

Tea and Cancer

Introduction

Cancer is a major cause of morbidity in the UK with over 200,000 newly diagnosed cases, and around 120,000 deaths from cancer each year. It is expected that more than one in three people in England will develop cancer at some stage in their lives¹. The disease is more likely to develop in later life, with around 65% of cancers diagnosed in people over the age of 65². However, cancer causes an even greater proportion of deaths in those under the age of 65, with more than one in three deaths being due to cancer.²

What is cancer?

Cancer is often thought of as a single disease; however in reality it is a term that covers a range of malignant conditions that can affect almost any organ or tissue in the body. Cancer occurs when tissue cells are no longer under the control of normal molecular regulatory processes that usually result in the division, differentiation and ultimately death of these healthy cells. When these control mechanisms become disturbed the cells divide in an uncontrolled and abnormal manner, often failing to differentiate and failing to respond to the usual death signals. In most cancers this uncontrolled growth results in the formation of a tumour.

In many cancers the malignant cells will migrate from their primary tissue of origin to secondary sites creating secondary tumour growths or 'metastases'. The lethal effects of both primary and secondary cancers is due to the compression of healthy cells, often killing them, so preventing the normal functioning of major organs.

Causes of cancer

Cancer is essentially a disorder of cellular genetic material. Damage to the DNA within the cells maybe as a result of environmental factors such as radiation, chemical carcinogens and some viruses.

Certain risk factors are associated with different types of cancer, and some of these are modifiable³:-

- Smoking is the greatest known risk factor for cancer and has been identified as the single most important cause of preventable disease and premature death in the UK
- UV (Ultraviolet) Radiation, specifically UVA and UVB, cause skin damage, including sunburn and premature ageing of the skin. This damage can eventually lead to skin cancer
- Diet, scientists at the Imperial Cancer Research Fund have estimated that 30% of all cancers may occur as a result of our diet
- Obesity may increase an individual's risk of developing certain types of cancer e.g. endometrial, breast, kidney and bowel cancers
- Excessive alcohol consumption strongly increases an individual's risk of developing oral cancer, laryngeal cancer, and oesophageal cancer
- Occupational hazards, exposure to certain chemicals has been to shown to be a risk factor for certain cancers

Diet and cancer

More and more research is finding that diet plays a crucial role in the prevention of cancer. The International Report on cancer prevention from the World Cancer

Research Fund, *Food, Nutrition and the Prevention of Cancer: a global perspective*,⁴ found that 30-40% of all cancers are directly linked to our diet, physical activity and weight. Diet is thought to be a risk factor for the following cancers.

- **Bowel cancer** - eating foods that are high in fat and low in fibre may increase the risk of developing bowel cancer.
- **Breast cancer** – maybe a link between fat consumption and breast cancer risk although this link remains uncertain.
- **Stomach cancer** - a high intake of salted, cured, and smoked foods may be linked with an increased risk of developing stomach cancer.
- **Prostate cancer** - many studies have been carried out looking at links between diet and prostate cancer. Although many links have been suggested, no definite links can be consistently found.
- **Lung cancer** - a low consumption of fruit and vegetables (in particular green vegetables and carrots) has been shown to be associated with an increased risk of developing lung cancer.
- **Oesophageal cancer** - diets that are low in fruits and vegetables may increase the risk of developing oesophageal cancer.

Findings from the world's largest investigation into diet and cancer, EPIC (European Prospective Investigation into Cancer and Nutrition), monitoring 480,000 individuals, have found that eating about 500g or more fruit and vegetables every day was found to decrease the number of cases of cancers of the mouth, pharynx and oesophagus by 50%.

Dietary Recommendations

The World Cancer Research Fund⁵ has made the following dietary recommendations:-

- Increase fruit and vegetable intake - at least 5 portions per day (a portion is approximately 120 grams or 4 ounces).
- Consume a high proportion of high fibre foods such as wholemeal bread and other cereals
- Choose a variety of plant based foods such as cereals, legumes (such as lentils, beans and peas), starchy foods (such as pasta, rice and bread) as well fruit and vegetables
- Select foods low in fat and salt
- Drink alcohol in moderation if at all

These dietary changes as well as maintaining a healthy weight and being physically active can help reduce the risk of developing cancer.

