: ■ Cinnamon (*Cinnamomum* spp.)
■ Diabetes
■ Glycemic Control

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RE: Meta-analysis of the Glycemic Effects of Cinnamon in Type 2 Diabetics

Akilen R, Tsiami A, Devendra D, Robinson N. Cinnamon in glycaemic control: systematic review and meta analysis. *Clin Nutr*. May 12, 2012; [epub ahead of print]. doi:10.1016/j.clnu.2012.04.003.

Many previous studies have investigated cinnamon (*Cinnamomum* spp.) for use in treating diabetes; however, results are conflicting, with studies reporting both hypoglycemic activity, as well as no improvement in blood glucose, in diabetic patients in response to cinnamon supplementation. Despite this, polyphenols found in cinnamon are thought to account for its bioactivity, and possible mechanisms include insulin mimetic properties and the stimulation of glucose uptake. This review and meta-analysis addresses the effects of cinnamon on glycemic control in randomized, controlled trials (RCTs) with type 2 diabetes mellitus (T2DM) patients.

A search of all clinical RCTs investigating cinnamon in T2DM patients through August 2011 was performed. Searched databases included the Cochrane Database of Systematic Reviews, ACP Journal Club, Database of Abstracts of Reviews of Effects (DARE), Cochrane Central Register of Controlled Trials (CCTR), Cochrane Methodology Register (CMR), Health Technology Assessment (HTA), National Health Service Economic Evaluation Database (NHSEED), Allied and Complementary Medicine, EMBASE, Ovid Medline, JAMA, BMJ, HighWire Press, and Lancet (January 2000 to March 2011). Search terms included "type 2 diabetes," "diabetes," "cinnamon," "glycaemic control," and "blood glucose." Out of 322 articles, 6 were included after dismissing in vivo and in vitro studies, those in languages other than English, those missing abstracts or author names, those with problems in methodology, or duplicates. Also excluded were studies with type 1 diabetes mellitus (T1DM) patients, healthy or pre-diabetic subjects, or those with metabolic syndrome.

Of the 6 RCTs analyzed (all published in 2000 or later), all used cassia (*C. aromaticum* syn. *C. cassia*) in dosages from 1 to 6 g daily (5 RCTs used cinnamon powder, while 1 study used cinnamon extract), included 375 patients combined, and varied in study length from 40 days to 4 months. In 1 study, daily dosages of 1, 3, and 6 g of cinnamon were found to significantly lower fasting plasma glucose (FPG) after 40 days of treatment ($P<0.05$).[1] Another study reported that FPG was significantly reduced in those taking cinnamon, with the strongest effects seen in patients with the most elevated FPG at baseline; however, no effects were seen on HbA1c (glycated hemoglobin, a measure of blood glucose) levels.[2] A

third study also showed no effects on HbA1c.[3] No improvement in FPG or HbA1c levels were reported in another study,[4] but a significant reduction in HbA1c levels as compared with placebo was reported in 2 of the analyzed RCTs.[5,6]

The analysis of the 5 RCTs that reported effects on HbA1c levels showed that cinnamon significantly reduced HbA1c levels as compared with placebo (0.09%; 95% confidence interval [CI]: 0.04-0.14; P=0.0002). Five RCTs observed decreased FPG concentrations in response to cinnamon and treatment and were analyzed; it was found that T2DM patients consuming cinnamon had significantly reduced FPG (0.84 mmol/l; 95% CI: 0.66-1.02; P<0.00001).

The authors note that the studies analyzed had omitted measurements, and the baseline parameters between the RCTs were quite varied. Other factors that may have contributed to uneven results were the testing of overweight, postmenopausal female patients, the allowance of patients on anti-diabetic medication, and the variation in study duration, particularly in reference to the amount of time needed to observe any effects on HbA1c concentrations. It is suggested that results may be dependent on the baseline severity of both T2DM and the HbA1c level, as opposed to the dosage of cinnamon; it is also surmised that this may be indicative of gastric emptying or decreased glucose absorption.

The need to elucidate the mechanism of any hypoglycemic activity of cinnamon, as well as the proper dosage and phytochemical content of cinnamon preparations, is also discussed. The shortcomings of this study include the small sample size of RCTs, incomplete descriptions of the randomization process within studies, inconsistent methodology, and brief treatment time. Although there is evidence to support the use of cinnamon in certain diabetic patients, future rigorous RCTs will ideally focus on the bioactivity, phytochemical profile, and safety of cinnamon preparations.

—Amy C. Keller, PhD

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