

# **Cancer treatment in the Arab-Islamic medicine: Integration of tradition with modern experimental trails**

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## **Abstract**

Cancer is a cohort of disorders that involves transformation, dysregulation of apoptosis, uncontrolled cell proliferation, invasion, angiogenesis and metastasis. Extensive research during the last five decades has revealed much about the biology of cancer. Drugs used to treat most cancers are those that can block cell cycle, cell signaling, including growth factor signaling; inflammation, angiogenesis and others. Strikingly, herbal plant extracts and based drug, including those attributed to the Islamic civilization were reported to mediate their effects by modulating several of these recently identified therapeutic pathways. Ibn Sina (Avicenna) and al Razi (Rhazes) described most types of cancers known at their time and suggested several treatments based on their believe that cancer is a result of excess of burned black bile in the affected tissue. Therefore, they recommended evacuation of the organ from black bile by excessive vomiting and laxatives and using cold medications and food. The Andalusian scholar Alzahrawi was the first to conduct classic removal of breast cancer and to invent more than 200 surgical equipments. He recognized that cancer can be treated surgically only in its early stages when complete removal is possible. The focus of this review is to elucidate the Arab-Islamic anticancer therapies suggested by the most famous Arab and Muslim scholars notably, Avicenna (980-1037), Rhazes (965-1015), Al Zahrawi (936-1013) and Ibn al Nafis (1218-1288). Furthermore, cancer classification, causes, pathogenesis and prevention; surgical removal of tumors; herbal remedies; dietary modifications; and spiritual treatments are also highlighted.

**Key words:** Cancer, medicinal plants, Arab herbal medicine, Avicenna, garlic, black seeds.

## Introduction

Cancer is a leading cause of death worldwide. It strikes more than one third of the world's population and it's the cause of more than 20% of all deaths (Toni et al., 2010). Cancer is a cohort of diseases characterized by uncontrolled cell proliferation and ability to invade other tissues through direct cell migration or through the blood and lymph systems. More than 100 different types of cancer are known, usually are named by the organ/tissue or type of cell in which they start. For example, cancer that begins in the colon is called colon cancer. A tumor is an extra mass of cells with abnormalities in their DNA. Tumors may be benign (not cancer), or malignant (cancer). Among many others, the causes of cancer might be tobacco smoke, infection, chemicals, radiation, environmental factors, and unhealthy diet (Figure 1).

In addition to uncontrolled cell proliferation, some cancer cells have the ability to invade neighboring tissues and may also affect other distant tissues/organs. As recognized by Avicenna and Alzahrawi, if the tumor is diagnosed at an early stage, it can be successfully treated. Advanced tumors are treated usually by chemotherapy and although these drugs are effective, they are associated with severe adverse events and drug resistance (Baguley, 2010; Yan and Wajapeyee, 2010). Traditional Arab-Islamic herbal-based medicines might be promising candidates for new cancer therapeutics with low toxicity and minimal side effects (Saad et al., 2006; Saad et al., 2008b; Said et al., 2008).

The origins of Arab-Islamic medicine can be traced back to the time of the Prophet Mohammad, Peace Be Upon Him (PBUH) as a significant number of Hadiths concerning medicine are attributed to him. Several Sahaba were successfully treated of certain diseases by following the medical advice of the Prophet Mohammad (PBUH). The most famous of the Prophet Hadiths on medicine are: *"There is no disease that Allah has created, except that He also has created its*

*treatment", "Make use of medical treatment, for Allah has not made a disease without appointing a remedy for it, with the exception of one disease, agedness.", "Allah has sent down both the disease and the cure, and He has appointed a cure for every disease, so treat yourselves medically", "The one who sent down the disease sent down the remedy", "For every disease, Allah has given a cure".* Moreover, some verses in the Holy Quran also emphasize that every disease has a remedy. For instance: *"Say: It is for those who believe, a guide and a healing"* [Fussilat 41:44] *"And We send down of the Quran that which is a healing and a mercy to those who believe"* [al-Israa' 17:82]. The unlimited Muslims belief in the Prophet (PBUH) and that there is a cure for every disease encouraged early Muslims scholars to engage in botanical and other natural products, chemical and biomedical research to seek out a cure for every disease known to them.

During the Golden Arab-Islamic Age (7<sup>th</sup> to 14<sup>th</sup> century), many of the famous Arab and Muslim physicians studied cancer and applied various medicines and surgical methods. For instance, Ibn Sina (980-1037), known in the west as Avicenna, was the most influential of all Islamic philosopher-scientists, suggested *"When cancer starts, it may be possible to keep it as it is, so that it will not increase and keep it non-ulcerated. It may happen sometimes that the staging cancer may be cured. But when it is advanced, verily will not"*. Hence, it is worthwhile looking back in the history to the views of old masters in the Arab medicine. It is appropriate to introduce first the history of the Arab and Islamic medicine for the reader who is not familiar with it.

