ABSTRACT
Coffee and tea are the most consumed drinks in the world. Coffee has health effects with caffeine, diterpene alcohols and chlorogenic acid while tea with polyphenolic compounds. Although epidemiological studies have shown that coffee and tea consumption potentially adversely affects health, recent studies have shown that it is effective in reducing the risk of some chronic diseases, especially cancer. The anticarcinogenic effects of coffee and tea have been found to be due to mechanisms such as reducing inflammation with antioxidant properties, taking part in the repair of DNA damage and modulating the immune process. However, there are few studies examining the relationship between cancer, tea and coffee, and the fact that these studies have been performed with different types of cancer leads to different results.

Keywords: Adverse effects, anticarcinogenic effects, coffee.

COFFEE
Coffee, one of the most widely consumed drinks in the world, is obtained by roasting and brewing coffee beans. Coffee is a complex beverage containing more than a thousand active compounds, including caffeine (a strong central nervous system stimulant and bronchodilator), diterpene alcohols (serum cholesterol stimulant) and chlorogenic acid. [1]

CAFFEINE
Caffeine (1, 3, 7-trimethylxanthine) is the most sought-after substance in coffee compounds, an alkaloid found naturally in coffee beans. The half-life of caffeine is about 4-6 hours. [2] Caffeine is rapidly absorbed in the digestive tract after digestion. After 90 minutes of caffeine consumption, serum caffeine concentration reaches the highest value. Caffeine is metabolized by the liver cytochrome P450 1A2 (CYP1A2) enzyme, and the difference in caffeine response of individuals is based on genetic polymorphism in the CYP1A2 gene. [3]

The amount of caffeine in coffee; type of coffee, the degree of roasting, cooking method can vary. A standard cup of coffee is thought to contain 100 mg of caffeine. It was found that the amount of caffeine in 240 mL brewed 14 different coffees taken from coffee selling places in the USA varied between 72-130 mg. [4] It was observed that the caffeine content in the same type 240 ml coffee purchased from the same store on 6 different days ranged from 130-282 mg. [5] Although coffee production is carried out to certain standards, the caffeine content of coffees may vary. [6] The average daily caffeine intake in the USA was found to be 106-170 mg. [6] According to the Canadian Chemical Safety Bureau, daily caffeine intake should be limited to 400-450 mg. [7] Although it causes a moderate addiction, caffeine is generally included in the reliable component (GRAS) by the Food and Food Association (FDA). [8]

DITERPENE ALCOHOLS
Other compounds expressed as diterpene alcohols in coffee are cafestol and kahweol. These compounds, which are thought to be the main cholesterol-increasing factors in coffee, were found to be higher in boiled coffee types (such as Turkish coffee or Scandinavian coffee) than those consumed by pouring them into hot water. [9] In a meta-analysis...
where the effect of coffee consumption on serum cholesterol concentration was investigated, it was found that boiled coffee consumption increased LDL and total cholesterol levels in serum compared to filter coffee consumption depending on the amount.[10]

**CHLOROGENIC ACID**

Chlorogenic acid, which forms antioxidant properties in coffee, is the most important polyphenol in coffee.[11] In addition to its antioxidant properties, it exhibits antibacterial and anticarcinogenic effects.[12,13] A single serving of coffee contains between 20 and 675 mg of chlorogenic acid, depending on the time of roasting and the amount consumed.[14]

**COFFEE AND CANCER**

Cancer develops as a result of hereditary and/or individual factors along with environmental factors, and the incidence of the disease increases significantly with age. The environmental determinants of cancer risk are diet, alcohol consumption, physical activity, obesity and stress.[15] Experimental data show that coffee can potentially interfere with and/or have adverse effects on many steps in the cancer process.[16]

The protective effect of coffee in cancer is expressed by its antioxidant properties, mechanisms involved in DNA damage repair, modulating the immune process and reducing inflammation.[15-18] There are studies suggesting that coffee is protective against cancer, as well as studies advocating that it has no cancer-related effects.[2,17-20]

In a 2007 report of a study by the World Cancer Research Fund (WCRF), there was an insignificant inverse relationship between a cup of coffee consumed once a day and the risk of breast cancer, while in some subtypes of breast cancer (type 1 mutation) in postmenopausal women, this relationship has been shown to be negatively significant in those treated with tamoxifen.[21-23]

