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**REPORT****Can Green Tea Protect Against Prostate Cancer?**

By Coulson K. Duerksen



In recent years, a growing body of research has established the many health-promoting benefits of green tea, which may include protection against coronary heart disease, stroke, osteoporosis, infections, and other conditions.<sup>1</sup>

Laboratory and epidemiological studies suggest that this long-valued beverage may help prevent and manage certain cancers. Last year, for example, an article published in the prestigious British medical journal *The Lancet* (and reprinted in the January 2005 issue of *Life Extension*) noted that a review of green tea's effects on human leukemia cells "provides a strong scientific basis for the chemopreventive property of green tea that has been inferred from several epidemiological studies."<sup>2</sup>

According to *The Lancet* article, "the importance of nutraceuticals in cancer prevention and treatment remains largely under-exploited despite increasing evidence showing that these molecules have chemopreventive and chemotherapeutic ability . . . Green tea and other diet-derived

compounds . . . offer several advantages as anti-cancer products, because these compounds are non-toxic, produce few side effects, are widely available, and are cheap."<sup>2</sup>

Despite mounting evidence of green tea's cancer-preventive effects published in prestigious medical journals, the FDA recently denied a petition that would have allowed companies that make green tea products to include a health claim on their product labels. The proposed health claim would have advised consumers that green tea, when ingested at certain levels, helps fight cancer. While the petitioner cited 135 studies in support of the proposed health claim, the FDA's "systematic review" considered only certain human studies while ignoring the other evidence.



In a statement released on June 30, 2005, Michael Landa, deputy director for regulation at the FDA Center for Food Safety and Applied Nutrition, wrote that the current scientific evidence from human studies does not support the proposed health claim for green tea. He explained that while some studies showed that green tea decreased risk for breast and prostate cancers, others did not.<sup>3</sup>

According to Landa, "Two studies do not show that drinking green tea reduces the risk of breast cancer in women, but one weaker, more limited study suggests that drinking green tea may reduce this risk. Based on these studies, FDA concludes that it is highly unlikely that green tea reduces the risk of breast cancer." Landa also wrote, "One weak

and limited study does not show that drinking green tea reduces the risk of prostate cancer, but another weak and limited study suggests that drinking green tea may reduce this risk. Based on these studies, FDA concluded that it is highly unlikely that green tea reduces the risk of prostate cancer."<sup>3</sup> Landa also noted that the FDA excluded from its review some Japanese research on stomach cancer because dietary salt intake in Japan differs from that in the US.

In short, the FDA concluded that the existing evidence does not support a qualified health claim associating green tea consumption with a reduced risk of breast, prostate, or any other type of cancer. The agency stated that it will evaluate any new evidence that becomes available to determine whether to change its decision.

**ITALIAN STUDY CONTRADICTS FDA POSITION**

Contrary to the FDA's claims, a breakthrough clinical trial in Italy study found that green tea indeed is effective in preventing prostate cancer in men at high risk for developing the disease.<sup>4</sup> Led by Salverio Bettuzzi, PhD, a team comprising researchers from two Italian universities demonstrated that green tea catechins were 90% effective in preventing prostate cancer in men with pre-malignant lesions.<sup>4</sup>

Prostate cancer is the second most commonly diagnosed cancer in men after non-melanoma skin cancer.<sup>5</sup> According to the American Cancer Society, more than 232,000 new cases of prostate cancer will be diagnosed this year in the United States alone. While often slow to develop, prostate cancer can be lethal—more than 30,000 US men will die from the disease this year.

Laboratory research has long shown that green tea catechins, including epigallocatechin-3 gallate (EGCG), inhibit cancer cell growth. However, results from the new Italian study—which were presented at the 96th annual meeting of the American Association for Cancer Research in April 2005—demonstrate that green tea can prevent prostate cancer in men with pre-cancerous lesions.<sup>4</sup> Men at risk for prostate cancer should thus give serious thought to adding green tea or green tea supplements to their diets.