The history of the Arab and Islamic medicine is divided into two phases: Greek-to-Arab phase and Arab-Muslim phase. The first phase started in the eighth century when the Arab-Islamic Empire ruled about two-thirds of the world. This magnificent spread allowed them to get and translate Greek scientific and philosophical manuscripts as well as Indian and Persian scripts. Hunayn Ibn-Is'haq (809-873), translated a large number of scientific and medical manuscripts in

Greek (including philosophical works by Galen, Plato, Aristotle, Euclid and Archimedes) into Arabic during the glory years of the *Abbasid Caliphate* (756-945). Some of the Greek physicians, especially Galen (129-199) were acquainted with tumors. It is believed that Galen was the first to deal with tumors, including cancer, in a systematic way. He adopted Hippocrates' (470-370 BC) basic theory of cancer as an excess of black bile. In the golden Islamic-Arab time, classic Greek texts including those of Galen, were translated into Arabic, and influenced physicians in the Arab-Islamic world. Disease, including cancer, was viewed in terms of the four Greek bodily fluids (Humors)—blood, phlegm, yellow bile, and black bile.

During the second phase, by 850, most of the philosophical and scientific works of Aristotle; much of Plato and the Pythagorean School; the major works of Greek astronomy, mathematics and medicine as well as the works of Hippocrates and Galen, were all rendered into Arabic. For the next 700 years, Arabic became the most important scientific language of the world and the repository of much of the wisdom and the sciences of antiquity (Hitti, 1970; Saad et al., 2008b). During this golden age of the Arab-Islamic civilization, numerous scientific and medical innovations were introduced. Notably, the discovering of the immune system, the introduction of microbiological science, the introduction of scientific methods to medicine including animal tests, clinical trials, quantification and the separation of medicine from pharmacological science. For instance, the earliest known medical experiment was carried out by Rhazes (865 - 915). In his '*Comprehensive Book of Medicine*', Rhazes described clinical cases of his own experience and provided very useful recordings of various diseases. Avicenna's wrote almost 450 treatises on a wide range of subjects, of which around 240 have survived and 40 of them concentrate in medicine. Perhaps '*The Canon of Medicine*' is the most comprehensive and the best-known amongst them. It was a standard medical text in Europe and the Islamic world up until the 18<sup>th</sup> century. Avicenna and many other

Arab and Muslim scientists introduced numerous new ideas, upgraded the knowledge about herbs and their potential medical efficacy and safety (Said et al., 2010). Here we aim to shed a light on the Arab and Islamic cancer diagnosis, herbal treatment and nowadays herbal-based treatment research.

***Cancer diagnostic and treatment by the Arab and Islamic medicine:*** The most effective way for illness prevention according to Arab-Islamic belief is healthy diet. Prophet Mohammad (PBUH) said *“food is the source of illness; however the diet program is the source of health”*. The Holy Quran contains a verse which sums up all medicine: *“Eat and drink but do not be prodigal, He does not like/love the wasters”* (al-Ar'af 7:31).

Avicenna also had discussed the diet effect on cancer progression. In regard of cancer prevention he said that *“As to preventing its (cancer) progress, it can be achieved by ...” improving the diet and reinforcing the involved organ by the known effective medications”* It is well known nowadays that several chemicals are carcinogenic [figure1 and (Volanis et al., 2010)] and that obesity is a cause of various diseases including cancer (Brown and Simpson, 2010; Fuemmeler et al., 2009).

It is worth however to emphasize that Rhazes, Avicenna and Abulcasis identified several cancer types, including eye, nasal, tongue, stomach (gastric), liver, the urinary system, kidney, testis, and breast cancer, as well as spleen and nerve tumor. For instance, kidney's cancer was mentioned clearly, for the first time, by Al Zahrawi (Abulcasis 936 - 1013) who had distinguished between kidney acute inflammation and kidney cancer. Both; Rhazes and Avicenna described cancer as a tumor which is extremely difficult disease to treat.

