

CRUNCH BY COLOURS AND CHECK THE CANCER**Negalur Vijay B¹ Bhat Ravi²**

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ABSTRACT

Oxidative stress plays important role in the pathogenesis of many cancers. Although a chemoprevention approach, which is a relatively new and promising strategy to prevent cancer using natural dietary compounds and synthetic substances, showed promising results in in-vitro and animal studies. Anti oxidants such as flavonoids and resveratrol supplementation, along with a well-balanced diet rich in fruits and vegetables containing antioxidants, were shown to lower the incidence of prostate, breast, renal, and other cancers in in-vitro and small trials, further research through larger clinical trials is needed to determine the optimal dosage and formulation that elicit antioxidant and anticarcinogenic

Key Words: Cancer, Antioxidants, Antioxidant property.

INTRODUCTION

The prevalence of cancer is increasing day by day due to increased sedentary lifestyle habits, According to the World Health Organization, cancer is a leading cause of death worldwide accounting for 7.6 million deaths (around 13% of all deaths) in 2008. Deaths from cancer worldwide are projected to continue rising, with an estimated 13.1 million deaths in 2030.¹ The lifetime probability of being diagnosed with an invasive cancer is more than 40%.² Cancer is characterized by the proliferation of abnormal cells that fail to respond correctly to normal regulatory mechanisms. Carcinogenesis, a term used to describe cancer development, is a multiple-step process consisting of initiation, promotion, and progression of uncontrolled cells. At the initiation step, damage to deoxyribonucleic acid (DNA) occurs. Cells begin to proliferate and expand into

abnormal cells during the promotion step. Finally during the progression step, further changes occur to these abnormal cells, leading to formation of malignant cells³

Proposed ways to reduce cancer progression include the avoidance of biological, chemical, or physical agents that can promote cancer and the consumption of a healthy diet of vegetables and fruits while maintaining optimum body weight. Natural dietary agents have drawn a great deal of attention because of their potential to suppress cancers pathophysiology and to reduce risk of cancer

About cancer

In cancer, cells divide and grow uncontrollably, and invade nearby parts of the body. This mainly caused by abnormal genes called oncogenes i.e. Loss or inactivation of these genes leads to cancer. Oxidative stress plays a significant role in the pathogenesis of numerous disorders and patho-

physiological processes including cardiovascular diseases, diabetes, and cancer.⁴Oxidative stress is the result of an imbalance between the production and the removal of reactive oxygen species (ROS) or reactive nitrogen species (RNS).⁴ROS or RNS can be generated from exogenous and endogenous sources. The body's antioxidant defense mechanisms include glutathione, superoxide dismutase, and catalase, protect against oxidative stress.⁴Excess production of ROS has been associated with carcinogenesis with damage to nucleic acids, proteins, or lipids. During carcinogenesis, breaks in DNA strands and formation of abnormal DNA linkages have been observed.⁴To prevent or to treat cancer are an ongoing research interest; studies that are attempting to find the link between oxidative stress and the process of carcinogenesis have found potential chemo preventive compounds and compounds with antioxidant activities.⁴

Role of Antioxidants

The majority of the present day diseases are due to the shift in the balance of the pro-oxidant and the anti-oxidant homeostatic phenomenon in the body. Pro-oxidant condition dominate either due to the increased generation of the free radicals caused by excessive oxidation stress of the current life or due to the poor scavenging/quenching in the body caused by depletion of the dietary antioxidants. These free radicals cause damage to cells and are responsible for aging and other ailments such as cancer etc which are life threatening and mostly fatal. Hence in recent years, antioxidants have gained importance because of their potential prophylactic and therapeutic action in many diseases. Antioxidants neutralize free radicals as the natural by-product of normal cell processes. Free radicals are molecules with incomplete electron shells which make them

