

Antioxidants, prevention and treatment of cancer

Lutfia Omar Morgem, Mohamed Abubaker Fadel*, Omar Abdussalam Aghil, Haifa Fakroon and Dia Sadique Abukhshem

Industrial Researches Centre, Faculty of Medical Technology*, University of Tripoli, Tripoli, Libya.
mohamed.fadel178@gmail.com

Abstract: The instinct to maintain the kind and love to stay has been the impetus for man since ancient times to protect himself from multiple hazards of various accidents and diseases. Cancer is one of the diseases suffered by man since long time ago and he tried hard to identify its causes and resist it in various ways. All efforts have been made till now to completely overcome it have failed, and this dreaded disease continues to be one of the most important causes of death in most countries of the world. Several studies have been conducted in various parts of the world to know the mechanisms of cancerous tumors, their causes and possibility of preventing them before they occur. Cancerous tumors occur as a result of the availability of two factors: genetic predisposition and the presence of an external factor that stimulates tumor occurrence; such as radiation and oxidation-causing substances inside the body. To prevent the tumor as a result of oxidation causing materials tended the efforts of researchers to know the importance of natural antioxidants (natural antioxidants found in fruits, vegetables, herbs, etc.) to prevent tumor. Of the most important natural antioxidants, which play an important role in preventing tumors are some vitamins like (vitamin C and vitamin E) and multi-phenols. In this paper we review the most important antioxidants and their sources, discussing mechanisms of cancerous tumors; we also review the most important studies carried out on the relationship between antioxidants and tumors and their role in the treatment and prevention of this disease. [Lutfia Omar Morgem, Mohamed Abubaker Fadel, Omar Abdussalam Aghil, Haifa Fakroon and Dia Sadique Abukhshem. **Antioxidants, prevention and treatment of cancer.** *Nat Sci* 2013;11(12):46-51]. (ISSN: 1545-0740). <http://www.sciencepub.net/nature>. 7

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1. Introduction

Plants and herbs and their derivatives have been used since ancient times to combat many aches and pains afflicting humanity and many herbs used as anti bacterial and pain relievers such as eucalyptus leaf and willow leaf. The last five Years have come full of information from laboratories around the world confirming the positive impact of diet on human health. Many of attention has focused a lot on oxidative activity and anti-oxidant and its relationship to aging and degenerative diseases such as cancer, cardiovascular diseases and diabetes¹.

It has been found that many of the chronic diseases, including heart disease and coronary artery occlusion in addition, occurrence and emergence of many types of cancer depend on the conversion of the large cellular molecules and cancer generators in vivo to special forms of from oxidizing interactive materials. So, nutrition supporting health should include consuming daily five to ten varieties of tomatoes, vegetables and fruits, fruit juices and tea. These substances rich in micronutrients with anti-oxidation properties.

Such as multi-phenols, vitamin C, vitamin E, beta-carotene and Licopin²

Also, the low incidence of certain types of cancer in the countries of the Mediterranean attributed to the high rates of consumption of olive

oil which contains multiple compounds such as phenols hydroxy Trizol and Alinin².

Some of the poly phenols found in many plant foods have been studied and the extent of their effect as anti-carcinogenesis, they were shown that they are anti-carcinogenesis and anti-mutations, also qirosommen (of poly phenols), a pigment found in the spices like turmeric and Lagic acid (which is also a poly phenol), found in fruits especially strawberries, berries, nuts and vegetables which contain large quantities of it and other poly phenols, shown to provide protection against chemicals that cause carcinogenicity in animals³.

Recent studies have shown that the antioxidants in grape juice, red grapes, strawberries, raspberries, peanuts show influential chemically blocking of carcinogenesis in rats have shown recent studies that tea that contains multiple vehicles of phenols showed protection against many types of diseases, including cancer³.

To understand how oxidants can treat and prevent cancer tumors and other diseases, we shall review and discuss the mechanisms of oxidation in the following paragraph.

Mechanism of oxidation

Information obtained from recent researches on cancer and cardiovascular disease, inflammatory

disease and the aging process indicate that these incidents or symptoms are strongly associated with each other by a general process, which is to organize the oxidation process at the level of a living cell. A considerable attention has been given to the impact of certain types of nutrients on antioxidants status. To understand the impact of natural antioxidants (found in food) on the oxidative balance, it is necessary to clarify the process of oxidation through its relationship with cellular metabolism¹.