Rhazes, Abulcasis and Avicenna realized that a cure is most likely if the cancer was identified at its earliest stage (Avi Senna, 1037; Rhazes, 925). The first goal of a treatment strategy should be to halt the cancerous growth. They suggested

surgical removal if the tumor was small and accessible, and not close to major organs (Figure 2). In his *Canon*, Avicenna described four ways to treat cancer: (a) total arrest (but it is difficult); (b) preventing its progress; (c) preventing ulceration; (d) treating of ulceration. He emphasized that medications should not be of much strength, since strong medications increase cancer evil. In addition, “one should avoid irritant medications. And for this, good medications are: pure minerals like washed pure tutty mixed with oils like rose oil and the oil of yellow gillyflower mixed with it” (Avi Senna, 1037). Avicenna also described one of the very early surgical treatments for cancer, in his *Canon*, he noted: “the excision should be radical and that all diseased tissue should be removed, which included the use of amputation or the removal of veins running in the direction of the tumor ... so that nothing of these will be left”. He also recommended the “use of cauterization for the area being treated if necessary”. Other citation by Avicenna “....and it was told by one of the predecessors that a physician had excised a cancerous breast radically then cancer developed in the other breast. My opinion is that the second breast might have been on its way to cancerization (a dormant cancer) which fits this case and it is possible to be a spread of the material (cancerous from the first breast) and this is more evident (opinion)...”. Avicenna also attempted the earliest known treatments for cancer. One method he discovered was the "Hindiba" (*chicorium intybus*), an herbal compound drug which Ibn al-Baitar later identified as having anticancer properties and which could also treat other tumors and neoplastic disorders (AlTurkimany, 1993; Hitti, 1970; Ibn AlBitar, 1874; Saad et al., 2008b).

***Prevention and treatment of cancer in the Greco-Arab and Islamic herbal medicine:*** Herbal-based preparations have been used worldwide for thousands of years to treat various forms of diseases including cancer. Currently, chemoprevention represents a novel approach for controlling cancer, which involve the use of specific natural products or synthetic chemical agents to reverse,

suppress or prevent pre-malignancy before the development of invasive cancer. Several natural products, such as, grains, nuts, fruits, vegetables and medicinal plants confer protective effects against wide range of cancers. Since diet has an important role in the body health, dietary chemoprevention received attention in the Arab-Islamic treatment of diseases including cancer. The Holy Quran states several plants as well as animal products among the foods Muslims can enjoy and benefit from their nutritional and health values. Among some of the foods mentioned in the Holy Quran and Hadith by the Prophet (PBUH) are grapes, citrus, melon, squash, figs dates, honey, olive oil, and black seeds. The Prophet (PBUH) mentioned figs and then stated, *"If I had to mention a fruit that descended from paradise I would say this is it because the paradisiacal fruits do not have pits...eat from these fruits for they prevent hemorrhoids, prevent piles and help gout."* Figs are a top source of fiber, as well as potassium and vitamin B6. Fiber results in bulkier stools, which lessen the incidence of constipation, hemorrhoids and colon cancer. Melon was among one of the fruits most often eaten by the Prophet (PBUH). In fact, melon is one of the best recommendations for health the Prophet has given us. Melon is one of the few fruits and vegetables rich in vitamin C, Beta-Carotene, and potassium. He recommended the use of olive oil, by a statement *"Eat olive oil and massage it over your bodies since it is a holy (Mubarak) tree"*. Black seeds were regarded as a medicine for that cures all types of diseases. The Prophet once stated, *"The black seed can heal every disease, except death"*. Dates are mentioned in twenty places in the Quran. Prophet (PBUH) is reported to have said: *"if anyone of you is fasting, let him break his fast with dates. In case he does not have them, then with water. Verily water is a purifier"*.

Avicenna had mentioned also that *"it (cancer) can be reached by controlling the material, improving the diet and reinforcing the involved organ by the known effective medicines, and by using mineral smears like those containing millstone dust and whet-stone dust and from smears taken from a mixture between the stone*

*pounder for aromatics and black head stone moisturized with rose oil and coriander water....".*

Due to place limitations we will focus on six widely used herbal products, namely, garlic, onion, black seeds, pomegranate, grapes and Palestinian arum. Other commonly used medicinal plants and wild edible plants are described in (Zaid et al., 2010).

**Garlic and onion (*Allium sativum L. and Allium cepa*):** The Prophet Mohammad said “*although onion and garlic have a bad smell, they are cures for 70 different illnesses that cannot be cured by any other means*”. Onion (*Allium cepa*) and garlic (*Allium sativa*) are closely-related vegetables that belong to the *Allium* class of bulb-shaped plants, which also includes chives, leeks, and scallions. Garlic is used for flavoring in cooking and is unique because of its high sulfur content. In addition to sulfur, garlic also contains arginine, oligosaccharides, flavonoids and selenium, all of which may be beneficial to health (Milner, 1996). In fact onion and garlic are used in the treatment and prevention of a number of diseases, including cancer, heart disease, obesity, hypercholesterolemia, diabetes type 2 and hypertension. Scientific research on garlic started in the 19<sup>th</sup> century with the work of Louis Pasteur who in 1858 first noted antibacterial properties of garlic (Pasteur, 1858).