Bettuzzi and his colleagues recruited 62 men, aged 45-75, with high-grade prostatic intraepithelial neoplasia, a pre-malignant condition that leads to prostate cancer within one year in nearly one third of all cases. Excluded from the study were vegetarians, consumers of green tea or green tea products, and men who had used antioxidants or anti-androgenic therapies.<sup>4</sup>

Thirty-two subjects received 200 mg of green tea catechins (50% EGCG) three times daily, while the other 30 men received a placebo. Biopsies were conducted at six months and one year later. Remarkably, only one man in the treatment group was diagnosed with prostate cancer, compared to nine men in the control group who developed the disease. No side effects or adverse reactions were reported in the subjects who received the green tea catechins.<sup>4</sup>

“A projection of our data suggested that up to 90% of chemoprevention efficacy could be obtained by [green tea catechin] administration in men prone to developing prostate cancer, such as the elderly, African-Americans, and those with a family history of prostate cancer,” Dr. Bettuzzi noted. He and his team will follow the study’s participants for five years, and they hope to conduct a larger confirmatory trial in the future.

## POSSIBLE MECHANISMS OF ACTION

While green tea contains numerous potential cancer-fighting compounds, studies suggest that its anti-cancer activity is primarily associated with the catechin known as EGCG. With a chemical structure similar to substances found in red wine and vegetables such as broccoli, EGCG’s superior bioavailability (or ability to be absorbed into the body) may account for its effectiveness. As to how green tea prevents cancer, the research to date indicates that green tea has several chemopreventive mechanisms of action:

- *Promoting cancer cell apoptosis.* Bettuzzi and his colleagues found that EGCG specifically targeted prostate cancer cells for programmed cell death, or apoptosis, without damaging the benign controls. Clusterin, the most important gene involved in apoptosis, might be a mediator for catechin action, according to the researchers. Previous laboratory studies have shown that apoptosis prevents metastasis, while tumor promoters often inhibit apoptosis.<sup>6</sup> Thus, if EGCG induces apoptosis specifically in cancer cells, it may be very useful in the management and therapy of metastatic cancer.
- *Inhibiting 5-alpha reductase and DHT.* Other studies of green tea have shown that EGCG and epicatechin-3 gallate, known as ECG, are effective in inhibiting the enzyme 5-alpha reductase type 1, thus reducing the synthesis of dihydrotestosterone (DHT), a potent form of testosterone implicated in contributing to prostate enlargement and cancer.<sup>7</sup>
- *Preventing angiogenesis.* In order to grow, tumors must have an adequate blood supply provided by local blood vessels. Numerous studies show that green tea catechins, particularly EGCG, block the development of new blood vessels, a process known as angiogenesis.<sup>8</sup> If green tea prevents angiogenesis in human tumors, then it would explain why green tea seems to be effective in preventing so many different types of cancer.
- *Inhibiting enzymes.* In-vitro data show that in human cell lines, EGCG and ECG may inhibit enzymes that are associated with an elevated risk of colon cancer, one of the most prevalent cancers in both men and women.<sup>9</sup> In a Japanese study, researchers found that green tea catechins inhibited secretion of collagenase enzymes by highly metastatic lung cancer tumor cells. Collagenase enzymes may be involved in tumor cell invasion and metastasis.<sup>10</sup>
- *Antioxidant activity.* Green tea’s antioxidant activity may help prevent cancer by impeding oxidative damage and scavenging free radicals.<sup>11</sup> This mechanism of action is not fully known, as the green tea polyphenols may act

## REASONS TO INCLUDE GREEN TEA IN YOUR WELLNESS PROGRAM

Among other benefits, green tea:

- 1. Contains antioxidants.** Antioxidants may help protect your body from the effects of aging and pollution.<sup>1</sup>
- 2. Has less caffeine than coffee.** An eight-ounce cup of coffee contains about 135 mg of caffeine, while tea contains only 30-40 mg per cup.
- 3. May reduce your risk of heart attack and stroke.** Drinking green tea may help promote cardiovascular and cerebrovascular health.<sup>1</sup>
- 4. Protects your bones.** Tea drinkers appear to have a reduced risk for osteoporosis.<sup>1</sup>
- 5. Gives you a sweet smile.** Tea contains tannins that may help fight plaque.<sup>28</sup>
- 6. Boosts your immune system.** Drinking tea may reduce the risk of bacterial and viral infections.<sup>1</sup>
- 7. Supports your metabolism.** Green tea may support weight-loss efforts and promote healthy body weight.<sup>29</sup>



synergistically with other constituents of the plant.

