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Dietary Supplement Assignment

NFS 330 – Integrative and Functional Nutrition

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GREEN TEA

Next to water, tea is one of the most consumed drinks globally.[3,5] In 2019, a consumer survey was done by the CRN Consumer Survey on Dietary Supplements, which showed that green tea is among the top ten most popular supplements among U.S. adults.[9] In November 2020, a Consumer Lab Vitamin and Supplement Users Survey ranked green tea as one of the top 20 of 169 supplements reported in the Dietary Supplement Consumer Trends and Preferences.[10] There are several varieties of tea, such as green, white, black, and oolong, all of which come from the *Camellia sinensis* plant. Each type is unique in how it is made. [1,5] Green tea is made from mature, unwilted leaves and is neither oxidized nor fermented. [1,5] Once harvested, it is steamed, slightly dried, wilted, and then pan-fried to stop oxidation. [1,5] Green tea is extracted and consumed in many forms, such as brewed tea, liquid extracts, capsules, pills, and powder. [1,5] This paper will focus on green tea's health-promoting polyphenolic compound, catechin "EGCG," and evaluate the claim of its antioxidant and anti-inflammatory properties and its effect on the body. [7,9]

Since ancient times, *Camellia sinensis* has been used for medicinal purposes and contains many ingredients such as polyphenols (especially catechins), amino acids (including L-theanine), enzymes, linoleic acid, chlorophyll, organic compounds (fluoride, aluminum, minerals), and trace minerals (iron, calcium, magnesium, chromium, manganese, copper, zinc).[13] Furthermore, it contains antioxidants (caffeine, quercetin, theobromine, theophylline) and anti-inflammatory compounds.[1,5] Green tea is the highest among other teas in its antioxidant flavonoids, and when

brewed, it is highest in polyphenol concentration.[5] The healthy compounds in green tea are called "catechins." These catechins are known as epigallocatechin (EGC), epicatechin-3-gallate (ECG), epicatechin (EC), and epigallocatechin-3-gallate (EGCG), with EGCG being the highest in content. [2,5]

Green tea has many potential health benefits: digestion, brain function, mental alertness, weight loss, bone density, immunity, high cholesterol, atherosclerosis, blood pressure, stroke, and type II diabetes.[24] It may help protect against, reduce, or slow the risk of CVD, cancer, and many chronic diseases.[1] Green tea also positively influences gut bacteria, reduces inflammation, and is linked to preventing Alzheimer's and Parkinson's disease and treating genital warts and bad breath.[4,5,6] Although a lot of green tea dietary supplements are on the market, catechin and caffeine content vary.[5] The L-theanine in green tea is a water-soluble amino acid that may affect the brain by increasing dopamine, serotonin, and GABA levels.[6] While green tea contains caffeine, its content is less than black tea, matcha, and coffee.[4] This lower level of caffeine, along with L-theanine, brings about a relaxed but alert state of mind.[6]

EGCG is the most researched and potent catechin among the other catechins and has antioxidant power 25-100 times more effective than both vitamin C and E.[9,11] Catechins are a phenol and antioxidant that protect natural stimulants in the body.[1,5] Diluted tea, decaffeinated tea, or tea with additives such as milk reduces the amount of these catechins.[5] Of all the threats our body faces, chronic inflammation is one of the most destructive.[7,8,9] Inflammation is viewed as a leading indicator of diseases.[9] It can result from different factors, including age, stress, obesity, environmental factors, genetics, or lack of exercise and sleep.[9] EGCG studies have shown its ability in metal chelation, radical scavenging properties, and inhibiting inflammation by reducing pro-inflammatory cytokine production and oxidative stress.[9] Extensive scientific

research and human studies were conducted about EGCG and its strong potential in antioxidant capacity and have shown a significant role in reducing inflammation by protecting cells from damage.[8,11,14] The most scientific results were obtained from the EGCG in green tea extracts.[9,10,11,12,13,14,15,16,17,18,19,20] Yet, more research is warranted to expand our knowledge on the effectiveness and bioavailability of green tea's impressive polyphenol EGCG. [9,10,11,12,13]