The association between consumption of *Allium* vegetables and risk for cancer has been first assessed in several epidemiologic studies, to show the protective effect of garlic and onion against cancer. For instance, death (attributed to stomach cancer) was 10 fold higher in a high risk area where the garlic consumption is less than 1g/day compare to the low risk area (20 g/day) (Mei et al., 1982; Takezaki et al., 1999). Similar studies in Netherlands had also attributed the low risk for colorectal, breast, and lung cancers to onion and garlic consumption (Dorant et al., 1996).

Findings from a study on the association between garlic consumption and colon cancer risk, shows clearly that women who consumed the highest amounts of garlic had a 50 percent lower risk of cancer of the distal colon compared with women who had the lowest level of garlic consumption (Steinmetz et al., 1994). Moreover, breast cancer risk was reduced in women consuming greater amounts of fiber garlic, and onions (Challier et al., 1998). Garlic and onion consumption was also associated with reduced risk of esophageal and stomach cancers, with greater risk reductions seen for higher levels of consumption (Gao et al., 1999), an approximately 30-50 percent reduction in prostate cancer risk (Colli and Amling, 2009; Hsing et al., 2002), pancreatic cancer (Chan et al., 2005) and other distinct cancer types (Kim and Kwon, 2009). The amount of garlic consumed on the above studies varied from 2 up to 20 g daily. It is worthy to note that although garlic has been used safely in cooking, excessive consumption can cause some side effects, in addition to strong breath and body odors (Boon and Wong, 2004). The World Health Organization (WHO) guidelines for general health promotion for adults is a daily dose of 2 to 5 g of fresh garlic (approximately one clove), 0.4 to 1.2 g of dried garlic powder, 2 to 5 mg of garlic oil, 300 to 1,000 mg of garlic extract, or other formulations that are equal to 2 to 5 mg of allicin (the active compound in garlic). The protective effect of *Allium* vegetables against tumor proliferation and angiogenesis is attributed mainly to its organosulfur compounds especially allicin and diallyl disulfide (Arnault and Auger, 2006). Those active compounds are able to block the formation of cancer-causing substances (Shenoy and Choughuley, 1992), halt the activation of cancer-causing substances (Milner, 2001; Powolny and Singh, 2008), enhance DNA repair (L'Vova G and Zasukhina, 2002), reduce cell proliferation, or induce apoptosis -programmed cell death (Figure 1 and (Arnault and Auger, 2006; Malki et al., 2009)).

Onion and garlic organosulfur compounds protective effect against carcinogenesis was also evaluated in animal models and in-vitro. When administrated to mice 2-4

days prior to carcinogen challenge, those compounds inhibited pulmonary adenoma formation (Sparnins et al., 1988). Intravenous administration of the garlic active compound (diallyl trisulfide) significantly retarded the growth of orthotopically transplanted hepatoma in BALB/c nude mice (Zhang et al., 2007). Those compounds had also halted the proliferation of cells from various cancer cell lines, including human, lung, skin and colon tumor cell lines, human neuroblastoma cells, human and murine melanoma cells, and human prostatic carcinoma cells (Sakamoto et al., 1997; Sundaram and Milner, 1996; Takeyama et al., 1993; Welch et al., 1992).

**Black seeds (*Nigella sativa*):** *Nigella sativa* is one the most revered medicinal seeds in history. In civilizations around the world, herbal spice *Nigella Sativa* referred to as Habbat-el-barakah (literally seeds of blessing in Arabic), Kalonji (Hindi), Kezah (Hebrew), Sijah Daneh (Persian) and in English called Black Caraway. The famous Greek physician Dioscorides (40-90 AC) used black cumin seeds to treat headaches and toothaches. *Nigella sativa* seeds and oil extracts has been used widely for centuries to treat interruptions in the respiratory system, stomach, kidney and liver function, circulatory, the immune system as well as cancer. In Islam, it is regarded as one of the greatest forms of healing medicine available (Zohary and Hopf, 2007). The prophet Mohammad (PBUH) stated, "*The black seed can heal every disease, except death*". Avicenna refers to black seed in his 'Canon of Medicine', as the seed that stimulates the body's energy and helps recovery from fatigue and dispiritedness. In the Unani Tibb system of medicine, seeds are regarded as a valuable remedy for a number of diseases. The seed's oil has been used to treat skin conditions such as eczema and boils and to treat cold symptoms.

