

## Role of Green Tea in the Prevention of Cancer

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**Abstract:** There are a lot of epidemiological pieces of evidence that natural fruits and vegetables and certain plant-based derived beverages are potent and rich in natural Polyphenols. the clinical studies carried out by Scientists.Green Tea is the common name given to the plant *Camellia sinensis*, which has shown to have important role in cancer prevention. In this article, we focus on the anti-cancer properties of Green Tea.

**Keywords:** Green tea, Catechin, Polyphenol, EGCG, Anticancer potential

### Introduction:

#### Green tea

Green Tea is the common name given to the plant *Camellia sinensis*. The dried sun pressed leaves and buds help make several teas, such as black and oolong teas.Green tea is made by using the processes such as steaming and frying

the leaves of *Camellia sinensis*. The steamed or the pan dried leaves are then sun-dried to use for further purposes. As methods like pan-frying and steaming are used, green tea can maintain its high potency without getting any nutrients harmed. It is neither fermented. The amazing properties and the strength of green tea remain viable for a long time without getting bad.

Green tea has a potent molecule named Polyphenol, which is found in large quantities. Polyphenols are compounds with aromatic rings and hydroxyl groups as their functional groups and are also antioxidants.The cell damage that occurs within the cell can be treated using Polyphenols.

#### Polyphenols in Green tea

With the number of cancer cases increasing every day globally and estimated to touch 25 million in the next ten years, there have been

many studies carried out in laboratories around the world to study the effect of anticancer compounds occurring naturally or chemically.

The natural anticancer compounds present in fruits, vegetables and beverages have been studied extensively to list their potency. Fruits and vegetables have many flavonoids present in them that can be potent to some extent.

Scientists worldwide have also been carrying out experiments on the Polyphenols present in green tea and know their efficacy.

#### **Natural Polyphenols are derived from secondary metabolites of plants**

A vast number of studies have reported that the natural polyphenols such as anthocyanins found in blueberries, epigallocatechin gallate (EGCG) resveratrol found in red wine, and isoflavones from soy have high anticancer efficacy.

Their efficacy has been linked to the property of being antioxidants and anti-inflammatory. They can modulate and target molecules and their signal pathways.

This special property can help in the survival of the cell, cell repairing, enzymatic activity of the cells, and detoxification of the body. They can also stop metastasis, i.e., the multiplication of cancer cells which is the most dreadful property of cancerous cells. Polyphenols also interact with oncogenes and oncoproteins, and the

enzymes associated with the multiplication of the tumour cells.

Therefore, these compounds are in high demand in the pharmaceutical industries, and they are using these plant-based derivatives due to their potency and all-natural properties.

#### **Different studies carried out in various countries around the world**

Globally, due to the increasing cancer rate and the charm of natural products being on the top, several studies were carried out in different countries.

In the studies carried out in Canada, a high intake of flavonoids obtained from fruits and vegetables effectively reduced the risk of lung cancer.

The studies were carried out in Korea on women, who had a daily routine of including flavonoids. Example flavones anthocyanidins was found to reduce the risk of gastric cancer in them. As Koreans are known for their fitness, their diet is highly beneficial in combatting the problem of gastriccancers.

In US, a study was carried out to check the effectiveness of flavonoids. However, no significant evidence was found to support the theory. But the Scientists found that instead of Flavonoids showing efficiency in gastric cancer, polyphenols such as isoflavone helped eliminate colorectal cancer.

In Spain, similar results were obtained. Certain special flavonoids and lignin had a significant effect on decreasing Colorectal Cancer.

### **The epidemiological studies**

The European Prospective Investigation carried out by the European Cancer Study Group found out that in the case of Hepatocellular Carcinoma (HCC), a high intake of certain flavonoids, not all the types of flavonoids could decrease the risk of Hepatocellular Carcinoma. A case study on breast cancer was also carried out in accordance with the same. A high intake of flavonols and flavones reduces the risk of Breast Cancer.

In Asian Women, a certain study carried out by the scientists suggested that in women of the premenopausal category, the intake of flavonoids was higher. Still, in western countries, due to low consumption of flavonoids, the risk of cancer was more.