Oxygen is necessary to sustain life, but may have negative effects if the numbers of oxygen-containing radicals (Highly Reactive Oxygen) exceed the need of the cell or not adequately seize⁴.

Metabolic activity produces free radicals which are unstable molecules that are able to interact with electron donors to neutralize their charge. This interaction is useful for the synthesis of nucleic acids, hormones and proteins in the presence of a catalyst such as iron, copper, manganese and molybdenum. The free radicals are also produced naturally to confront the invading (attacking) organisms like microbes and viruses¹.

Oxidative balance/Antioxidant is highly regulated, but oxidative stress induced by overproduction of the types of reactive oxygen (Reactive Oxygen Substances, ROS) leading to interfere with cellular functions. The types of intensity of reactivity of oxygen vary from high reactivity as in the radical of the hydroxyl (OH) and ferric ion (Fe+2O) or Copper hydroxide (Cu(OH)₂) to low reactivity as in the positive ion to the super oxide radical (O₂) and root Alberoxy (ROO) and hydrogen peroxide (H₂O₂) singular oxygen (O₂)¹ peroxy acid (HOCl) and nitric oxide (NO⁻) and nitrite peroxide (ONOO⁻) and epoxy radical (RO⁻), also, free radicals breed by external factors such as toxic compounds.

And microbial attacks, ozone and ultraviolet radiation, cigarette smoke or by intensive exercise¹.

Free radicals in the cells are affected by modulating the activity (DNA) or the production of energy, proteins and hormones. Free radicals also change unsaturated fatty acids in the membranes of cells which reduces their ability to protect the contents of the cell during the exchange with the external environment. Protein oxidation have been diagnosed by free radicals as an important cause of the aging process and tissue damage arising from radiation of the oxidation proteins bearing functional groups (SH⁻) may lead to severe damage because of their metabolic importance and as enzymatic active groups in respiratory processes. Oxidation of nuclear bases in (DNA) stimulates the genetic mutations and increases the risk of cancer. The oxidation of fats and

proteins increases the complications of vascular hardening, diabetes and low immune function¹.

Cell combats the toxic activity of free radicals by multiple internal mechanisms of antioxidants in which detoxification via the enzyme system in which the phase enzymes (I) activates molecules (cytochrome, P450, NADPH) and convert them to water-soluble compounds attracting electrons before connecting the free radicals with anti-venom molecules (glutathione, UDP - Glukoroncel, amino acids) in order to disable and remove them. Glutathione, vitamin C, vitamin E and coenzyme Super Dismutase oxide are the basic internal defenses of the cell¹.

Although cells possess the means of enzymatic and non-enzymatic reactions against free radicals, but the antioxidant nutrients contribute to the overall protection from oxidative activity of free radicals for the safety of the cell and strengthen immune function¹.

It is difficult to assess the impact of various mixtures of food ingredients and their action on the metabolism of the cell, it has been concluded that ascorbic acid and tocoferolate are one of the best protective factors against a wide range of oxidizing molecules. The relationship was well studied original mechanism for prevention by GSH. Carotenoids which include alcoppinate also work as antioxidants to protect cell membranes and DNA integrity and multi phenols (flavonoids) found only in plants play an important role in the defense against oxidation. It is believed that the presence of fruits, vegetables and herbs in food protect against cancer and many other diseases because of their antioxidant properties. In addition they are good sources of vitamins A, C and E and the factors associated with mineral enzymes. Mineral nutrition, including adequate selenium, copper and zinc are very important in the ideal activity of the enzyme system against oxidation¹.

How to configure cancer and tumors

The beginning, encourage and progress of cancer development are linked to a number of factors related to metabolism, food and the external environment. The accumulation of types of reactive oxygen in the cell and modifications in DNA synthesis and enzymatic activity and mechanical defense all affect the development of configuration of cancer disease. Accordingly, the antioxidants can play an important role in the prevention and control of cancer progression¹.