- *Binding Heat Shock Protein 90.* Researchers from the University of Rochester in New York recently reported that EGCG from green tea targets a protein known as heat shock protein 90, which is present in higher levels in cancer cells than in normal cells.<sup>12</sup> Heat shock proteins enable some cancer cells to survive even in the face of toxic radiation and chemotherapy. By binding with heat shock protein 90, EGCG may help thwart cancer cell growth and survival.

Other research suggests that green tea catechins may also work by suppressing the formation of heterocyclic amines (toxic compounds created during the grilling of food),<sup>13</sup> supporting liver pathways and enzymes that detoxify undesirable compounds,<sup>14,15</sup> and behaving like methotrexate, a drug used to treat cancers of the breast, lungs, blood, bone, lymphatic system, and uterus.<sup>16</sup>

## REPORT

### Can Green Tea Protect Against Prostate Cancer?

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#### GREEN TEA AND CANCER PREVENTION

Numerous animal and human cell studies suggest that green tea catechins may act as powerful inhibitors of cancer,<sup>17,18</sup> particularly colon, rectal, and prostate cancers,<sup>19,20</sup> as well as cancers of the lung, stomach, and kidney.<sup>21</sup> Green tea catechins appear to be effective chemopreventive agents against a variety of carcinogens.

In addition to laboratory studies, population studies tracking the health of large groups of people who drink tea in abundance demonstrate the cancer-preventive benefits of green tea. Population studies have found reduced cancer rates in Asian countries where green tea is a

dietary staple.<sup>22,23</sup> In one Asian study, tea drinkers were about half as likely to develop stomach or esophageal cancer as men who drank little tea, even after adjusting for smoking and other health and dietary factors<sup>24</sup> Japanese men, who commonly drink four to six cups of green tea daily, also have significantly lower rates of cancer incidence and mortality than Westerners.<sup>18,25</sup>

It has long been noted that the lung cancer rate in Japan is one of the lowest in the world, despite that nation's high rate of smoking. Data from a case-controlled study conducted in Okinawa, Japan, from 1988 to 1991 showed that the greater the intake of Okinawa tea (a partially fermented tea), the smaller the risk of squamous cell lung cancer, particularly in women.<sup>26</sup> These findings suggest that tea consumption has a protective effect against lung cancer in humans.

Another interesting fact relating to green tea consumption is that the cancer mortality rate in Shizuoka Prefecture, located in central Japan, is much lower than the Japanese average. As it turns out, green tea intake is even more habitual in the Shizuoka Prefecture than in other areas of Japan.<sup>27</sup>

#### CONCLUSION

FDA regulators believe the evidence that green tea prevents cancer is insufficient to merit a limited health claim, and that, based on the "limited" research available, green tea is highly unlikely to reduce the risk of prostate or any other type of cancer.

Given the limited information available concerning the biological processes that lead to the development of prostate cancer, it is wise to examine all possible prevention strategies. While a larger, confirmatory study is needed, the Bettuzzi study shows that green tea catechins may be an excellent prophylactic agent against prostate cancer in men at high risk for the disease.<sup>4</sup>

Most modern medicines used to treat cancer have serious side effects, high costs, and other associated risks. Green tea, on the other hand, is safe and widely available as a beverage and a nutritional supplement. Furthermore, growing scientific evidence suggests that green tea is effective in preventing many diseases associated with aging, including prostate and other cancers.

#### FACTS ABOUT TEA

- All teas (green, black, and oolong) are derived from the same plant, *Camellia sinensis*. They differ in how the plucked leaves are prepared.
- Unlike black and oolong tea, green tea is not fermented, so the active constituents remain unaltered in the herb.
- Green tea contains abundant antioxidants and may be as important as fruits and vegetables to your daily nutritional intake.<sup>30</sup>
- To get an adequate amount of tea polyphenols, you may need 3-10 cups of green tea daily or 300-1200 mg of green tea extract in capsule form.

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