Data collected from the Netherlands showed that the intake of flavonoids is also essential in reducing the advanced or non-advanced stage of prostate cancer in men. An interesting data collected from the study suggested that isoflavones and proanthocyanidins, on the other hand, increased the risk of prostate cancer.

Following Research Paper was published supporting the use of Green Tea in the prevention of Cancer.

In the epidemiological studies that suggested the potency of flavonoids revealed that a diet full of fruits and vegetables could reduce the effect and risk of certain cancers.

This was attributed to the antioxidants and anti-inflammatory properties of the flavonoids and their interaction with the oncogenes and oncoproteins.

### **Polyphenols in the treatment of Cancer:**

The laboratory studies carried out in this prospect revealed the properties of the following polyphenols in the treatment of Cancer:

#### **Anthocyanins:**

Anthocyanins are found in plants extensively. Anthocyanidin types, namely delphinidin, peonidin, petunidin, malvidin, pelargonidin etc., are found in the plants.

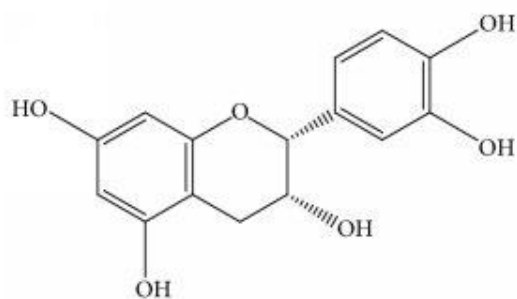
Among the different types of Anthocyanins, it was found that delphinidin possessed high anticancer properties.

Two anthocyanins extracted from the black rice variety, namely peonidin 3 glucosides and cyaniding 3 glucosides, could help decrease the proliferation of cells and growth of tumours in breast cancer HER2 type.

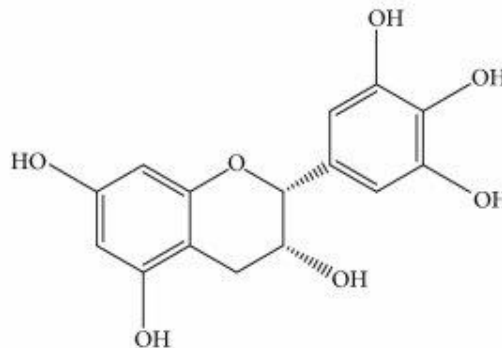
**Peonidin 3 glucoside** help in suppressing the metastasis of the cancerous cells of the lungs by

regulating the MMP (Matrix Metalloproteinase).

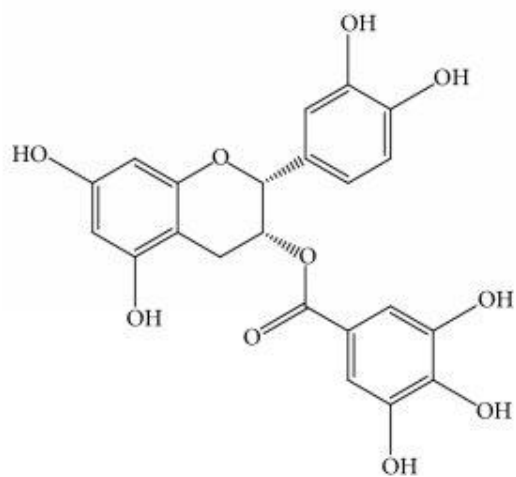
**Cyanidin 3-O** helps suppress the breast cells and their invasion in the body.



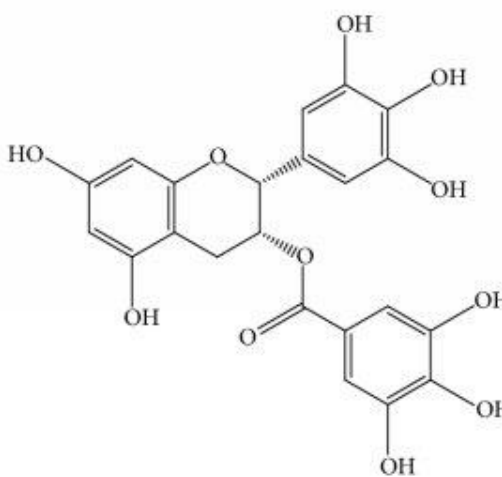
Epicatechin



Epigallocatechin



Epicatechin-3-gallate



Epigallocatechin-3-gallate

**Fig.** Active constituents of Green Tea

### EGCG in Green Tea

The main prime leading reason for lung cancer is smoking. The EGCG was found to be more potent in the treatment of lung cancer.