A - The beginning of cancer

Primary generators of cancer that are activated by phase (I) enzymes such as cytochrome P450 capable of modulating DNA in the genetic

content and stimulation of tumor as a result of the accumulation of and activity of cancer generators such as reactive oxygen species. They also may be formed as a result of the presence of carcinogenic compounds such as Nitrosamine (a cancer Generator present in tobacco) or as a result of formation of heterocyclic amines from fish or cooked meat and they are toxic to the genetic content, which leads to activation of enzymes of phase (II) and the occurrence of genetic mutations 5-7.

B – Promotion of Cancer

When genetic mutations affect the DNA they may lead to the formation of malignant tumor cells, this stage is controlled by a series of steps of conversion the mark that include factors NFkB (nuclear CAPA B factor) and AP-1 (Activator protein I), which is regulated by the capability for oxidation and reduction so they are sensitive to oxidants / antioxidant state in the cell⁸⁻¹¹.

C- Progress of cancer

Cancer progress occurs as a result of growth of malignant tumor cells with cell division in the phase due to bonding of growth factor with the receptor and conversion of the generator's sign to division¹²⁻¹³.

The Urokinase enzyme (an enzyme that helps the proteolysis) plays an important role in growth and secondary spread of cancer via interference with the ability of enzymes to recognize their primary sources. Cancer progress and invasion of cells and creation of secondary cancer spread may facilitate due to excretion and activity of collagenase of the mineral enzymes that analyze protein complexes, exposure of multi- saturated fatty acids in immune cell membranes to oxidation due to oxidation activities of free radicals promotes cancer development¹⁴⁻¹⁵.

Effect of antioxidants in the protection against cancer tumors.

Primarily, for the substances (antioxidant) to play an effective role in the prevention of oxidation, they must be able to donate electrons and fix the charge and non-dual electrons on the body of the substance (antioxidant)³.

The mechanisms of antioxidant may be summarized in that3:

1. Prevents mutants and toxicity of (hereditary) gene.
2. Stops and inactivate and develops vital chemical indicators of the tumor.
3. Working as anti-toxics for enzymes.
4. Track the products of active metabolites of carcinogens.
5. Actively act as antioxidant and cleaner of free radicals.

Action of antioxidants at the beginning of cancer

Antioxidants inhibit cytochrome enzymes P450 and they directly neutralize primary generator of cancer via their strong activity in the capture of oxygen before cell damage 5-7 various phenol compounds that inhibit Nitrosamine compounds in vitro and inhibit formation of varied rings amines during cooking of meat and fish¹⁶.

Antioxidants such as Flafenodate, showed the highest protection against genetic mutations, non-enzymatic cutting and intervention of negative ions of super oxide. They also lead to a significant reduction in reverse mutants induced by different mutations' generators. Antioxidants promote deflationary death of cancer cells. And increase resistant of lymphoid cells to oxidative damage. They intervene (supporting) enzymatic defense mechanism in cells 1. Some poly-phenols¹⁷⁻¹⁹ (EGCG poly-phenols in tea) inhibit the action of phase (I) enzymes and prevent stimulate cancer generators and stimulate phase (II) enzymes that connect active generators of cancer and lead to their obstruction^{17,19}.

Action of antioxidants at the stage of cancer promotion

Antioxidants halt work AP-1 and inhibit division signal converters which are responsible for cell division, inhibit interactions between proteins and compounds that are bonded by closure and prevent them from bonding²⁰ stimulates vacuum articulated contact between the cells and prevent inhibition due tumors' promoters 16 it has been found that (EGCG) inactivates the activity of telomerase (the enzyme opens the lock ability of division in cancer cells) thus stimulates aging and reduces the life span of tumor cells in leukemia and solid tumors²¹ caffeine also shows inhibiting effect on the mechanical repair of deadly damage in the cells of tumors sensitive to radiation, which improves the sensitivity to radiation therapy²².

Action of antioxidants in the stage of cancer progress.

