It was estimated that in 2008, approximately 200,000 new cases of prostate cancer (PCa) would be diagnosed, resulting in roughly 30,000 deaths. Worldwide, the highest rates of PCa occur in "the West" (i.e., the United States, Canada, Australia, and Western Europe), and the lowest rates occur in Asia. A variety of genetic and environmental factors are thought to contribute to the development of PCa. It has become increasingly evident that dietary constituents have the ability to "target multiple deregulated signaling pathways while allowing normal processes to continue." Furthermore, migratory studies have shown that Asian men who move to the United States and adopt a western diet have a greater incidence of PCa than do their native Asian counterparts. Thus, many epidemiologists have suggested that lifestyle and dietary factors play a role in the development of PCa. Asian populations are known to consume large quantities of green tea (Camellia sinensis), and a major constituent of green tea—epigallocatechin-3-gallate (EGCG)—has been shown in cell culture models to decrease cell viability and to promote apoptosis in PCa cell lines but not in noncancerous cell lines and in animal models, to delay the development and progression of PCa. The objective of the present study was to review the available data on the effects of green tea on PCa chemoprevention.

Conflicting results have been observed in epidemiologic studies. Of 6 epidemiologic studies of green tea reviewed, the majority showed a significant decrease in the risk of developing PCa with increasing intakes of green tea; however, other studies showed no significant decrease. EGCG is the most abundant catechin in green tea and has been studied extensively. In preclinical studies, several mechanisms of action for the chemopreventive effects of EGCG have been observed. For example, EGCG has been shown to target inflammatory pathways (e.g., nuclear factor-kappa B and cyclooxygenase-2), MAP kinases, insulin-like growth factor, androgen receptors, and detoxification enzymes. Preclinical pharmacokinetic studies of green tea have shown that the availability of green tea catechins (GTCs) is low (from 2% to 13%) after oral consumption. Many of these studies used a standardized pharmaceutical-grade preparation known as Polyphenon E® (200 mg of EGCG, 37 mg of epigallocatechin, and 31 mg of epicatechin per capsule; Mitsui Norin, Ltd.; Tokyo, Japan); Polyphenon E has been granted investigational new drug (IND) status by the
FDA, with each capsule containing 80-98% total catechins by weight, standardized to EGCG that comprises 50-75% of the substance.

N.B. The structure of epicatechin-3-gallate provided in this publication has been inadvertently misrepresented as identical to that of EGCG.

Thus far, three clinical trials on the role of different forms of green tea on the prevention (n = 1) or treatment (n = 2) of PCa have been published.\textsuperscript{1-3} Two of these trials were conducted in patients with hormone-refractory PCa. The patients were treated with green tea powder (1 g 6 times daily; n = 42) in the study by Jatoi et al\textsuperscript{1} and with capsules of green tea extract (250 mg twice daily; n = 19) in the study by Choan et al.\textsuperscript{2} Both studies showed little to no therapeutic effect, although one patient in the study by Jatoi et al had a significant decrease from baseline in his prostate specific antigen (PSA) level, although this effect was not sustained beyond 2 months. Bettuzzi et al\textsuperscript{3} conducted a randomized clinical trial of the safety and efficacy of green tea in a chemoprevention trial in patients with prostatic intraepithelial neoplasia. Patients received either placebo (n = 30) or 600 mg GTCs (n = 30) daily (three 200-mg capsules); each capsule contained 5.5% epigallocatechin, 12.2% epicatechin, 51.9% EGCG, 6.1% epicatechin-3-gallate (a total of 75.7% GTCs), and <1% caffeine. After 1 year of treatment, 1 patient in the green tea group and 9 patients in the placebo group developed PCa. The total PSA level was not “noticeably” different between the 2 groups of patients. A 2-year follow-up in a subset of these participants showed that the chemopreventive effect of green tea catechins was “long lasting.” The authors conclude that the results of this clinical trial “are encouraging and provide rationale for additional clinical trials evaluating the efficacy of green tea polyphenols as a cancer chemoprevention agent.” A very recent study of the effects of short-term supplementation with the active compounds in green tea (EGCG; Polyphenon E) on serum biomarkers in men with prostate cancer showed a significant reduction in serum levels of PSA, hepatocyte growth factor, and vascular endothelial growth factor and no elevation in liver enzymes.\textsuperscript{4}

According to the authors, it has become evident over time that standardized green tea polyphenols should be used, as opposed to green tea infusions, for interventional purposes to ensure the content of polyphenols being investigated. Evidence collected thus far on the effects of green tea polyphenols on PCa prevention and treatment “suggests that green tea may be a promising agent for PCa chemoprevention and further clinical trials of participants at risk of PCa or early stage PCa are warranted.”

—Brenda Milot, ELS

References

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