Shimazu et al.[24] showed that 90,000 female and male Japanese individuals followed for 10 years had 76% less risk of hepatocellular carcinoma than those who consumed 5 cups or more of coffee per day than those who did not consume coffee. Recent data show that caffeinated coffee consumption is necessary to see these beneficial effects.[25]

Another possible health benefit of coffee is that it reduces the risk of endometrial cancer. In a case control study, it was found that those who consume 1-2 cups of coffee per day and those who consume 3 cups or more of coffee per day are less at risk.[3]

In the case-control studies evaluating the relationship between colorectal cancer risk and coffee consumption, no linear relationship was found regarding the reduction of colorectal cancer risk in those consuming more than 4 cups of coffee per day and in cohort-type studies consuming 5 cups of coffee per day.[26]

One of the most discussed types of cancer related to the relationship between coffee and cancer is pancreatic cancer. In a meta-analysis study in which 20 cohort-type studies were evaluated by Ran et al.,[27] high coffee consumption may be associated with decreased pancreatic cancer risk. In a prospective study investigating the effect of coffee consumption on pancreatic cancer, no association was found between caffeine, decaffeinated or total coffee consumption and the risk of pancreatic cancer.[28]

**TEA**

Tea, produced by processing the leaves of Camellia sinensis, is the most widely used beverage after water worldwide. It is a rich source of pharmacologically active molecules consumed to provide various health benefits. The three main tea forms are green, black and oolong tea, depending on the degree of fermentation.[29]

The composition of tea varies according to species, seasons, leaves, climate and horticultural practices.[29] A glass of green tea usually contains 250-350 mg of solids; 30-42% of it is catechins and 3-6% is caffeine.[30] Polyphenols are the main active compounds found in teas. Catechins are the main polyphenolic compounds in green tea.[29] Some of these are catechins such as epigallocatechin-3-gallate (EGCG), epigallocatechin (EGC), epicatechin-3-gallate (ECG) and epicatechin (EC). These polyphenols are found in green tea at much higher concentrations than black or oolong tea and these polyphenols are responsible for the antioxidant properties of tea.[31,32] Among them, EGCG is the most effective and constitutes 50-75% of catechins.[30] Most of the protective/therapeutic effect of green tea against various types of cancer occurs with EGCG.[33]

EGCG has been shown to be potent chemoinhibiting agents in *in vitro* and *in vivo* animal models.[34] It has been found that EGCG acts by
suppressing blood vessel formation (angiogenesis) and regulating its permeability and thus interrupting the feeding of cancerous cells.\textsuperscript{[35,36]}

**Possible Anticarcinogenic Effects of Camellia Sinensis**

Green tea polyphenols inhibit cell proliferation and show a strong antioxidant activity.\textsuperscript{[37,38]} Polyphenols, especially EGCG, have been found to exhibit antioxidant activity in various mouse organs and thus increase the overall chemoprotective effect of antioxidants in these organs.\textsuperscript{[39]} Polyphenols, especially catechins, can enhance the communication between cells and thus protect cells from tumor development.\textsuperscript{[40]} Experimental studies state that the effects of green tea compounds are by a mechanism that can inhibit tumor growth by closing receptors in the affected cells.\textsuperscript{[41]} Another possible mechanism suggests that EGCG may facilitate direct binding to certain carcinogens.\textsuperscript{[42]} Polyphenols, skin, lung, oral cavity, esophagus, anterior abdomen, stomach, small intestine, colon, liver, pancreas, ovaries and mammary glands, including various organs have been found to help inhibit tumor formation.\textsuperscript{[43-47]} Green tea polyphenols have been shown to induce apoptosis in human lymphoid leukemia cells\textsuperscript{[48]} and human prostate cancer cells.\textsuperscript{[49]}

Despite the increasing number of studies revealing the important role of polyphenols as antioxidants with anticarcinogenic properties, the effects of green tea are not yet fully understood.\textsuperscript{[50]}

**Declaration of conflicting interests**

The author declared no conflicts of interest with respect to the authorship and/or publication of this article.

**Funding**

The author received no financial support for the research and/or authorship of this article.

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