P.O. Box 144345 Austin, TX 78714-4345 ▪ 512.926.4900 ▪ Fax: 512.926.2345 ▪ www.herbalgram.org

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File: ■ Cinnamon (*Cinnamomum verum*, Lauraceae)
■ Cardamom (*Elettaria cardamomum* var. *cardamomum*, Zingiberaceae)
■ Saffron (*Crocus sativus*, Iridaceae)
■ Ginger (*Zingiber officinale*, Zingiberaceae)
■ Type 2 Diabetes
■ Glycemic Control
■ Lipid Profile

HC 091523-542

Date: April 15, 2016

RE: Cinnamon and Ginger May Decrease Inflammation in Patients with Type 2 Diabetes

Azimi P, Ghiasvand R, Feizi A, Hariri M, Abbasi B. Effects of cinnamon, cardamom, saffron, and ginger consumption on markers of glycemic control, lipid profile, oxidative stress, and inflammation in type 2 diabetes patients. *Rev Diabet Stud*. Fall-Winter 2014/15;11(3-4):258-266.

Type 2 diabetes (T2D) has increased in prevalence over the last 2 decades and is the fourth leading cause of death in developed countries. T2D and several other chronic diseases, including metabolic syndrome and heart disease, are characterized by high levels of oxidative stress and inflammation. A number of plants, including cinnamon (*Cinnamomum verum*, Lauraceae), cardamom (*Elettaria cardamomum* var. *cardamomum*, Zingiberaceae), saffron (*Crocus sativus*, Iridaceae), and ginger (*Zingiber officinale*, Zingiberaceae), contain compounds that are strong antioxidants and anti-inflammatories. In vitro and in vivo studies have shown that herbal medications containing these plants can reduce oxidative stress and inflammation. In addition, these herbal medications have sometimes been shown to alter glycemic control and lipid profile. The goal of this randomized, controlled, single-blind study was to measure the effect of teas made with cinnamon, cardamom, saffron, and ginger on glycemic control, inflammation, oxidative stress, and lipid profile in patients with T2D.

Patients with T2D over the age of 29 were recruited from the Endocrine and Metabolism Research Center at Isfahan University of Medical Sciences in Isfahan, Iran. Patients were included if they were overweight (body mass index ≥ 25 kg/m^2), had fasting blood glucose concentrations ≥ 126 mg/dl, and were not taking insulin. Patients could be taking the oral hypoglycemic medications glibenclamide or metformin. Patients were excluded if they were pregnant, needed to begin insulin therapy during the study, or consumed the study spices as part of their regular diet.

The study consisted of a 3-week run-in phase in which all patients drank a consistent amount of black tea (*Camellia sinensis*, Theaceae) each day. This was followed by an 8-week treatment phase in which 3 cups of black tea (Golestan, Inc.; Tehran, Iran) were consumed

each day combined with 1 of the 4 powdered treatment herbs or without herbs (control). The treatments consisted of 3 g of cardamom seeds, 3 g of ginger rhizome, 3 g cinnamon bark, or 1 g saffron stigmas. No information was provided on the origin of the herbs. Patients were divided randomly and almost evenly among the groups (sample size varied between 39 and 42 patients). Patients received packets of herbs and tea each week for the 8 weeks of the study and were trained to stew the herbs and/or black tea for 10 minutes. Compliance and adverse reactions were assessed each week.

Patients were asked to maintain their regular activity level and diet for the duration of the study. The following blood measurements were made at baseline and 8 weeks: fasting blood glucose, glycated hemoglobin (HbA1c), triglycerides (TG), total cholesterol, low-density lipoproteins (LDL), high-density lipoproteins (HDL), high-sensitivity C-reactive protein (hs-CRP), and F2-isoprostane. Height, weight, and waist circumference also were measured at baseline and 8 weeks. Data were analyzed with one-way multivariate analysis of variance, Dunnett's post hoc pairwise comparisons, and paired samples t-tests.

Four of the 208 patients were excluded from analysis because a blood sample was not obtained at the end of the study. At baseline, the saffron group was significantly older and more overweight ($P = 0.02$ and 0.005, respectively). There were no significant changes in anthropometric measures with time or treatment. The ginger treatment resulted in a decrease in hs-CRP and F2-isoprostane levels from the beginning to the end of the study ($P = 0.04$ and 0.01, respectively). The cinnamon treatment resulted in a decrease in hs-CRP, fasting blood glucose, and TG from the beginning to the end of the study ($P = 0.04$, 0.003, and 0.02, respectively). In addition, significant treatment effects among groups were found for total cholesterol, LDL, and HDL ($P = 0.004$, 0.01, and 0.001, respectively), compared to control. Cholesterol decreased in the control, saffron, and ginger groups and increased in the cinnamon group. LDL decreased in the cinnamon, saffron, ginger, and control groups. HDL decreased in the saffron group and increased in the ginger and control groups. While none of these changes from baseline values were significant, they did approach significance (all $P < 0.1$). No adverse effects were reported.

Both cinnamon and ginger steeped with black tea resulted in a decrease in the hs-CRP biomarker of inflammation in overweight patients with T2D. In addition, cinnamon in black tea resulted in a decrease in fasting blood glucose and TG, while ginger reduced the oxidative stress marker F2-isoprostane. Significant treatment effects were found for total cholesterol, LDL, and HDL, but in each of these measures the improvement was similar or greater in the control group when compared to most of the treatment groups. Each of the treatments, cinnamon, cardamom, saffron, and ginger, has been previously shown to decrease oxidative stress and inflammation. In this study, only ginger and cinnamon reduced the marker for inflammation. In addition, other studies have found that cinnamon may also alter glucose metabolism and blood lipid profile. The study may have been limited by the lack of double blinding. It also may have been useful to continue the duration of the study for longer than 8 weeks.

—Cheryl McCutchan, PhD

Referenced article can be accessed at http://www.soc-bdr.org/content/rds/archive/11/3_4_fall_winter/original_data/herbal_medicines_in_type_2_diabetes.