

A REVIEW ON AYURVEDIC ANTI-CANCER DRUG

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ABSTRACT

Schedule E1 is an important part of Drugs and Cosmetics Act (Government of India) that comprises the list of poisonous drugs from plant, animal and mineral origins to be consumed under medical supervision. Ayurveda, the world's oldest medicinal system has a list of drugs represented in schedule E1 that are used since thousands of years. This review reports the anti-cancer activities of fifteen toxic ayurvedic drugs from plant origin represented in Drugs and Cosmetics Act, 1U40. The information was collected from the various authentic sources, compiled and summarised. The plant extracts, formulations, phytoconstituents and other preparations of these drugs have shown effective activities against mammary carcinoma, neuroblastoma, non-small cell lung carcinoma, lymphocytic leukaemia, colorectal adenocarcinoma, Ehrlich ascites carcinoma, prostate adenocarcinoma, glioblastoma astrocytoma and other malignancies. They have various mechanisms of action including Bax upregulation, Bcl2 down regulation, induction of cell cycle arrest at S phase, G2/M phase, inhibition of vascular endothelial growth factors, inhibition of Akt/mTOR signalling etc. Certain traditional ayurvedic preparations containing these plants are reported beneficial and the possibilities of these drugs as the alternative and adjuvant therapeutic agents in the current cancer care have been discussed. The studies suggest that these drugs could be utilised in future for the critical care of malignancies.

Keywords: Anti-cancer, Ayurveda, Drugs and cosmetics act, Toxic medicinal plants.

INTRODUCTION

Cancer stands as the primary contributor to mortality, impacting over one-third of the global populace and constituting more than 20% of total fatalities. Various factors like tobacco use, viral infections, chemical exposure, radiation, environmental factors, and dietary habits contribute to cancer development. In China, conventional cancer therapies primarily involve surgery, chemotherapy, and radiotherapy, often complemented by alternative treatments.

Traditional remedies, especially plant-based therapies, have a longstanding history in cancer management. The 1U60s and 1U70s witnessed extensive research at Sandoz Laboratories in

Switzerland, leading to the discovery of etoposide and teniposide, efficacious agents against lymphomas, bronchial, and testicular cancers. These botanicals enhance the body's resilience to infections by stabilizing body temperature and fortifying tissues ¹⁻³.

Limitations of Modern Chemotherapy

Despite the advent of novel chemotherapeutic compounds, a significant drawback persists, manifested in adverse side effects during treatment. These compounds lack specificity, indiscriminately affecting healthy cells, thus inducing genomic instability^[4]. Notable among chemotherapy's adverse effects is alopecia in patients undergoing treatment. Additionally, Chemotherapy has been connected to bone marrow suppression. Patients may have a variety of adverse effects, such as nausea, vomiting, anorexia, diarrhea, oral mucositis, numbness, and fatigue. Gastrointestinal complications, nephrotoxicity, neuropathies, neurotoxicity, cardiotoxicity, and pulmonary toxicity pose challenges to effective chemotherapy ⁵⁻⁷.

Furthermore, prolonged chemotherapy usage may culminate in chemoresistance, rendering tumors refractory to treatment. This underscores the necessity for pharmacophores devoid of such deleterious effects in cancer management ⁸.

Understanding Cancer

Cancer encompasses a diverse range of diseases characterized by abnormal cell proliferation with the potential for invasion and metastasis. These conditions form a subset of neoplasms prevalent in the United States. Neoplasms, or tumors, denote clusters of cells undergoing uncontrolled growth, which may manifest as localized masses or diffuse infiltrates ^{9,10}.

Fundamental Characteristics of Tumors

All tumor cells exhibit six distinct hallmarks crucial for malignant transformation: Imperative signals regulating cellular growth and differentiation. Concurrent proliferation and evasion of growth-inhibitory signals. Evasion of programmed cell death or apoptosis. Infinite replicative potential through sustained proliferation. Promotion of angiogenesis to support tumor vascularization. Invasion and metastasis, enabling tumor dissemination to distant sites ¹¹⁻¹⁴.

