



Review Article

A Review on Herbal Medicine Used in Cancer Treatment

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ABSTRACT

Herbal medicine used traditionally from ancient times. it is used in treatment or prevention of various disease. Herbal drugs are harmless to human body and treat cancer. Some herbal drugs prevent chemotherapy or radiation therapy by treating cancer cell. Certain herbs enhance the effect of chemotherapy in a toxic way that leads to unwanted side effect the various herbal drugs cancer activity can be seen or accessed below like astragalus, dongquai, burdock root, ginger, aloe vera, turmeric, tea, Medicinal herbs and their derivative phytochemicals are being increasingly recognized as useful complementary treatments for cancer. A large volume of clinical studies has reported the beneficial effects of herbal medicines on the survival, immune modulation, and quality of life (QOL) of cancer patients, when these herbal medicines are used in combination with conventional therapeutics. We also report recent studies on the biochemical and cellular mechanisms of herbal medicines in specific tumor microenvironments and the potential application of specific phytochemicals in cell-based cancer vaccine systems. The effort has been put into the verification and upgrade of many traditional remedies or multiple-herb formulations, systematic, standardized research and the use of FDA regulatory protocols and defined clinical trials are still quite limited and need to be actively pursued.

INTRODUCTION

Cancer is an uncontrolled growth of abnormal cells anywhere in the body. These abnormal cells are called cancer cells, malignant cells, or tumor cells. These cells can enter the normal tissues of the body. Many types of cancer and abnormal cells that form cancerous tissue are also identified by the name of the abnormal tissue for example,

breast cancer, lung cancer, and skin cancer etc. When damaged or undamaged cells do not die and become cancer cells and show disintegration and uncontrollable growth - the number of cancer cells grows. Usually, cancer cells can break away from the original group of cells, move through the blood and lymph systems, and settle in other organs where they can repeat the uncontrolled growth cycle. If left untreated, cancer can lead to serious

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health complications and death. It can originate in almost any organ or tissue, including the skin, lungs, breast, colon, and blood (leukemia). Cancer develops due to genetic mutations that alter normal cell cycle regulation, leading to excessive cell division and resistance to cell death (apoptosis). These mutations can be caused by various factors, including genetic predisposition, environmental exposure (such as tobacco smoke, radiation, and carcinogenic chemicals), infections, and lifestyle choices like poor diet and lack of physical activity. [1,2]

Importance of Cancer Research and Its Impact on Global Health

Importance of Cancer Research

Cancer research is crucial for understanding the causes, prevention, diagnosis, and treatment of cancer. As cancer remains one of the leading causes of death worldwide, research efforts have played a pivotal role in improving survival rates and enhancing the quality of life for patients. Key reasons why cancer research is essential include [2,4]:

1. **Early Detection and Diagnosis** – Advances in screening technologies, such as mammography and liquid biopsies, allow for early cancer detection, significantly improving treatment success rates (**World Health Organization, 2023**).
2. **Development of Innovative Treatments** – Research has led to groundbreaking therapies, including targeted therapy, immunotherapy, and precision medicine, which provide more effective and personalized treatment options (**National Cancer Institute, 2024**).
3. **Understanding Risk Factors** – Epidemiological studies help identify lifestyle

and environmental risk factors, such as smoking, obesity, and exposure to carcinogens, guiding public health interventions.

4. **Improved Patient Survival and Quality of Life** – Cancer research has contributed to better supportive care, palliative treatments, and rehabilitation, ensuring that survivors live healthier lives.
5. **Reduction in Global Cancer Burden** – With growing investments in research, the global incidence of preventable cancers can be reduced through vaccines (e.g., HPV vaccine for cervical cancer) and lifestyle changes

Impact on Global Health

1. **Decreased Mortality Rates** – Research-driven advancements in early detection and treatment have significantly reduced cancer mortality in many countries (**American Cancer Society, 2023**).
2. **Economic and Social Benefits** – Effective cancer treatments lower healthcare costs and reduce the burden on families and healthcare systems.
3. **Health Equity and Accessibility** – Ongoing research supports the development of affordable and accessible cancer treatments, particularly in low- and middle-income countries.
4. **Global Collaboration** – International partnerships in cancer research enable the sharing of knowledge, leading to more effective cancer control programs worldwide.

Cancer Biology and Pathophysiology: Mechanisms of Carcinogenesis



Cancer is a complex group of diseases characterized by uncontrolled cell proliferation, resistance to apoptosis, and the ability to invade and metastasize. The process of carcinogenesis, or cancer development, involves multiple genetic, molecular, and cellular alterations that transform normal cells into malignant ones.