more chemically reactive than those with complete electron shells. Exposure to various environmental factors, including tobacco smoke and radiation, can also lead to free radical formation. In humans, the most common form of free radicals is oxygen. When an oxygen molecule (O₂) becomes electrically charged or "radicalized" it tries to steal electrons from other molecules, causing damage to the DNA and other molecules. Over time, such damage may become irreversible and lead to disease including cancer. Antioxidants are often described as "mopping up" free radicals, meaning they neutralize the electrical charge and prevent the free radical from taking electrons from other molecules.⁴These are molecules of defence that quench these hazardous free radicals and reduce their potential to attack the cells, thereby protecting the cells. A variety of antioxidant molecules have been isolated and analyzed. Studies show that antioxidant molecules in their isolated forms are not as efficacious as they are in their natural forms This review is focused on the roles of selenium, vitamin E, carotenoids, flavonoids, and resveratrol as potential antioxidants for cancer prevention and treatment.

Antioxidants are abundant in fruits and vegetables, as well as in other foods including nuts, grains, and some meats, poultry, and fish. The list below describes food sources of common antioxidants.

1 Beta-carotene is found in many foods that are orange in color, including sweet potatoes, carrots, cantaloupe, squash, apricots, pumpkin, and mangos. Some green, leafy vegetables, including collard greens, spinach, and kale, are also rich in beta-carotene.

2 Lutein, best known for its association with healthy eyes, is abundant in green,

leafy vegetables such as collard greens, spinach, and kale.

Lycopene is a potent antioxidant found in tomatoes, watermelon, guava, papaya, apricots, pink grapefruit, blood oranges, and other foods. Estimates suggest 85 percent of American dietary intake of lycopene comes from tomatoes and tomato products.

3 Selenium is a mineral, not an antioxidant nutrient. However, it is a component of antioxidantenzymes. Plant foods like rice and wheat are the major dietary sources of selenium in most countries. The amount of selenium in soil, which varies by region, determines the amount of selenium in the foods grown in that soil. Animals that eat grains or plants grown in selenium-rich soil have higher levels of selenium in their muscle. In the United States, meats and bread are common sources of dietary selenium. Brazil nuts also contain large quantities of selenium.

4 Vitamin A is found in three main forms: retinol (Vitamin A1), 3,4-didehydroretinol (Vitamin A2), and 3-hydroxy-retinol (Vitamin A3). Foods rich in vitamin A include liver, sweet potatoes, carrots, milk, egg yolks, and mozzarella cheese.

5 Vitamin C is also called ascorbic acid, and can be found in high abundance in many fruits and vegetables and is also found in cereals, beef, poultry, and fish.

6 Vitamin E, also known as alpha-tocopherol, is found in almonds, in many oils including wheat germ, safflower, corn, and soybean oils, and is also found in mangos, nuts, broccoli, and other foods.

Some of the following studies strongly suggest the role of antioxidants in cancer

a)The first large randomized trial on antioxidants and cancer risk was the Chinese

Table 1 showing colours and respective fruits with their properties.

Cancer Prevention Study, published in 1993. This trial investigated the effect of a combination of beta-carotene, vitamin E, and selenium on cancer in healthy Chinese men and women at high risk for gastric cancer. The study showed a combination of beta-carotene, vitamin E, and selenium significantly reduced incidence of both gastric cancer and cancer overall ⁵.

b)A 1994 cancer prevention study entitled the Alpha-Tocopherol (vitamin E)/ Beta-Carotene Cancer Prevention Study (ATBC) demonstrated that lung cancer rates of Finnish male smokers increased significantly with beta-carotene and were not affected by vitamin E ⁶.

c)Another 1994 study, the Beta-Carotene and Retinol (vitamin A) Efficacy Trial (CARET), also demonstrated a possible increase in lung cancer associated with antioxidants ⁷.

d)The 1996 Physicians' Health Study I (PHS) found no change in cancer rates associated with beta-carotene and aspirin taken by U.S. male physicians ⁸.

e)The 1999 Women's Health Study (WHS) tested effects of vitamin E and beta-carotene in the prevention of cancer and cardiovascular disease among women age 45 years or older. Among apparently healthy women, there was no benefit or harm from beta-carotene supplementation. Investigation of the effect of vitamin E is ongoing ⁹.

