



DIETARY INFLUENCE IN CANCER

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ABSTRACT

The article outlines the role of dietary components in relation to cancer with special attention to the ways in which body composition, physical activity, food and nutrition, may modify the risk of cancer. Environmental factors are supposed to play an important role in the carcinogenesis and can be modified. The importance of calorie intake, dietary fats, intake of fruits and vegetables in the associated cancers will be discussed. Some of the constituents of the food like fibres, selenium, lycopene, omega 3:6, fats are discussed with emphasis on their role in cancer.

KEYWORDS: Diet, cancer, fruits, vegetables.

INTRODUCTION

American Institute for Cancer Research and the World Cancer Research Fund has estimated that 30–40 percent of all cancers can be prevented by appropriate diets, physical activity, and maintenance of appropriate body weight.^[1] Nutrients also play important roles in defining the immune response, metabolic capacity to detoxify chemicals, and response to drugs with carcinogenic potential.^[2]

DIRECT AND INDIRECT EFFECTS OF DIET AND NUTRITION ON CANCER RISK

The effect of diet can be direct, via the cumulative effect of exposure to nutrients and carcinogens in foods; in this case, the balance of cancer-promoting and -protective substances may contribute in defining cancer risk. Indirect ways include the effects of diet on energy balance and risk of obesity and the hormonal and metabolic responses related to energy balance.^[2]

Over Consumption of Energy (Calories): Overweight and obesity accounted for 14 percent of all cancer deaths in men and 20 percent of those in women. Significant positive associations were found between obesity and higher death rates for the following cancers: esophagus, colon and rectum, liver, gallbladder, pancreas, kidney, stomach (in men), prostate, breast, uterus, cervix, and ovary. The authors estimated that over 90,000 cancer deaths per year could be avoided if the adult population all maintained a normal weight (BMI < 25.0).^[3]

Attained stature (height): Adult height is associated with cancer risk for some sites, prominently for the breast and more weakly for other sites, such as the prostate and colon. The mechanisms underlying this association are complex: adult height is positively correlated with birth weight; growth rate; and age at puberty, which is negatively associated with breast cancer risk. For esophageal cancer, men of low stature had the highest risk. An increased risk of esophageal adenocarcinoma was observed in overweight and obese men and women, whereas the opposite relation was observed for esophageal squamous cell carcinoma.^[4]

Food preferences and selection: Doll and Peto estimated that about 30% of human cancers could be attributed to dietary factors and consumption of certain foods promotes the occurrence of cancer, whereas other foods have a protective effect.^[5] The greater the net variety of species in the diet, the less intense the exposure to any one of them that might have a carcinogenic potential. This is a first principle for encouraging young children to consume a wide array of dietary items, especially of plant origin.^[2]

Glucose Metabolism: The glycemic index is an indication of the blood sugar response of the body to a standardized amount of carbohydrate in a food. The case control studies have found consistent increased risk of a high glycemic load with gastric, upper aero digestive tract, endometrial, ovarian, colon or colorectal cancers.^[1]

Low fiber: In prospective health studies low fiber was not found to be a risk for breast cancer.^[1] Slattery et al found an inverse correlation between vegetable, fruit and whole grain intake plant food intake and rectal cancer, while refined grains were associated with increased risk of rectal cancer.^[6]

Dietary Fats: Most of the interest in the relationship between low-fat diets and cancer has focused on the role of fat in the etiology and prevention of breast, colorectal, and prostate cancers. The evidence that total fat intake is a cause of breast cancer is quite weak and inconsistent, whereas the evidence for a role of dietary fat in the cause of colon and prostate cancers is stronger.^[7]

Omega 3:6 Ratio Imbalance: Association between consumption of (n-3) fatty acids (alpha-linolenic acid, EPA, DHA) and reduced risk of certain hormonal cancers, such as those of the breast and prostate is seen while omega 6 fats (linoleic acid, arachidonic acid) have been found to be cancer promoting fats.^[1] These dietary substances are also attributed with protection against cancer of the large bowel. The habit of eating marine fish and fish oils would favor a higher (n-3): (n-6) ratio in the diet and in blood and tissues. The authors concluded that fish consumption is associated with protection against the later promotional stages of colorectal carcinogenesis but not with the early initiation stages.^[2] Except for the study by London et al, all of these studies found an association between a higher ratio of N-3 to N-6 fats and reduced risk of breast cancer.^[8,9] Flax seed provides all of the nutrients from this small brown or golden hard-coated seed. It is an excellent source of dietary fiber, omega 3 fat (as alpha-linolenic acid), and lignans.^[1]

Fruits and Vegetables: One of the most important messages of modern nutrition research is that a diet rich in fruits and vegetables protects against cancer.

Block et al reviewed about 200 studies of cancer and fruit and vegetable intake. A statistically significant protective effect of fruits and vegetables was found in 128 of 156 studies that gave relative risks.^[10]

Steinmetz and Potter reviewed the relationship between fruits, vegetables, and cancer in 206 human epidemiologic studies and 22 animal studies.^[11] They found "the evidence for a protective effect of greater vegetable and fruit consumption is consistent for cancers of the stomach, esophagus, lung, oral cavity and pharynx, endometrium, pancreas, and colon." Allium vegetables, carrots, green vegetables, cruciferous vegetables, and tomatoes also had a fairly consistent protective effect.^[11] Allium vegetables (garlic, onion, leeks and scallions) are particularly potent and have separately been found to be protective for stomach and colorectal cancers and prostate cancer.^[12,13,14]

A joint report by the World Cancer Research Fund and the American Institute for Cancer Research found

convincing evidence that a high fruit and vegetable diet would reduce cancers of the mouth and pharynx, esophagus, lung, stomach, and colon and rectum; evidence of probable risk reduction was found for cancers of the larynx, pancreas, breast and bladder.^[15]

Selenium: Selenium is a mineral with anti-cancer properties. There was a significant reduction in total cancer incidence ($p = 0.03$), prostate cancer, a marginally significant reduction in colorectal cancer incidence, and a reduction in cancer mortality, all cancer sites.^[16]

Soy Foods: While there is tremendous public and scientific enthusiasm for the use of soy foods in the prevention of recurrences of breast and prostate cancers, scientific support for such recommendations is remarkably inconsistent. Several trials are examining the effects of soy components on cancer risk. Until these trials are concluded, there is insufficient information to make a recommendation about use of soy foods for cancer survivors. These products may have beneficial effects for some, and adverse effects for others.^[7]

Teas: Some evidence suggests that tea consumption, including both green and black teas, could reduce the risk of cancer. Epidemiologic evidence suggests that cancer risk might be lower among those who drink teas, especially green teas, which contain high levels of polyphenols, a family of antioxidant phytochemicals.^[7]

Lycopene: Of the various carotenoids lycopene has been found to be very protective, particularly for prostate cancer. The major dietary source of lycopene is tomatoes, with the lycopene in cooked tomatoes being more bioavailable than that in raw tomatoes. Moreover, tomato supplementation significantly diminished oxidative DNA damage in leukocytes and prostate tissues, and there was a decrease in blood prostate-specific antigen in the patients, which was explained by the increase in apoptotic death of prostate cells, especially in carcinoma regions.^[17] Several prospective cohort studies have found associations between high intake of lycopene and reduced incidence of prostate cancer, though not all studies have produced consistent results.^[18,19] A more recent follow-up report on this same cohort of men confirmed these original findings that lycopene or frequent tomato intake is associated with about a 30–40% decrease in risk of prostate cancer, especially advanced prostate cancer.^[20]

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