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A review of Anticancer Properties of Herbal Medicines

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Abstract

There are tremendous reserves of organic compounds found in many plants on Earth that only a very small amount of which as an anti-cancer compounds tested and used. Worldwide endeavors are underway to discover new anti-cancer drugs. Nowadays, there is a proclivity to use of traditional and herbal medicines in cancer treatment. The omission of this paper aimed to investigate the medicinal plants which are endemic in many parts of the world and were used for the treatment of various cancers. The evaluated plants and consequently appropriated ones that are used in cancer treatment as well as metabolites that are extracted from which would be useful to scholars around the world.

Keywords: Carcinogenic; Anti cancer; Herbal drugs; Medicinal plants; Apoptosis

Introduction

Cell growth and proliferation considered as cell division and this process must be controlled very closely, so that cells, tissues and organs do their job properly. When cells begin to multiply, their high-speed and uncontrolled results could be disastrous. Before a cell division process to begin during semiconservative replication process on DNA molecules, a copy of one strand is made and then each one in turn is transmitted to daughter cells that are similar to each other genetically. Hundreds of different proteins are involved in cell division and some of them inform you when cells divided and when did not. Some of them bear responsibility for monitoring copying DNA to be done correctly. But most of them which are involved in the process of cell division are responsible for pulling the chromosomes toward the poles of the cells were doubled. Uncontrolled cell division may be attributed to several reasons. But, generally, it is related to one or a number of damaged genes due to uncontrolled cell division. For example, exposure to cigarette smoke or ultraviolet radiation may cause uncontrolled cell division. The damaged cells begin to divide and produce an anomalous mass called a tumor [1]. Cancer is the uncontrolled growth of eccentric cells in the body and is considered today as a humanitarian disaster and deaths caused by it is steadily rising. It seems that new strategies are needed to prevent and cure cancer. In cancer management and treatment, control and survival of cell is important. Anticancer agents must be able to destroy cancer cells while limiting side effects on healthy cells so that these cells have not undergone apoptosis. Apoptosis can be defined as the programmed death of cells in diseased cells. This process is a series of morphological changes in the cell that including condensing and fast budding of cells, organs; which ones experienced apoptosis and also cell organelles that are well maintained. Induction of Apoptosis is one of the markers of anti-toxic and anti-cancer substances. Some natural substances such as metabolites extracted from plants using different mechanisms to induce apoptosis in cancer cells that are blocked. Some combinations of plant extracts such as vinca alkaloid compounds, podophyllotoxin and camptothecin in cancer treatment have been used. There are enormous resources of plants on earth that only very few of them have been used in cancer treatment in clinical trials. Nowadays, the most important approaches including chemotherapy, radiation therapy or surgery used for cancer treatment, could be successful, however, they have fundamental drawbacks. Chemotherapy has severe side effects on cells and can cause damage to healthy cells. Radiation therapy is effective in tumors that their location is specified exactly. Surgery is effective when the tumor location is well known and is not surrounded by sensitive tissues, such as brain tissue. In the heat hyperthermia approach tissue surrounding cancer cells damaged. In the era of Nanotechnology, nanoparticles have the ability to selectively bind to cancer cells and these cells are sensitive to light [2]. Herbal medicines include herbs, herbal substances and products, plants or a combination of plants before the discovery of new drugs have being used for more than thousands of years[3]. With the advent of the Industrial revolution and the introduction of new industrial medicine herbs using was forgotten for a long period of time [3].However, using new techniques reduced the obstacles in the way of natural compounds and now there is more interest in the use of natural ingredients in the pharmaceutical industry [4,5]. According to World Health Organization (WHO), 80% of people in the world using traditional treatment methods [6]. Sixty percent of the global medicines approved by food and agriculture organization of united nation (FAO), between 1984 to1994 have been extracted from natural ingredients especially herbs [7]. Among the 121 medicines for treating cancer, 90 medicines have been extracted from medicinal plants. According to a report among the 65 new drugs that have been recorded between 1981 and 2002, 48 of which derived from natural products, including: vinca alkaloid (vincristine-vinblastine-vindesine-vinorelbine), taxans compounds (paclitaxel-docetaxel), podophyllotoxin and compounds derived from it (topotecan-irinotecan), antracyclines compounds(doxorubicin-daunorubicin-epirubicin-idarubicin [8,9].(Table 1).