After reviewing and evaluating several peer-reviewed articles conducted in the last three years, I found that green tea, specifically the ingredient phenol – EGCG, was studied most extensively.[9,10,11,12,13,14,15,16,17,18,19,20] These current studies and several others I researched have supported its numerous health benefits on the human body.[13,17,19] In recent years, green tea has gained popularity globally due to the potential benefits of polyphenol content.[13] In the last couple of years, it has been a topic of research and in the media for its possible benefits in treating or reducing symptoms of SARS-CoV-2 (COVID-19) due to EGCG's antiviral properties.[12,13,15,16] One recent study stated that green tea contains strong anti-inflammatory properties which may inhibit inflammation associated with the COVID-19 virus and potentially ease symptoms.[12,15,16] During the pandemic, natural remedies such as green tea extracts have amplified EGCG's research and identified it as an alternative to NSAIDs for reducing inflammation.[16] Other trends and marketing campaigns were geared towards the notoriety of green tea and green tea extracts (GTEs) anti-inflammatory benefits with cosmetics, lotions, eye creams, face masks and peel masks.[16] Outcomes from a study conducted in 2019 showed results in vasoconstriction from the tea plant and a noticeable reduction of swelling around the eyes.[11] The facial masks contained mainly green tea extracts, which soothed inflammation and closed skin pores.[11]

The inflammatory response in the body under extreme and persistent circumstances may become chronic, thus having a possible effect on the progression of various inflammatory diseases such as cancer, diabetes, respiratory disorders, CVD, and metabolic syndrome.[24] Throughout the studies, a constant theme in the research supported similar outcomes of benefits to anti-inflammatory effects with the supplementation of polyphenol EGCG found in green tea.[16] Moreover, additional studies looked at the roles of catechins in the regulation of systemic inflammation, cultural and lifestyle practices related to low inflammatory physiology in Japanese adults, and the anti-inflammatory effects of green tea extracts (GTE) in eye diseases.[18,19,20] Evidence supporting these claims was scientific and widely demonstrated in experimental models varying between in vivo and in vitro with animal and human trials done.[9,10,11,12,13] These results were significant and applicable to the general population.[9,10,11,12,13]

Scientists must look at any possible side effects or adverse outcomes with the consumption of any dietary supplement. One example is how green tea may inhibit iron bioavailability from the diet.[21,22] This effect may be necessary for people who suffer from iron-deficiency anemia.[3,5] Some experts find that the correct dose can be misleading and problematic due to EGCG degrading when it reaches the large intestine.[21] Increased amounts of ECGC increased blood levels of transaminases and were correlated as an indicator of liver damage.[21,23] Several other possible side effects must be considered when optimizing EGCG.[22,23] Other studies discussed the potential adverse side effects of serum albumin levels, hypoglycemic activity, and kidney failure.[21] Of all the possible adverse effects mentioned, the hepatotoxicity of GTEs stood out as the most significant concern when consuming large EGCG intake amounts from 140mg to ~ 1000mg/day.[21,22,23] One possible concern is the contamination of herbicides and pesticides depending on where it is grown and manufactured.[21] The National Center for Complementary

and Integrative Health said that “although many studies have been done on green tea and its extracts, definitive conclusions cannot yet be reached on whether it is helpful for most of the purposes for which it is used.”[1]

Based on the research and supporting scientific evidence that green tea possesses, I have been drinking tea for several years and recently switched to green tea after learning about its numerous health benefits. I also started enjoying matcha in a latte and using it in recipes. As far as green tea extracts, I would like to investigate them more extensively to determine dosage recommendations, effectiveness, and possible adverse side effects and compare green tea extracts vs. green tea/matcha. Suppose a client had a condition such as an inflammatory issue or just wanted suggestions on a healthier alternative for a caffeinated drink other than coffee, soda, sweetened beverages, or energy drinks. In that case, one recommendation I would suggest is green tea or matcha. Everyone has their unique health history, body chemistry, or possible drug contraindication that needs to be considered before providing any advice for nutrition therapy. Hence, I would want to do an ABCD nutrition assessment before making recommendations.

It is recommended that antioxidants are best when acquired from food sources rather than ingesting them as supplements.[2] Scientific research suggests that consuming green tea is safe when consumed in amounts of up to eight cups per day.[1] When having only 2-3 cups of green tea per day, useful markers were seen.[1,2,3,5,14] More research is needed to understand better the characteristics of EGCG in green tea, the impact of increased consumption, and how it is used to prevent or treat inflammatory diseases or conditions.[24] With the support of ongoing scientific research, green tea continues to be studied for its valuable content and positive effects on the human body.[24]

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