1. Mechanisms of Carcinogenesis

Carcinogenesis is a multistep process that includes initiation, promotion, and progression. These processes involve genetic mutations, epigenetic modifications, and alterations in cellular signaling pathways [5,6].

A. Genetic and Epigenetic Changes

- **Mutations in Oncogenes and Tumor Suppressor Genes**

- **Oncogenes (Gain of Function Mutations):** Mutations activate proto- oncogenes into oncogenes, leading to uncontrolled cell growth (e.g., *RAS*, *MYC*, *HER2*).

- **Tumor Suppressor Genes (Loss of Function Mutations):** Mutations in genes such as *TP53*, *RBI*, *BRCA1/2* remove critical cell cycle and apoptosis regulation.

- **Epigenetic Alterations**

- DNA methylation, histone modifications, and non-coding RNA changes can silence tumor suppressor genes or activate oncogenes without altering the DNA sequence.

B. Hallmarks of Cancer (Hanahan and Weinberg)

Cancer cells acquire biological capabilities through [7,8]:

1. Sustaining proliferative signaling (e.g., EGFR, RAS activation).
2. Evading growth suppressors (e.g., *TP53* inactivation).
3. Resisting cell death (e.g., overexpression of *BCL-2*).
4. Enabling replicative immortality (e.g., activation of telomerase).
5. Inducing angiogenesis (e.g., *VEGF* signaling).
6. Activating invasion and metastasis (e.g., epithelial-mesenchymal transition).
7. Deregulating cellular energetics (e.g., Warburg effect).
8. Avoiding immune destruction (e.g., PD-L1 overexpression).

C. Role of the Tumor Microenvironment (TME)

The TME consists of cancer cells, fibroblasts, immune cells, and blood vessels that support tumor progression by [9,10]:

- Supplying growth factors and cytokines.
- Promoting immune evasion through immunosuppressive cells (e.g., Tregs, MDSCs).
- Remodeling the extracellular matrix for invasion.

D. Metastasis and Tumor Progression

Metastasis occurs through a series of steps (Chaffer & Weinberg, 2011):



1. **Local Invasion** – Breakdown of the basement membrane.
2. **Intravasation** – Entry into the bloodstream or lymphatic system.
3. **Circulation** – Survival in the bloodstream, evading immune attack.
4. **Extravasation** – Exit from circulation into new tissue.
5. **Colonization** – Growth in a secondary organ.

Type And Classification of Cancer:

Cancer can be classified based on the tissue or cell type of origin into the following major categories [11,12,13]:

1. Carcinomas

- Origin: Epithelial cells (lining of organs and body surfaces)
- Examples:
 - Adenocarcinoma (glandular tissues, e.g., lung, breast, colon)
 - Squamous cell carcinoma (skin, esophagus, cervix)

2. Sarcomas

- Origin: Connective tissues (bones, cartilage, fat, muscles)
- Examples:
 - Osteosarcoma (bone)
 - Liposarcoma (fat tissue)
 - Leiomyosarcoma (smooth muscle)

3. Leukemias

- Origin: Blood-forming tissues (bone marrow, white blood cells)
- Examples:
 - Acute myeloid leukemia (AML)
 - Chronic lymphocytic leukemia (CLL)

4. Lymphomas

- Origin: Lymphatic system (lymph nodes, immune system)
- Examples:
 - Hodgkin lymphoma (Reed-Sternberg cells)
 - Non-Hodgkin lymphoma (various B-cell and T-cell types)

Herbal Medicine in Cancer Treatment:

Nowadays herbal medicine has played a major role in controlling the symptoms of cancer and treatment by reducing side effects. Other therapeutic drugs create apoptotic pathways through a variety of mechanisms and pathways to cancer cells.

Herbal medicines in the treatment of cancer In India, herbal medicines have been used for centuries to treat many different health problems. Includes plants or a mixture of herbs extracted to treat illness and encourage health. Herbal medicine is one of the most widely used medicines that are consistent and different for people who have cancer.

1. Astragalus

Astragalus is obtained from the dried root of Perennial herb of Astragalus membranaceus,



Angelica gigas, and Trichosanthes kirilowii which belongs to the family of Fabaceae. The chemical constituent of Astragalus is Polysaccharides, saponins, flavonoids, is flavonoids, sterols, and astragalosides are the major chemical components of A membranaceus roots. Extraction of SH003, a novel herbal medicine containing Astragalus membranaceus, Angelica gigas, and Trichosanthes kirilowii, showed the potential to act as an anticancer agent. SH003 inhibits the binding of vascular endothelial growth factor (VEGF) to its VEGF receptor 2 (VEGFR2; KDR) receptor, thereby inhibiting VEGF/VEGFR2 signaling and tumor endothelial cell migration, invasion and formation of the tube. This inhibits tumor angiogenesis [14,15].