The modern research confers that *Nigella sativa* seeds ethanol extract possess antitumor activity in mice tumor primary cells (Musa et al., 2004). *Nigella sativa* seeds extracts contains amino acids, proteins, carbohydrates, alkaloids, saponins,

fixed and volatile oils, and many others. Among the volatile oil, Thymoquinone (TQ) is the main active compound (Ghosheh et al., 1999). TQ affects multiple targets, including suppression of, anti apoptotic genes expression and thus enhances apoptosis induction (Kaseb et al., 2007). Moreover, TQ inhibited cell proliferation of many types of cancer cell lines, including breast adenocarcinoma, ovarian adenocarcinoma (Shoieb et al., 2003), human pancreatic adenocarcinoma, colorectal cancer (Gali-Muhtasib et al., 2004a), uterine sarcoma (Worthen et al., 1998), human osteosarcoma (Roepke et al., 2007), neoplastic keratinocytes (Gali-Muhtasib et al., 2004b) and fibrosarcoma, lung carcinoma (Kaseb et al., 2007). More recently, it was reported that TQ blocks tumor angiogenesis in vivo (mouse model) and in vitro (human umbilical vein endothelial cell -HUVEC) (Yi et al., 2008).

**Pomegranate (*Punica granatum*):** The pomegranate has long been used in traditional Greco-Arab and Islamic medicine to treat a variety of ailments, including sore throat, inflammation and rheumatism. The fruit is also used for treating bladder disturbances, strengthening gums and soothing mouth ulcers. Pomegranates feature prominently in all religions Islam, Judaism, Christianity, Buddhism and Zoroastrianism. According to the Quran, pomegranates grow in the gardens of paradise. Among the small number of fruits and vegetables mentioned in the Quran, (including date, olive, grape, banana, fig, cucumber, garlic, lentil and onion) pomegranate is mentioned three times, indicating its significance in Muslims life.

The pomegranate fruit has been used for centuries in ancient cultures for medicinal purposes. For a long time, the fruit has been widely consumed fresh and, more recently, in beverage form as juice. Pomegranate is known as an anti-oxidant and is used to treat several diseases including cancer, inflammation, cardiovascular disease, diabetes, bacterial infections and antibiotic resistance, as well as ultraviolet

radiation-induced skin damage (Jurenka, 2008; Lansky and Newman, 2007). However, most of the research groups has focused on its antioxidant, anti-inflammatory and anticarcinogenic properties.

It is now well documented that pomegranate is effective in treating prostate cancer. In in-vitro experiments, Pomegranate fruit extract decrease proliferation and induced apoptosis of DU-145 prostate cancer cells and suppressed invasive potential of PC-3 cells. These effects may be associated with plant based anti-inflammatory effects (Lansky et al., 2005; Malik and Mukhtar, 2006). Moreover, Mukhtar and his colleges reported that oral administration of Pomegranate fruit extract resulted in significant inhibition of tumor growth in prostate tumor model mice (Malik and Mukhtar, 2006). Pomegranate fruit extract was also effective in inhibition of lung tumorigenesis in mice (Khan et al., 2007), suggesting that consuming pomegranates could potentially help reduce the growth and spread of prostate and lung cancer cells or even prevent cancer from developing. Pomegranate juice was also effective in inhibition of inflammatory cell signaling in colon cancer (Adams et al., 2006).

The pomegranate anticancer activities is not limited to its juice, but also the peel and seeds oil have been shown to be effective against tumor cell proliferation, cell cycle, invasion and angiogenesis (Lansky and Newman, 2007). Concomitant, pomegranate seed oil suppressed colon carcinogenesis in mice (induced by azoxymethane) (Kohnno et al., 2004). The anti-carcinogenic effects of the different parts and compounds of the pomegranate, is describes elsewhere (Lansky and Newman, 2007; Syed et al., 2007).

**Grapes (*Vitis vinifera*):** Grapes exerts several health benefits including but not limited to anti-inflammatory and anti-cancer effects, prevent lipid oxidation and platelet aggregation. The main active compound in grapes is polyphenol compound; Resveratrol. Resveratrol is believed to decrease circulating LDL (low-

density lipoprotein) cholesterol levels and thus reduce cardiovascular disease risk. (Ramprasath and Jones, 2010). Grapes and many other fruits and vegetables are rich in antioxidant compounds called flavonoids. They're among the plant chemicals that have also shown potential against heart disease. Flavanoids as well as the whole black grape (including seeds) were shown to inhibit key enzymes in the tumorigenic cell, thereby inducing apoptosis and or stopping their growth (Durak et al., 2005; Jo et al., 2006). In Rats, grape seeds extracts (proanthocyanidins) reduced the ulcerative colitis progress which is known to significantly increased risk of colorectal cancer (Li et al., 2008).