Differentiating Between Normal and Cancerous Cells

Cancer cells diverge from their normal counterparts in several aspects, facilitating unbridled proliferation. Unlike normal cells, which differentiate to become specialized cell types, cancer cells

perpetuate continuous division. Additionally, cancer cells exhibit insensitivity to growth-regulating signals and evade apoptosis, a crucial mechanism for eliminating superfluous cells.

The interface between Ayurveda and modern medicine

The interface between Ayurveda and Modern medicine has grown more and more significant, particularly in the realm of drug discovery and development. Traditional knowledge of Ayurvedic medicinal plants serves as a valuable resource in the quest for novel therapeutics. There exists a strong correlation between historical herbal remedies and the derived drugs utilized in modern medicine. In the context of cancer treatment, Ayurvedic medicinal plants have long been utilized for their therapeutic potential. Thousands of years ago, Ayurveda utilized various medicinal plants to address symptoms associated with cancer, predating modern medicinal knowledge. Notably, plants like *Vinca rosea* and *Taxus* species were historically employed in cancer treatment. From these plants, compounds such as Vincristine and Paclitaxel were isolated, demonstrating potent anticancer properties¹⁵⁻¹⁷.

Prescription drugs and are frequently utilized in clinical settings.

The modes of operation of anticancer drugs derived from Ayurvedic medicinal plants often involve the modulation of signalling pathways. These drugs target oncogenes, tumor growth factors, cancer-promoting enzymes, and protein kinases, thereby exerting their anticancer effects.

Ayurvedic treatment

Ayurvedic treatments have garnered attention from researchers for their potential benefits in managing cancer symptoms and improving quality of life. Certain therapies, such as massage, have been found to reduce stress and induce relaxation. Similarly, meditation has shown promise in reducing stress levels, lowering blood pressure, and enhancing overall well-being. Studies suggest that yoga can enhance sleep among lymphoma patients and alleviate stress in individuals with breast or prostate cancer^{18,19}.

Ayurvedic medicine utilizes over 200 herbs and plants, some of them have been the focus of laboratory studies. Scholars have investigated the effectiveness of these ingredients, often testing them on animals to understand their potential therapeutic effects²⁰⁻²¹.

CONCLUSION

The quest for effective measures to mitigate the onset and progression of cancer remains paramount. Leveraging botanical extracts for the regulation or reversal of the carcinogenic process offers a viable alternative to orthodox allopathic remedies for disease prevention. Numerous botanicals have undergone scrutiny and are being studied clinically at the moment. to ascertain their tumoricidal attributes against diverse cancer types. Evidently, there are evolving methodologies encompassing, yet not confined to, cytotoxic methodologies, alongside the molecular modulation of cancer pathophysiology. These multifaceted strategies, transcending mere cell eradication, possess the potential to alter the cancerous phenotype. In contrast to singular constituents derived from natural reservoirs, a spectrum of plant-based derivatives has demonstrated efficacy in anticancer interventions. Efforts have been made to delineate the outcomes of chemopreventive agents. Ayurveda, emphasizing comprehensive disease management, presents a cost-efficient alternative to individual botanical isolates for cancer therapy. Botanicals find application in treating diverse maladies and dysfunctions within the Ayurvedic paradigm. The renowned treatises of Charaka Samhita and Sushruta Samhita trace back to approximately 1000 B.C., documenting the utilization of botanical agents in disease prophylaxis. Cancer, as delineated in Charaka and Sushruta Samhitas, is characterized as either inflammatory or non-inflammatory swelling, manifesting as either *granthi* (minor neoplasm) or *arbuda* (major neoplasm). Notably, *T. cordifolia* is acclaimed for its anti-inflammatory, anti-arthritic, and anti-allergic attributes. The anticancer efficacy of *T. cordifolia* has been corroborated in vitro investigations. Extracts of *A. paniculata* have exhibited anti-oncogenic potential.

Oral administration of *C. asiatica* extracts has demonstrated retardation of solid and ascitic tumor growth, alongside an extension of the overall lifespan of tumor bearing rodents. Additionally, turmeric has shown prowess in mitigating tumor cell invasiveness and metastatic spread in vitro. Rodents administered with *P. amarus* extracts orally exhibited prolonged survival and reduced tumor dimensions. Studies suggest that botanical derivatives harbor antitumoral properties devoid of adverse effects. Further research on botanicals and their derivatives may unveil potent anticancer agents sourced from the botanical realm.

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