2. Dong Quai:

Dong Quai is obtained from the root or root oil of Angelica sinensis belonging to the family of Apiaceae [16]. The chemical constituent of Dong Quai is phytosterols, polysaccharides, ligustilide, butylphthalide, cnidilide, isoenidilide, p-cymene, ferulate, and flavonoids. Dong quai exhibits estrogenic activity in vitro and stimulates proliferation of MCF-7 cells. Patients using this herb ask the doctor before taking this [17].

3. Burdock Root:

It is obtained from the species of Arctium lappa, the species A. minus and A. tomentosum. Burdock is a plant belonging to the Asteraceae family. The mucilage, sulfurous acetylene compounds, polyacetylenes and bitter guaianolide-type constituents are present in burdock root. Seeds contain arctigenin, arctiin, and butyrolactone lignans. Burdock seeds contain arctiin, which may have a protective effect against cancer. Preliminary research suggests arctiin converted into estrogenic and antiestrogenic compounds by intestinal bacteria. Burdock leaf may have Lappaol

F was shown to induce G (1) and G (2) cell-cycle arrest, induce cell [18,19]

4. Aloe Vera:

Aloes is obtained from the dried juice of the leaves of Aloe barbadensis Miller, known as Curacao aloes, Aloe perryi Baker, known as Socotrine aloes. Aloe ferox Miller and hybrids of this species with Aloe africana Miller and Aloe spicata Baker, known as Cape aloes, belonging to family Liliaceae. Active components with its properties: Aloe vera contains 75 potentially active constituents: vitamins, enzymes, minerals, sugars, lignin, saponins, salicylic acids and amino acids. Vitamins: It contains vitamins A (beta-carotene), C and E, which are antioxidants. It also contains vitamin B12, folic acid, and choline. The two fractions from Aloes that are claimed to have anticancer effects include glycoproteins (lectins) and polysaccharides [20,21].

5. Turmeric:

Turmeric is obtained from the dried rhizome of Curcuma longa Linn. (syn. C. domestica Valetton), belonging to the family Zingiberaceae. Turmeric contains 3-6% polyphenolic compounds, collectively known as curcuminoids, which is a mixture of curcumin, dimethoxy curcumin and bisdemethoxycurcumin. Curcuminoids, the main constituent of turmeric. Pure curcumin has more potent superoxide anion scavenging activity than dimethoxy curcumin or bisdemethoxycurcumin. cancer cell death without harming healthy cells. It does this through the suppression of an activation pathway, kappa B, which is linked to numerous diseases caused by inflammation, including cancer. Some recent studies indicate that curcumin has anti-cancer properties. When given to laboratory mice by mouth, turmeric was effective in preventing stomach, lung, colon, breast, and skin cancers [22,23].



6. Tea:

It contains the prepared leaves and leaf buds of *Theasinensis* (Linne) Kuntz, belonging to the family theaceae. The leaves are a rich source of caffeine (1-5%). It also contains theobromine and theophylline in small amounts. The color of the tea leaves is due to tannin (10-20% gallic acid). The aroma is caused by the presence of yellow oil. Tea leaves also contain protein, wax, resin and ashes. Another study conducted by the USDA in 2006 found that tea contains more than 700 different compounds, many of which were already known for their ability to fight disease. Among these compounds known to fight disease are polysaccharides, flavonoids, certain vitamins, and amino acids. All varieties of tea, including green, white, black, and long, were found to contain high levels of antioxidants, which are powerful anti-aging and antitumor agents. Tea has high levels of vitamin C, which is known to fight cancer-causing free radicals. Tea has a low glycemic index and has strong cleansing properties. Regular consumption of tea has long been associated with the prevention of diabetes and heart disease.[24]

CONCLUSION

For centuries, various plants (many systematized in traditional Chinese medicine) have been used as medicines and disease therapeutics. In most human many companies work on the pharmacological effects, usage, and the development into future medicines of herbs and derivative medicinal phytochemicals as anti-tumor and chemoprevention agents. Although considerable effort has been put into the verification and upgrade of many traditional remedies or multiple-herb formulations, systematic, standardized research and the use of FDA regulatory protocols and defined clinical trials are still quite limited and need to be actively pursued.

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