Colours	Fruits And Veggies	Antioxident Property
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Red	Watermelon, Tomato, Beet root, Tomato, Grapefruit	Lycopene-
Red/purple	Blueberries, Brinjal, Purple grapes, Straw berries Red cabbage, PomegranateGrapes, Blackberries, Raspberries, Blueberries	Anthocyanins
Green	Broccoli,Sprouts, Cabbage, Cauliflower, Co-riander	Isothiocyanates as sulpho-raphane&idoles
Yellow/green	Corn, Cucumbers, Peas, beans, Pumpkin Spinach, corn, avocado, melon	Lutein and zeaxanthin
White / green	Onion and garlics, Mushrooms	Allicin,flavanoids
Orange/yellow	Oranges, Papaya, Pineapple, Musambi,carrot, mango.	Beta cryptoxanthin,

DISCUSSION

The recent researches clearly through a light on cancer prevention through varies veggies and vegetables. Plant foods like rice and wheat are the major dietary sources of selenium. Selenium is a trace element found in selenoenzymes including glutathione peroxidase (GPx) an antioxidant enzyme for detoxification of hydrogen peroxide, and thioredoxinreductase (TrxR), an enzyme involved in the reduction of protein disulfides Preclinical studies using cell culture indicated that selenium can decrease cell proliferation, promote cell cycle arrest, and induce apoptosis in cancer cells.¹⁰ Experiments in animal models and cell culture showed that selenium can either inhibit the carcinogenesis process acted as a cancer preventive agent or have failed to show an anticancer effect. Observational studies of selenium and cancer risk have shown mixed results.¹¹⁻¹⁴

The Vitamin E effects on cancer cells have also been investigated in pre-clinical models, observational studies, and randomized clinical trials. Results from these studies have been in conclusive with many demonstrating no difference in cancer incidence and some showing an in-

creased cancer risk.¹⁵ Carotenoids are a group of pigments found in a wide range of vegetables and fruits that have antioxidant activities. More than 600 carotenoids have been identified, with only a few having significant biological importance, in particular beta-carotene and lycopene.¹⁶⁻¹⁷ Flavonoids are polyphenolic compounds found in herbs, apples, tea, grapes, honey, red wine, fruits and vegetables that have been shown to have anti-inflammatory, antidiabetic, antifungal, anti-allergic, antiviral, antioxidant, and anticancer properties. Flavonoids are Categorized into the following classes: flavones, flavonols, flavanones,flavonols, anthocyanidins, isoflavones, and chalcones. Dietary flavonoids that possess anticancer properties are also known to have antioxidant activities because of their ability to scavenge free radicals, and to prevent initiation, promotion, and progression of cancer development through interact selectively with protein kinase signaling cascades involved in cell defense.^{18-25.}

CONCLUSION

Most of the studies suggest that a diet rich in fresh fruits and vegetables protects from risk of cancer. The types of vegetables or fruit that most often appear to be protective against cancer are raw vegetables, followed by allium vegetables, carrots, green

vegetables, cruciferous vegetables, and tomatoes. Substances present in vegetables and fruit that may help protect against cancer, and their mechanisms are also briefly reviewed; these include dithiolthiones, isothiocyanates, indole-3-carbinol, allium compounds, isoflavones, protease inhibitors, saponins, phytosterols, inositol hexaphosphate, vitamin C, D-limonene, lutein, folic acid, beta carotene, lycopene, selenium, vitamin E, flavonoids, and dietary fiber. Fastfood, junk food, spicy and aerated drinks can give taste for the tongue later that produces lifestyle disorders instead of this fresh fruits and vegetables intake can cut down the risk of cancer.

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