SNO	Metabolites	Extracted drugs
1	Vinca	Vincristine
2	Vinca	Vinblastine
3	Vinca	Vindesine
4	Vinca	Vinorelbine

5	Taxan	Paclitaxel
6	Taxan	Docetaxel
7	Podophyllotoxin	Topotechan
8	Podophylotoxin	Irinotechan
9	Anthracyclines	Doxorubicin
10	Anthracyclines	Daunorobicin
11	Anthracyclines	Epirubicin
12	Anthracyclines	Idarubicin

Table1: Plant drugs influenced in cancer treatment.

In 1959 the medicinal plants studying with the discovery of drugs; vinblastine and vinca compounds as well as the isolation of cytotoxic compounds such as podophyllotoxin began significantly. These findings prompted the National Cancer Institute in 1960 to collect their plants. The result has discovered new compounds with cytotoxic effects, such as taxan and kamptotoxines. It took 30 years for the drugs used in clinical trials [10] (Table 2).

SNO	Metabolites	Groups	Plant species	Type of cancer
1	Cucumin	Phenolic	Curcuma	Colorectal
2	Phenol	Phenolic	Ginger	Cancer
3	Resveraterol	Phytoalexin	Grapes	Breast
4	Genistein	Flavonoides		Leukaemia
5	Biocalein	Flavonoides	Shosiko	Hepatocellular
6	Hydroxystaurosporin	Alkaloid	Viscom album	Ovarian cancer
7	Lectine	Lectines		Cancer
8	Xanthorrhizol	Terpenoids	Curcuma	Cancer

Table 2: Extracted metabolites influence in different cancers.