Treatment of a cancer patient who has lung cancer showed the suppression of the nicotine-induced migration of the cancerous cells of the lungs as well as in the prevention of the invasion of the cancerous cells of type A549

type. These effects were observed in the mice as well as in vitro. The epithelial-mesenchymal transition and angiogenesis were also reduced. The variation of the risk deduction was recorded at various doses of EGCG. At a concentration of 5-20 micrograms, the effect was observed in CL1-5 type of cancerous cells in the lungs. It showed effective suppression of the expression named MM2. At a higher concentration, i.e., above 20 micrograms, it was observed that it stopped the proliferation activities of the cells by inducing the arrest of the G2 or M cycle, but apoptosis was not inhibited.

Another study was carried out for Gastric Cancer as it is the second major leading type of cancer globally, where EGCG at a concentration level above 20 micrograms helped induce apoptosis by inhibiting the survivin, an antiapoptotic protein found in gastric cells.

Several signaling pathways were observed to be affected by the treatment involving EGCG. At the concentration of 20 micrograms of EGCG, it was found to exert anti-proliferative symptoms in the stomach cells by helping in the prevention of the B catenin oncogenic pathway of signaling. The studies on colon cancer revealed that the AKT, Extracellular Signal Related Kinase (ERK) and p38MAPK

pathways were associated with preventive effects shown by EGCG.

Major Processes like Methylation of DNA, modifications of Histones etc., were shown to be altered due to the alteration property of the EGCG.

EGCG, along with Sodium Butyrate, helped inhibit DNA methyltransferases and Class 1 Histone deacetylases in the cancerous cells, thus helping in modulating the methylation of global DNA and modifications of histone proteins.

The cancer stem cells are highly responsible for playing a major role in the resistance of chemo drugs and recurrence of the resistance to multiple drug rejection. It was found that the EGCG was successful in suppressing the further growth and multiplication of the cancer stem cells. It was also observed that the anticancer properties of the EGCG also helped in modulating the hormone levels in cancer patients.

The main risk sign estimated for breast cancer was the patient's exposure to Estrogen.

EGCG concentration levels of 1 microgram were found to help suppress the Estradiol 1 (Estrogen) that is known to cause Breast Cancer. They were found to suppress the levels of proliferative cancer cells that were the cause of cell proliferation. In ER+/ PR+ cancerous

cells of the breast that have ER-alpha present in them, the usage of EGCG was found to be useful in regulating their levels.

At the concentration of 20micrograms, it was found that EGCG was also efficient in suppressing and inhibiting the metastasis in the cancerous cells found in the breasts. It was found that they could maintain a balance between MMP and TIMP (Matrix Metalloproteinase).

Several observational studies revealed the key mechanism in this process. It was said that Matrix Metalloproteinase (TIMP) was responsible for being the key mechanism in inhibiting the proliferation of cells. Homolog 2 and HDAC1 were also modified by the treatment of EGCG.

In the case of patients who have prostate cancer, apart from the usage of EGCG, antiandrogen and androgen deprivation were found to be highly effective. It was found that EGCG was antagonistic to androgens, and that is why it is found to be highly effective in suppressing the growth of cancerous cells in the prostate by suppressing the growth of cancerous cells both in vivo and in vitro conditions of growth.

### **Conclusion**

It may be concluded from the above analysis that the Polyphenols found in green tea are

highly effective in curing several types of cancers like prostate, gastric, or lung cancers. Consumption of natural flavonoids is effective in reducing the risk of various cancers. People who have a regular and daily uptake of flavonoids are healthier than people whose diet is rich in green vegetables, fruits and a certain type of plant-based derived beverages. Therefore, it may be deduced that the consumption of fruits and vegetables along with herbal green teas are playing important role in being effective in the treatment of cancer.

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