Recent studies have indicated that multi-phenols inhibit the growth of malignant tumors and stimulate deflationary death even in tumor cells resistant to deflationary death²³⁻²⁵ also it was found that (EGCG) showed inhibition of reaction to enzyme Urokinase and halted division oral cancer cells in phase (GI) While curcumin substance has stopped cell division at the stage of S/G2M, when used together showed a synergistic effect²⁶ the compound (EGCG) can also kill mutated cells in a specialist manner because of the adenovirus²⁷, antioxidants also disable the synthesis of DNA in the cells of liver cancer, cancer of the blood cells and cancer of lung cells²⁸ and can inhibit the adhesion of tumor cells in

the lungs of mice which stop the progress of cancer²⁹ also oxidation of multi fatty acids prevents unsaturation in immune cell membranes, helping them to resist the tumors. The Filafinoedat inhibiting the release of (Tumor necrosis factor Alpha TNF- α) and reduce tumor promotion 30 they also seems to inhibit frequent production of the gene responsible for multidrug resistance and modify the enzyme Topoizomirase which has to do with the growth of the tumor 31 they carry out a specialized inhibition Of elected enzymatic activities and targets the anomaly in DNA and repair it³¹.

Effect of antioxidants on different types of cancer

1- Skin Cancer

Some studies have indicated that the topical use multiple or consumption of poly-phenols lead to inhibition of the beginning of the tumor and its promotion by chemical cancer generators or ultraviolet radiation in experimental rats 32-35 more recent study has shown that caffeine may be of benefit in the chemical prevention of stimulated cancer generate due to ultraviolet UV³⁶⁻³⁷ also poly-phenols inhibition of the growth of skin tumors very steady note, it was possible to note decline in the tumor. It has been observed the full decline in about 4% of the tumor-bearing mice papiloma virus (out of 346 rat)³⁵.

2- Leukemia

Some studies have shown that poly-phenols are of benefit to the mucous layer lining the mouth. Studies have shown that there is an inverse relationship between the rates of eating this type of antioxidants and rates of formation of pimples 38 and that tumor patients who took poly-phenols decreased the number of pimples compared with patients who did not take poly-phenols. This study indicates that eating antioxidants not only has protective properties but also has therapeutic properties.

3- Esophageal cancer

Studies did not show any relationship between eating phenol juice with the presence of or low incidence of cancer of the esophagus 39.

4- Pancreatic Cancer

Pancreatic cancer is one of the most cancerous tumors that cause death. A study in China has shown that there is an inverse relationship between pancreatic cancer and the rates of consumption of poly-phenols⁴⁰ a decrease was found in infection rates between 12% to 53% among men and women respectively 40 Another study in Poland showed that there is a statistically significant decline with morality up to ($p < 0.001$) with the increase in the rates of poly-phenols consumption in food and tea⁴¹.

5- Lung cancer

When treating mice with poly-phenols they have observed decline in the number of lung cancer tumors

after chemical stimulation to generate lung tumors³²⁻⁴² and the same result was obtained when consuming Nitrosamine NNK for tobacco⁴³⁻⁴⁴ or when tumors were allowed to self evolve⁴⁵ it stopped an increase in the compound 8-hydroxy deoxy guanosine in mouse lung and a compound 6-methylguanine. Each of these bases are derived from purine necessary to generate mice lung tumors⁴³⁻⁴⁴.

6- Cancer of the gastrointestinal tract

High doses of Tiaflavin and multi-phenols have led to inhibition of tumor proliferation when presented to rats^{32,46} also drenched green tea inhibited chemically stimulated anterior stomach cancer in mice. One study reported that the multi-phenols failed to reduce the incidence or the proliferation of colon cancer. While another study reported that a high dose of phenols led to the reduction of primary malignant lesions. little inhibition has been observed of the anomaly focus glandular cavity stimulated by ozomethane in rat colon⁴⁶⁻⁴⁷ also found that multiple phenols which provided in low concentration led to a significant reduction in the incidence of the large bowel tumor 46-48 in tumors induced by dissimilar ring amines, multi-phenols have led to stimulate phases I and II that remove toxicity for the rapid secreting generators of genetic mutations 49 also inhibition of liver cancer was observed in rats and mice 48-49.