**Palestinian Arum (*Arum palaestinum*):** Arum is edible plant and is widely used in cooking. According to a general survey conducted on 2008, Palestinian Arum is one of the most known as anti cancerous (especially colon cancer) plants in Palestine (Ali-Shtayeh et al., 2008). Moreover, *Arum Plasetenum* is also effective against internal bacterial infections, poisoning and circulatory system. However, the action mechanism of Palestinian Arum awaits further studies.

***The wisdom of the past led to the discovery of chemopreventive drugs-*** The past medical literature is a valuable source of information which has the potential suggestions to the contemporary scientists. Several studies have revealed that natural products exhibit an extensive spectrum of biological activities such as, stimulation of the immune system, antibacterial, antiviral, anti-hepatotoxic, anti-ulcer, anti-inflammatory, antioxidant, anti-mutagenic, and anti-cancer effects (Al-Johar et al., 2008; Boon and Wong, 2004; Cragg and Newman, 2005; Saad et al., 2008a; Saad et al., 2008b). A variety of grains, cereals, nuts, soy products, olives, beverages such as tea and coffee, and spices including turmeric, garlic, ginger, black pepper, cumin and caraway confer a protective effect against cancer (Al-Johar et al., 2008; Boon and Wong, 2004; Challier et al., 1998; Chan et al., 2005;

Clifford and Digiovanni, 2010). Several studies have also documented the relationship between decreased cancer risk and high consumption of vegetables, including cabbage, cauliflower, broccoli, brussels sprout, tomatoes, and fruits such as, apples and grapes (Chan et al., 2005; Cragg and Newman, 2005; Saad et al., 2008b; Vainio and Weiderpass, 2006). In addition, a number of medicinal plants and herbs have also been reported to reduce the risk of cancer in multiple sites [Figure 1 and (Kroll et al., 2007; Park and Pezzuto, 2002)].

Traditional herbal medicines provide a remarkable source for new drug development. Indeed, about 50% of the modern drugs are herbal based (Harvey, 2008). Since natural based products are inherently better tolerated in the body compared to synthetic chemicals and have higher chance to be approved as new drugs, searching for and purification of natural drug candidates is imperative. In the case of anti cancer drugs, various drugs are derived from plant sources including but not limited to paclitaxel (taxol), vinblastine, capsaicin, vincristine, the camptothecin derivatives, topotecan, irinotecan and etoposide [table 1 and (Butler and Newman, 2008; Cragg et al., 2009; Cragg and Newman, 2005; Saklani and Kutty, 2008)]. Many commonly used anti-cancer herbs possess chemopreventive effects within their diverse pharmacological properties. Since cancer evolves over a long period of time, agents that inhibit or retard one or more of its stages could affect the overall course of the disease. Certain micronutrients (like Oleuropein and Diallyl sulfide compounds found in olives and garlic respectively) possess potent cancer-preventive abilities.

The current emphasis should be laid on identification the action mechanism of the plant-based drugs on cancer prevention and treatment and combining this remedy with modern developments in medicine. For instance, combination of the Baby Birth plant (*Gypsophila paniculata* L.) with the saponins based chemotherapy increase the sensitivity of the tumorigenic cells for the chemotherapy drugs treatments several ten folds *in vitro* and *in vivo* animal models (Weng et al., 2009).