The Committee on Medical Aspects of Food and Nutrition policy (COMA)⁶ assembled a working party of experts to look at the evidence for the role of nutrition in cancer causation and to develop recommendations for the prevention of a number of common cancers. In addition to the above dietary recommendations they also suggested that red meat and processed meat consumption should not increase, instead choosing white meat and fish as alternatives

The benefits of tea

There is increasing evidence that specific substances found in certain foods can enhance general healthy eating recommendations e.g. phenolic compounds found in plants. Tea is rich in specific phenolic compounds including flavonoids.

Flavonoids are powerful antioxidants *in vitro* and have been identified as potential cancer preventative components.^{7,8,9,10} Tea has been shown to inhibit tumorigenesis at the initiation, promotion and progression stages of cancer.^{8,11,12} It has been suggested that possible mechanisms of action include their:

- Antioxidant activity^{13,14}
- Ability to inhibit nitrosamine reactions¹⁵
- Modulation of carcinogen-metabolising enzymes¹⁶
- Trapping of ultimate carcinogens¹⁷
- Ability to inhibit cell-proliferation¹⁷
- Modulation of gut-microflora¹⁸ (associated with colon cancer)
- Antimicrobial actions^{19,20} (association between *Helicobacter pylori* and gastric cancer)

For further information about the antioxidant action of tea please refer to the fact sheet, 'Tea and Antioxidant Properties.'

The evidence for tea and cancer

In a Japanese population survey, an overall protection together with a slowdown in increase of cancer incidence was reported with tea drinking²¹. The effects were more pronounced when the consumption rose to over 10 cups of tea a day. However, other epidemiological studies investigating the association between tea consumption and a reduced risk of cancer have been inconclusive.

Some studies have shown an inverse association between green tea drinking and stomach cancer²²⁻²⁸, one of which reported that green tea drinkers had a 48% reduced risk of developing stomach cancer and a 51% lower risk of developing chronic gastritis versus non drinkers²². However, one study in Taiwan showed an increased risk with green tea drinking²⁹ and other studies investigating the relationship between flavonol intake and stomach cancer reported no association^{30,31}.

Flavonoids have also been associated with a reduced risk of lung cancer³² and one case control study reported a 50% reduction in lung cancer risk when consuming 1 cup of black tea a day³³. However, another study that investigated the relationship between catechin intake (a type of flavonoid that is abundant in tea) and lung cancer, found no such association³⁴. Other studies investigating the relationship between tea drinking and lung cancer also reported no association^{30,31,35,36}.

Results from a recent study in Japan found that the regular consumption of green tea (more than 3 cups a day) might be protective against recurrence of breast cancer in the early stages³⁷, although the authors do report that careful interpretation of the results is needed at this stage and further studies are required to confirm these findings.

Inconsistencies from these studies maybe as a result of their design e.g. lack of detail about exposure to tea – quantity, strength and variety, insufficient information about the flavonoid contents of foods, variation of flavonoid content amongst food varieties, discrepancies in the collation of dietary information using dietary analysis

questionnaires and confounding lifestyle and environmental factors. These details may influence the end results and make them difficult to interpret. This problem has been reviewed in association with cancer and tea drinking^{17,28,38,39}. Consideration of these factors is required for any future research.

In summary

Tea and flavonoids have been identified as potential cancer preventative components in animal and in vitro studies. However, the inconclusive results reported in population studies maybe as a result of a number of confounding factors making the results difficult to interpret. Although the scientific evidence for tea is growing it is not yet conclusive and represents a promising area for future research. In the mean time, it is reasonable to conclude that drinking both green and black tea is compatible with healthy eating dietary advice to help reduce the risk of developing cancer helping to maintain overall health and well-being.

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