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File: ■ Korean Red Ginseng (*Panax ginseng*, Araliaceae)
■ Epithelial Ovarian Cancer
■ Adjuvant Chemotherapy

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RE: Korean Red Ginseng May Reduce Genotoxicity and Improve Quality of Life in Patients with Epithelial Ovarian Cancer receiving Chemotherapy

Kim HS, Kim M-K, Lee M, Kwon B-S, Suh DH, Song YS. Effect of red ginseng on genotoxicity and health-related quality of life after adjuvant chemotherapy in patients with epithelial ovarian cancer: a randomized, double blind, placebo-controlled trial. *Nutr*. July 2017; 9(7):772. doi: 10.3390/nu9070772.

Epithelial ovarian cancer (EOC) has no effective screening method for early detection, and it is often detected at advanced states. As a consequence, the survival rate is low. Patients diagnosed with EOC have a poor health-related quality of life (HRQL), which is worsened by chemotherapy. Complementary and alternative medicines are being evaluated to help improve HRQL in these patients. Korean red ginseng (*Panax ginseng*, Araliaceae) root contains ginsenosides that may reduce genotoxic effects of chemotherapy. Also, studies show that Korean red ginseng may improve fatigue and cognition, thereby improving quality-of-life. The purpose of this randomized, double-blind, placebo-controlled study was to evaluate the effect of Korean red ginseng on genotoxicity and HRQL in patients with EOC undergoing chemotherapy.

Women (n = 30, mean age 52.9 years in the placebo group and 55.9 years in the ginseng group) with EOC participated in this study from April 2012 to November 2014 at Seoul National University Hospital in Seoul, Korea. Included patients were older than 20 years; received six cycles of adjuvant taxane- and platinum-based chemotherapy after cytoreductive surgery; had a complete or partial response after chemotherapy; and completed the treatment within 8 weeks prior to entering the study. Excluded patients had a history of smoking, a chronic disease, recurrent cancer requiring more intensive treatment, previous radiotherapy, and a history of hypersensitivity to ginseng.

Patients received either placebo or 3000 mg/day (2 capsules 3x/day) Korean red ginseng (prepared for the study from 6-year-old root) for 12 weeks. At baseline and at 12 weeks, blood was drawn to evaluate toxicity (white blood cells [WBC], hemoglobin, platelet counts, neutrophil counts, lymphocyte counts, alanine aminotransferase [ALT] levels, aspartate aminotransferase [AST] levels, bilirubin levels, alkaline phosphatase [ALP] levels, blood urea nitrogen [BUN], and creatinine). Genotoxicity was evaluated by measuring binucleated cell (BN) index and micronuclei (MN) yield. HRQL was evaluated using the European Organization for Research and Treatment of Cancer QLQ-C30 (EORTC QLQ-C30), the Brief

Fatigue Inventory (BFI), the Brief Pain Inventory (BPI), the Hospital Anxiety and Depression Scale (HADS), and the Sleep Scale from the Medical Outcome Study (MOS-SS). Progression-free survival (PFS) was measured and defined as the time from the date of diagnosis to the date of cancer recurrence. Overall survival was measured and defined as the time from the date of diagnosis to the date of cancer-related death or end of the study.

Baseline characteristics were similar between groups ($P > 0.05$). Treatment compliance was excellent, with > 90% compliance rate. There was no significant difference for either group in the BN index ($P > 0.05$) when comparing the beginning to the end of the trial. However, Korean red ginseng significantly decreased MN yield from week 0 to 12 ($P = 0.038$). There were no significant changes in either group for lymphocyte and platelet counts, bilirubin, ALP, BUN, and creatinine levels ($P > 0.05$ for all). Both the Korean red ginseng group and the placebo group had significant increases in WBC ($P = 0.008$ for both), neutrophils ($P = 0.030$ for both), and hemoglobin ($P < 0.001$ and $P = 0.001$, respectively). AST ($P = 0.010$) and ALT ($P = 0.009$) levels significantly increased over time in the Korean red ginseng group but not the placebo group. There were no significant differences between groups for the incidence of any adverse events (AE; $P = 1.000$ for all). For the Korean red ginseng group's EROTC QLQ-C30 results, emotional score ($P = 0.027$), fatigue ($P = 0.012$), nausea and vomiting ($P = 0.004$), and dyspnea ($P = 0.021$) scores were significantly improved at week 12 compared with baseline. In contrast, the placebo group did not have significant improvements on these same EROTC QLQ-C30 parameters ($P > 0.05$ for all).

On the BFI, for the Korean red ginseng group, worst fatigue score ($P = 0.026$), interference score ($P = 0.014$), and enjoyment of life score ($P = 0.035$) were significantly improved at week 12 compared with baseline. In contrast, the placebo group did not have significant changes on these BFI parameters ($P > 0.05$ for all). On the HADS, anxiety was significantly lower at week 12 compared with baseline in the Korean red ginseng group ($P = 0.015$), but not in the placebo group ($P = 0.119$). On the MOS-SS, daytime somnolence score was significantly improved at week 12 compared with baseline in the Korean red ginseng group ($P = 0.043$), but not in the placebo group ($P = 0.342$). There were no significant differences between groups on mean PFS ($P = 0.448$) and mean overall survival($P = 0.478$).

The authors conclude that Korean red ginseng is safe and may reduce genotoxicity and improve HRQL in patients with EOC receiving chemotherapy. The decrease in MN in the Korean red ginseng group indicates that Korean red ginseng may reduce additional genetic mutations. Low MN is related to improved survival in cancer patients. The authors hypothesize that oxidative stress and inflammation induced by chemotherapy may reduce HRQL, and Korean red ginseng may benefit the patient by decreasing both.

The limitations of this study are the small population size and relatively short duration. Large-scale clinical studies are needed to better estimate the effects of Korean red ginseng on many of these outcomes. The authors declare no conflicts of interest.

—Heather S. Oliff, PhD

Referenced article can be accessed at http://www.mdpi.com/2072-6643/9/7/772.