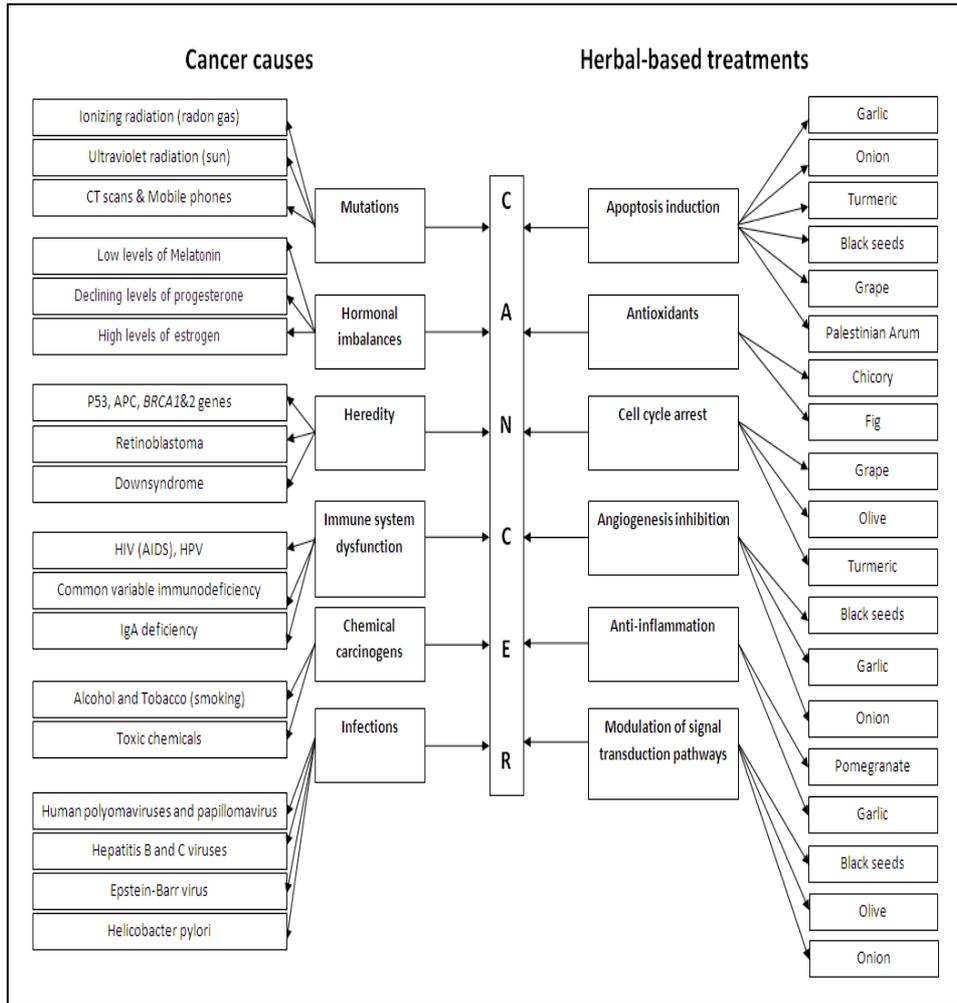
### Concluding remarks

There is no doubt that Avicenna, Rhazes and Al-Zahrawi influenced the field of cancer medicine and the principles laid down by them were recognized as authentic in medical science, especially surgery, and these continued to influence the medical world for five centuries. Despite the rapidly increasing understanding of the molecular and cellular processes, such as gene and protein expression, apoptosis, angiogenesis, signal transduction involved in carcinogenesis, the morbidity of this epidemiologic disease is still rising. In fact, cancer epidemiology is just increasing every day and it has revealed that certain cancers are more common among people of some cultures than others. Cancers of the lung, colon, prostate and breast are very common in Western countries; they are not as prevalent in Eastern countries. Yet, the prevalence of cancer in the current Arab-Islamic countries is in an increase mode. The best ways for cancer treatment is preventing its causes (Figure 1) and diagnose it at earlier stages as state earlier. Yet we still need to continue searching for the most effective anti-cancerous drug as the Prophet (PBUH) stated: “*The one who sent down the disease sent down the remedy*”. Several drugs are used to treat and prevent the development of tumorigenesis. However, these treatments are not always effective and usually are accompanied with side effects. Alternative treatment, e.g. herbal plants might be a potential safe candidate for use and treatment of several diseases including cancer. Several studies have been conducted *in vivo* and *in vitro* to evaluate herbal plants efficacy on carcinogenesis treatment.

**Table1.** Selected natural derived chemicals used in divers diseases remedy including cancer.

<b>Drug and Source</b>	<b>Activity</b>	<b>Mechanism</b>
Betulinic acid from the bark of several species of plants, principally the white birch ( <i>Betula pubescens</i> )	Inhibitor of human melanoma, anti-retroviral, anti-malarial, and anti-inflammatory	Antiproliferative and apoptosis-inducer
Camptothecin from Happy Tree ( <i>Camptotheca acuminata</i> )	Treats lung, breast, ovarian, and colorectal cancer	Inhibits the DNA enzyme topoisomerase I leading to apoptosis
Capsaicin from Pepper ( <i>Capsicum</i> )	Anti- carcinogenic and anti-tumor promotion effects. Relieve the pain of peripheral neuropathy, itching and inflammation (Psoriasis)	Interacts with sensory neurons, binds to a receptor called the vanilloid receptor subtype1 (VR1)
Curcumin from Turmeric ( <i>Curcuma longa</i> )	Multiple myeloma, pancreatic cancer, myelodysplastic syndromes, colon cancer, psoriasis, and Alzheimer's disease treatment	Antitumor, antioxidant, antiarthritic, anti-amyloid, anti-ischemic and anti-inflammatory
Etoposide from Mandrake ( <i>Mandragora</i> )	Lung cancer, testicular cancer, lymphoma, non-lymphocytic leukemia	Inhibits the enzyme topoisomerase II, causing DNA strands to break
Irinotecan from Happy Tree ( <i>Camptotheca acuminata</i> )	Colon and rectum cancer	Inhibits the DNA enzyme topoisomerase-I, causes DNA damage and apoptosis

