Unconventional therapies for cancer: 2. Green tea

Elizabeth Kaegi, MB, ChB, MSc, on behalf of the Task Force on Alternative Therapies of the Canadian Breast Cancer Research Initiative

Education

Éducation

Dr. Kaegi was Director of Medical Affairs and Cancer Control of the National Cancer Institute of Canada and the Canadian Cancer Society, Toronto, Ont., from 1993 to 1996.

The Canadian Breast Cancer Research Initiative does not endorse the use of any particular unconventional therapy. It urges patients to evaluate all evidence carefully and to consult their caregiver in order to make thoughtful and fully informed personal decisions.

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This article continues the series that reviews the evidence for the safety and effectiveness of 6 unconventional therapies commonly used by Canadian cancer patients: Essiac, green tea, Iscador, hydrazine sulfate, vitamins A, C and E, and 714-X. Part 1 (*CMAJ* 1998[7]:897-902) describes the methodology used to obtain and evaluate the available information on the products and provides a summary of the findings on Essiac. Subsequent articles will cover the other products.

Annotated bibliographies that provide more detailed references for the information summarized in this series of articles are available in print from the Canadian Breast Cancer Research Initiative (CBCRI; address appears at end of article). The reference lists and the lay summaries of the findings (published in 1997) can be found on the CBCRI's Web site (**www.breast.cancer.ca**).

The following summary of the information on green tea adapts the lay summaries for clinicians and provides references for the key findings. [Copies of this and other articles in the series will be available on *CMAJ*'s Web site (**www.cma.ca/cmaj/series/therapy.htm**).]

Green tea

What is it?

Each year about 2.5 million tons of tea are manufactured from the dried leaves and leaf buds of the shrub *Camellia sinensis*. Black tea accounts for about 78% of production and is prepared by drying and fermenting the leaves. This tea is most widely drunk in Europe, India and North America. Oolong tea, a specialty tea accounting for 2% of production, is only partly fermented and is popular in southeastern China and Japan. Green tea, which is not fermented, is made by steaming or pan-frying tea leaves and then drying them. It accounts for about 20% of world production and is mostly consumed in China and Japan, where it has been used medicinally as a stimulant and digestive remedy for about 5000 years.[1]

When green tea is taken for medicinal purposes, 5–10 mL of the dried herb is steeped in a cup of boiling water for about 15 minutes. The usual amount taken is 1–3 cups daily, without the addition of milk or sugar. More recently, green tea capsules have been developed for the market, but the clinical benefits of these are unknown.

Safety

No adverse effects have been reported in association with the medicinal use of green tea. However, a cup of tea, black or green, contains 10–80 mg of caffeine depending on the methods used in its production, storage and preparation. Because excess caffeine can cause nervousness, insomnia and irregularities in heart rate, pregnant women, nursing mothers and patients with cardiac problems are usually advised to limit their intake to 2 cups daily.[1,2]

The possible role of tea consumption in causing cancer has been explored by several researchers.[3–6] However, when the International Agency for Research on Cancer (IARC) reviewed the available information in 1989, it found that there was inadequate evidence to conclude that tea drinking presented a carcinogenic risk.[7]

Laboratory and clinical evidence

Much of the research into the effects of green tea has focused on its potential to prevent cancer. There has been far less research into its role in the treatment of cancer.

With respect to prevention, a number of epidemiologic studies have suggested that the regular consumption of tea, particularly green tea, moderately decreases the risk of cancer, especially cancers of the upper digestive tract.[8–10]

There has been some laboratory research into the possible role of green tea in the treatment of cancer. However, no human studies and only limited data from animal studies were identified. In assay systems, the effects of green tea have been contradictory and inconclusive, showing both mutagenic and antimutagenic effects.[4,11–13] However, several murine studies have demonstrated anticarcinogenic effects. For example, extracts of green tea applied to mouse skin have been found to inhibit the development of skin cancer in response to known skin carcinogens.[14] Green tea and green tea extracts given orally or intraperitoneally have been shown to inhibit the growth of transplanted tumours[14–16] and to reduce the incidence of tumours in animals exposed to carcinogenic agents.[11]

A few studies have reported that green tea and green tea extracts reduce the metastatic potential of cancer cells in some animal systems.[17,18] These findings, together with the evidence that green tea extracts suppress chromosomal abnormalities induced by carcinogens,[12] have generated some interest because they suggest that green tea plays a role in delaying the cumulative genetic damage necessary for a cell to evolve from normalcy to one with aggressive metastatic capabilities.

Constituents of green tea

Dried tea leaves are composed mainly of phytochemicals known as polyphenols (36%), principally flavonols (including catechins), flavonoids and flavondiols.[9,19] The leaves also contain plant alkaloids (about 4%), including caffeine, theobromine and theophylline. Other constituents include proteins, carbohydrates, phenolic acids, minerals (including fluoride and aluminum) and fibre. Like most herbs, the precise composition of green tea varies with the geographic origin of the leaf, the time of harvest and the manufacturing process. The constituents of black tea differ from those of green tea: oxidation and fermentation of black tea alter the catechins and lower the concentration of polyphenols.

Research suggests that it is the polyphenols in green tea that are responsible for its chemopreventive effect.[19–21] Some animal studies have also shown that extracts of tea catechins injected intraperitoneally cause implanted breast and prostatic tumours to decrease in size.[22] With respect to anticarcinogenic activity, the catechin in green tea that has generated the most interest is a potent, naturally occuring antioxidant, epigallocatechin gallate (EGCG). The mechanism of action of EGCG and other similar substances is uncertain, but they may function in several ways: by acting as antioxidants, by inhibiting enzymes involved in cell replication and DNA synthesis, by interfering with cell-to-cell adhesion, or by inhibiting some of the intracellular communication pathways required for cell division.[16,20,21,23–28]

Conclusion

Moderate consumption of green tea appears safe. There is some evidence that green tea may prevent the occurrence of some forms of cancer, but the mechanisms of action of its specific constituents are poorly understood. Preliminary evidence exists of the potential effectiveness of green tea as a treatment of cancer. Further research into the effects of green tea and some of its constituents would be worthwhile.

This article reports some of the work carried out by the Task Force on Alternative Therapies of the Canadian Breast Cancer Research Initiative (CBCRI). The CBCRI is the main funder of breast cancer research in Canada and was established in 1993 as a consortium of the Canadian Cancer Society (CCS), the National Cancer Institute of Canada (NCIC) — which also serves as the administrative home of the CBCRI — and the federal government (through the participation of the Medical Research Council of Canada and the National Health Research and Development Programme). In addition to the author, a number of other CBCRI staff worked on the project, including Dr. Carmen Tamayo (research associate), Ms. Rebecca McDonald and Ms. Jess Merber. Others contributed to the reviews of specific agents. The task force was chaired by Ms. Donna Cappon. Dr. Kaegi was the Director of Medical Affairs and Cancer Control for the CCS and the NCIC and staff partner with the task force.

Iscador will be the topic of the next article in the series, to appear in the May 5 issue.

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Peer-reviewed journals dealing with unconventional therapies:

Alternative Therapies in Health and Medicine

The Journal of Alternative and Complementary Medicine

Reprint requests to: *Dr. Marilyn Schneider, Director of Research, Canadian Breast Cancer Research Initiative, 200–10 Alcorn Ave., Toronto ON M4V 3B1; tel 416 961-7223; fax 416 961-4189*