7- Mammary gland cancer

Recent study on the development of mammary gland cancer could not notice any significant impact on the generation of mammary gland cancer in rats that were fed on normal diet^{32,50-51} this effect was also observed in clear auto-formation of the tumor of mammary gland deciduous in mice that have been fed on poly-phenols with aluminum hydroxide³² It was found that injection of(EGCG) within the peritoneal cavity led to growth inhibition and reduction in size of tumors generated by cell lines of breast cancer in humans and attached inside the mice and rats⁵²⁻⁵³ it has been found hat poly-phenols may be helpful in chemotherapy, oral consumption of which the by Dropsical IRISH tumor-bearing mice with Doxyrobicin has increased efficiency of chemotherapy 54 as they fully inhibit the development of mammary gland tumors in mice with a mixture of Tamoxiphene 55 and Tininat have led to promote the activity of anti-tumor and proliferation in mice infected with secondary ovarian cancer 56

8- Prostate cancer

Seems to be that the risk of cancerous tumors inversely proportional to the increased intake of antioxidants. Daily communion antioxidants significantly reduces the incidence of prostate cancer (approximately 11%) 57.

9- Cancer of the bladder

It was found that there was a 50% reduction in the incidence of bladder cancer in women⁵⁸, but did not notice any significant decrease in bladder cancer for men, though increased survival rates of five years in men patients when consuming with poly-antioxidants⁵⁹.

In conclusion, it is useful to recall that many chronic diseases, such as atherosclerosis and many of cancerous tumors depend on in vivo conversion of large cellular molecules.

Or cancer generators to special interactive active forms. For this reason precisely, health support nutrition must include consuming daily between 5 to 10 varieties of vegetables, fruit, juice, red grapes and tea are rich sources of micronutrients with antioxidant properties such as vitamin C, E and Alapta carotene (vitamin A) tomato also contains lycopene and many vegetables contain Kwersethein and various phenolic compounds. Tea contains Flavinoids also red grape juice contains on Receveratrol. Antioxidants are necessary for the body to control the oxidation reactions with potential negative consequential in the body where oxidation of cholesterol and low-density fats LDL lead to the production of compounds detrimental to the vascular system or blood vessels⁶⁰ So low consumption of saturated fats to reduce cholesterol in the blood in addition to communion enough antioxidants is the ideal way to reduce the risk of heart disease and hardening of the arteries 60 stomach cancer which may be caused by consumption salty pickled food which produces cancer generators with direct influence, can be disabled or inhibition by vitamins. The cancers of the colon, breast, prostate and pancreas caused by a new class of cancer generators which are varied ring amines that are formed during grill or frying foods containing creatinine, such as meat and fish 60 of these types of cancer generators can be inhibiting their formation and impact by antioxidants present in many fruits and vegetables such as soybeans, tea or by vitamin c.

Conclusions and Recommendations

The oxidation reactions can be disabled or inhibited by antioxidants found in fruits, tea and tomatoes and Alkhaddoat. Even Alchkhokhh and aging in good health will be supported by the available sufficient quantities Mnamadadat the different oxidation. Any that prevent the formation and impact of interactive products by antioxidants such as those found in fruits and vegetables, Tadm and fruit juices, juice, tea grapes Alokhr and holds great importance to public health by reducing the risk of diseases and their prevention.

1 – to maintain health and the prevention of cancerous tumors resulting from oxidation reactions of free radicals, it is recommended to consume from 5 to 10 varieties of fresh or cooked vegetables in addition to tea and coffee instead of soft drinks that contain dyes and preservatives only.

2 - The Libyan habits of cooking meat and fish after seasoning with various spices such as turmeric, thyme and other wild herbs are good habits and must be maintained.

3 - Cooking of meat with vegetables is suitable method to reduce and prevent the formation of a heterogeneous ring amino compounds that generate cancer.

4 - Avoid and limit the intake of fried meat and fish, or at least add lemon juice to them when frying is useful in minimizing opportunities of contracting malignant tumors.

5 - There are many herbs and wild Libyan plants that were directly eaten or used in Libyan food such as Altefaf, and Agazul, Alkitoot, Ahumaidah, Alkhubes, Alhereg, Alasloz, Almiramia, etc. can have significant benefits. Therefore, I am of the view of further studies on these herbs and wild Libyan plants whether or not they contain vitamins and antioxidants.

Corresponding Author:

Dr. Mohamed Abubaker Fadel

Faculty of Medical Technology, Tripoli, Lybia

Email: mohamed.fadel178@gmail.com

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