<b>Drug and Source</b>	<b>Activity</b>	<b>Mechanism</b>
Lapachol from Trumpet tree ( <i>Tabebuia sp.</i> )	Anti-several types of cancer. Nowadays is rarely used due to its toxic side effects	It is a derivative of naphthoquinone, related to vitamin K.
Paclitaxel (Taxol) from Pacific yew ( <i>Taxus brevifolia</i> )	Treating ovary and breast cancer	Interferes with the growth of cancer cells and slows their growth and spread in the body
Podophyllotoxin from mayapple ( <i>Podophyllum peltatum</i> )	Anti- lung cancer, lymphomas, and genital tumors	Arrest the cell cycle by inhibition of tubulin polymerization
Topotecan from Happy Tree ( <i>Camptotheca acuminata</i> )	Treating ovarian or lung cancer that do not respond well to other types of cancer treatment	Inhibits the DNA enzyme topoisomerase I, leading to DNA damage and apoptosis
Vinblastine from Madagascar periwinkle plant ( <i>Catharanthus</i> )	Treat some types of lymphoma, Hodgkin's disease, testicular cancer, breast cancer, choriocarcinoma and others	Interferes with the growth of cancer cells, slows their growth and spread in the body
Vincristine from Madagascar Periwinkle ( <i>Catharanthus roseus</i> )	Treats leukemia, diabetes, malaria, and Hodgkin's disease	It binds tubulin, thereby inhibiting the assembly of microtubules thus prevent separation of chromosomes during mitosis
Epothilone from <i>Sorangium cellulosum</i> bacteria	Currently undergoing clinical development for treatment of various cancers	Inhibition of microtubule function therefore stops cells from properly dividing



**Figure1.** Summary of the potential Cancer causes and the possible cellular targets of the herbal anti cancer derived drugs and extracts.



Figure 2. Some of the 200 surgical instruments introduced by AlZahrawi.

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## معالجة السرطان بالطب العربي – الإسلامي

### الموروث الطبي العربي والتجارب العلمية الحديثة

#### تلخيص:

السرطان هو عبارة عن مجموعة أمراض ناتجة عن خلل في موت الخلية المبرمج، فقدان السيطرة على نمو الخلايا، الانبثاث (نمو ثانوي للورم) أو تكوين الأوعية الدموية غير المنظم. وقد تم خلال الخمسة عقود الأخيرة تطوير أدوية كيميائية لإصلاح هذه الأضرار وعلاج مرض السرطان. اللافت للنظر، هو أنّ العصارات والأدوية المستخلصة من النباتات الطبيّة (بضمنها النباتات الطبيّة الإسلامية-العربية) تقي وتعالج مرض السرطان بواسطة تعديل الخلل الخلوي المذكور آنفاً.

وصف ابن سينا والرازي معظم أنواع السرطانات المعروفة في عهدهم وأدخلوا عدة طرق لعلاجها بالاعتماد على اعتقادهم بأنّ السبب الرئيسي هو إنتاج كمّية فائضة من العصارة السوداء (النكد) المحروقة في العضو المصاب. لذلك عالجوا المرضى بواسطة تفريغ العضو المصاب من هذه العصارة بواسطة تقيؤ مفرط، مسهّلات واستعمال الأدوية والأغذية المبرّدة. أدرك العالم الأندلسي، الزهراوي، أنّ السرطان قابل للاستئصال فقط في مراحل نموّه المبكرة وكان أول من قام بعملية استئصال الورم السرطاني من الثدي، وقد ابتكر أكثر من 200 أداة جراحية.

هذا البحث يتناول طرق علاج السرطان في الحضارة الإسلامية – العربية التي طوّرها أشهر العلماء العرب والمسلمون، خاصةً: ابن سينا (980-1037م)، الرازي (965-1015م)، الزهراوي (936-1013م) وابن النفيس (1218-1288م). كما سلّقى الضوء على مسببات السرطان، طرق الوقاية والعلاج بالنباتات الطبيّة، الأغذية الصحيّة الوقائية وبعض الآيات القرآنية والأحاديث النبوية في هذا المجال.