Endemic anti- carcinogenic plants

Plant material is used for the treatment of malignant disease for a few hundred years. Phytochemical examination of plants that have a good history of use in the treatment of cancer in popular culture led to the isolation of compounds that have anti-cancer properties. Since late 1950, an extensive research on plants, microorganisms and marine animals by the National Cancer Institute (NCI) in the United States of America home began with a screening of the original application. Program was consistent screening for new compounds could be found everywhere in the animal kingdom or plant. Phytochemicals substances such as genistein in soybean help prevent prostate cancer [11]. Studies have shown that regular consumption of fruits and vegetables because of phytochemical compounds extracted from them inhibiting the activity of antioxidant and free radicals which in turn showing anti-cancer activities [12]. In Yemen, the local custom screening of native plants methanol extracted from some species including; Dendrosicyos socotrana, Withania aduensis, Withania riebeckii, Dracena cinnabari(dragon's blood tree) used as anti-cancer compounds, and Buxus hildebrandlii showed cytotoxic effects on tumor cells [13]. Metabolites extracted from plants Khaya senegalensis demonstrated anticancer effects [14,15]. Compounds extracted from the leaves of Shvagandha showed anti-cancer effects and this can be used as an anticancer drug [16]. Fruit of Vaccinium stamineum has effects against lung cancer and leukemia, respectively [17]. Metabolites derived from Vaccinia macrocarpon or blueberries have anti-cancer effects of breast, colon, prostate, lung, respectively [18]. Morinda citrifolia or berry Hindi has anticancer effects in both clinical and laboratory [19]. Alcoholic extract derived from Biorhythms sensitivum have anti-cancer activity in cancer development induced by Dalton ascites lymphoma cells and prevent the lifespan of mice with cancerous tumors where Ehrlich ascites cells increase [20]. Grains and fruits are a source of anti-cancer drugs [21]. Nymbolid as a triterpenoid extracted from Neem tree showed some anticancer effects on cancer cells [22]. Sap extracted from Baladhuri plants native to India by eliminating oxidative reactions showed its anti-cancer effects [23]. Extracts from two plants Linum persicum and Euphorbia cheradania that are native to Iran have shown anticancer effects [24]. Pomegranate extract has anti-cancer effect on breast cancer cells [25]. Brassinosteroids has a high potential in the production of anti-cancer drugs containing steroid hormones [26]. Careya arborea metabolites extracted from skin reduced cancer for a significant volume which induced by DLA cells [27]. Metabolites extracted from Tradescantia stem bark showed anti-cancer effects in mice [28]. Compounds extracted from Indigofera aspalathoides have anticancer effects [29]. Twelve plant species native to China that include Anemarrbena asphodeloides, Artemisia argyi or Chinese Artemisia, Commiphora myrrh, Duchesnea indica, Gleditsia sinessis, Ligustrum lucidum, Rheumpalmatum, Rubia cordifolia, Salvia chinesis, Scutellaria barbata, Uncaria rhichopilla, Vaccaria segetails have anticancer effects [30]. Phytochemical compounds belonging to the hypericum genus has the potential to combat cancer [31]. It has been proven that Sarris cernuss has anti-cancer effects on colon and breast cancer [32]. Antioxidant effects of gallic acid extracted from Phaleria macrocarpa native to Indonesia has been demonstrated [33]. Ginger is one of the ginger family's plants that are too broad around the world as a seasoning used in foods and beverages. Anti-cancer properties in spicy ginger are attributed to valenoides such as 6-zhyngerol and 6-paradol [34]. Methanol compounds extracted from five plants that are native to Iran has been proven to have anti-cancer properties. These plants include Galium mite, Ferula angulate, Stachys obtuscrena, Echinophora cinera, Circicum bracteosum [35]. Ginseng plant is used for a long time for drug purposes and currently there are many attentions for extracting anti-cancer metabolites too. [36]. Bioactive compounds that are extracted from fungi have the potential to prevent cancer [37]. Saponins extracted from Chinese clematis have shown significant anti-cancer effects on tumors in mice [38]. Embelin compounds such as 1,4 - benzoquinone derivative 5-0 ethyl embelin(1) and 5-0 methyl embelin are promising antimitotic and anti- cancer molecules [39]. Sesquiterpenes the class of naturally occurring molecules that are 15-carbon isoprenoid compounds. Those typically found on plants and marine life. They have therapeutic potential in decreasing the progression of cancer [40]. Platycodon proven that has anti-cancer properties [41]. The combination methanol extract of Dillenia pentagons seems to have anticancer effects against Dalton lymphoma [42]. Limonium Vulgare, Artemisia maritima and Salicornia europaea demonstrated anti-cancer effects. The extracts of Ononis spinosa, Trifolium fragiferum and Trifolium repen showed tumor growth inhibiting activities [43]. Methanol extracted from Ledum groelandicum retzius (Labrador tea) leaf twig extract showed

anticancer activity [44]. The anti-neoplastic activity of guduchi (Tinospora cordifolia) on Ehrlich ascities carcinoma was proved [45].

Conclusion and Future Challenges

Given that today more than 50% of drugs are derived from plants so it is crystal clear that natural resources, especially plants could be drastically used to find effective drugs for cancer treatment. There was been disagreement in the past that the use of natural resources, especially plants can be time-consuming. However, today using new techniques have been accelerated active plant compounds extraction and this in turn has been recycled medicinal plants. The rebirth of medicines that originated in plants especially ones used for cancer treatment and autoimmunity is remarkable. The number of herbal ingredients that have been used to treat cancer is not more than 60 combinations. Since there is little information about the usefulness and safety of plant production compared to products commonly consumed more research can improve the appropriate use of herbal preparations. There are some disadvantages in cancer treatment using chemotherapy, surgery and radiation therapy that make challenges in treatment for these methods. Chemotherapy often leaves severe adverse effects and can cause damage to healthy cells. Radiation therapy will be effective when the tumor position is well known. Surgery will be effective when tumor location and addition identified but, when sensitive tissues, such as brain tissue surrounding around it, is impossible. Therefore, a new approach in the treatment of cancerous tumors is unavoidable to comment. The use of gold nanoparticles and especially nanoparticles is increased targeting cancer cells. Therefore, investigating the use of these nanoparticles with plant metabolites as a new approach is recommended.

Conflict of interest

The author declares that there is no conflict of interest.

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