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Anti-Cancer Agents and Species Identified with Properties

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Abstract

The Withania somnifera root extract's chemo preventive effect has been evaluated in a study on induced skin cancer in mice administering WS before and during exposure to the skin cancer causing agent 7, 12-dimethylbenz anthracene.

Keywords: Animals; Inhibition; Skin tumour; Cytoxic activity; Calotropis procera; Leukemia

Introduction

A significant decrease in incidence and average number of skin lesions was observe when compared to the control and standard groups. An in vitro study showed withanolides from Withania somnifera reduced the growth of cancer cells in human breast, central nervous system, lung, and colon cancer cell lines comparable to doxorubicin, which was used as standard drug [1]. Withaferin A was found more effective than standard drug doxorubicin. Withania somnifera has also been evaluated for its antitumor effect in urethane induced lung adenomas in adult male albino mice. The histological appearance of the lungs of animals protected by Withania somnifera extract was found similar to those observed in the lungs of control animals [2].

Methodology

The treatment of drug extract also reversed the adverse effects of urethane on total leukocyte count, lymphocyte count, body weight, and mortality. A significant increase in the life span and a decrease in the cancer cell number and tumour weight were noted in the tumour-induced mice after treatment with WS. These observations are suggestive of the protective effect of Withania somnifera in carcinogens [3]. Zingiber officinale ethanol extract was investigated to find out its antitumor effects in skin tumorigenesis model as shown in (Figure 1).

Pre-application of Zingiber officinale ethnol extract onto the skin of mice resulted in significant inhibition of 12-0-tetradecanoylphorbol-13-acetate (TPA)-caused induction of epidermal ODC, cyclo oxygenase, and lipoxygenase activities and ODC mRNA expression in a dose dependent manner. Pre-application of Zingiber officinale ethanol extract to mouse skin also resulted in a significant inhibition of TPAcaused epidermal edema and hyperplasia [4]. In prolonged time studies, topical application of Zingiber officinale ethanol extract thirty minute prior to that of each TPA application to 7, 12-dimethylbenz anthracene initiated mice caused a marked protection against skin tumour incidence its multiplicity [5].

Results

Ginger's natural bio-actives, specifically ginger extract and 6-gigerol, have also been investigated for their in vitro inhibition of two key aspects of colon cancer biology, cancer cell proliferation and angiogenic potential of endothelial cell tubule formation [6]. These active ginger constituents linked to a direct effect on cancer cells. Among other compounds, 6-gingerol was found more effective even at lower doses resulted in inhibition of endothelial cell tube formation. The suggested mechanism of action of Ginger extract on colon cancer cells may be its suppression and arresting the G0/G1-phase, reducing DNA synthesis and inducing apoptosis. Plants namely Azadirachta indica, Boesenbergia pandurata, Coscinium fenestratum were extracted with 95% ethanol and tested for cytotoxic effects [7]. The results showed that three plants, A. indica, B. pandurata, and C. fenestratum, exhibited high cytotoxic activity against the Hep2 cell lines at a minimum concentration of 0.05% in ethanol extract [8]. In addition, C. fenestratum demonstrated the most potent cytotoxic extract based on its lowest IC50. All of these extracts resulted in a reduction of cell proliferation of Hep2 cells at four and eight hour's incubation. When incubated for eight hour, Azadirachta indica and B. pandurata resulted in 95% inhibition of cell proliferation, while C. fenestratum provided 80% inhibitions respectively [9]. Calotropine, a glycoside present in Calotropis procera has shown anti tumor activity against human

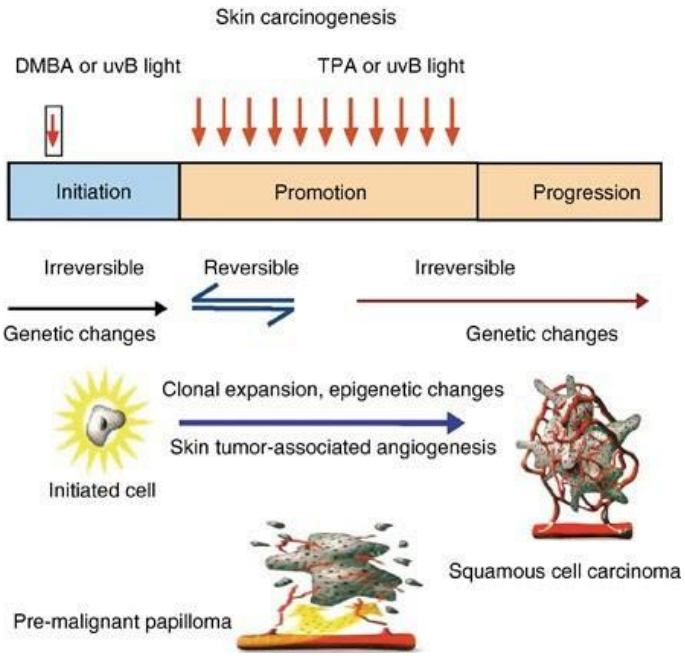

Figure 1: Skin tumourigenesis.

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epidermoid carcinoma cells of rhinopharynx in vivo studies. Calotropis procera inhibited the growth of cells and mitotic activity in a dose-dependent manner in vitro. Ellipticine, an indole alkaloid isolated from Ochrosia ellipitica, is a potent topoisomerase inhibitor. Curcumin, the active constituent of Curcuma domestica, has potent anticancer activity in animal models [10]. Homo-harringtonine, an alkaloid from Cephalotaxus homoharringtonia, when combined with cytarabine, has shown activity in chronic myelogenous leukemia in a study 105 patients received continuous infusion of homoharringtonine 2.5 mg/kg/m2/day plus subcutaneous cytarabine 15 mg/kg/m2/day for five weeks.

Discussion

L-Canavanine isolated from Medicago sativa and Canavalia esniformis, has shown significant antineoplastic activity in animal models bearing carcinoma and cancer cell lines. Cancer is one of the leading causes of death and globally the numbers of cases of cancer are increasing gradually [11]. There are several medicines available in the market to treat the various types of cancer but no drug is found to be fully effective and safe [12]. The major problem in the cancer chemotherapy is the toxicity of the established drugs. However plants and plant derived products have proved effective and safe in the treatment and management of cancers. These days most of the research work on cancer drugs is targeted on plants and plants derived natural products [13]. Many natural products and their analogues have been identified as potent anti-cancer agents and day by day the anti-cancer property of various plants is being identified as shown in (Figure 2).

Here an attempt is being made through this review to highlights the natural products and their analogues established as anti-cancer agents and the new plant species identified with anti-cancer properties either in vivo or in vitro [14]. Cancer is a major public health burden in both developed and developing countries [15]. It is an abnormal growth of cells in body that can lead to death. Cancer cells usually invade and destroy normal cells. These cells are born due to imbalance in the body and by correcting this imbalance, the cancer may be treated. Billions of dollars have been spent on cancer research and yet we do not understand exactly what cancer is.

Conclusion

Every year, millions of people are diagnosed with cancer, leading to death. According to the American Cancer Society, deaths arising from cancer constitute 2–3% of the annual deaths recorded worldwide. Thus cancer kills about 3500 million people annually all over the world. Several chemo preventive agents are used to treat cancer, but they cause toxicity that restricts their usage. Cancer begins with mutations in DNA, which instructs the cells how to grow and divide. Normal cells have the ability to repair most of the mutations in their DNA, but the mutation which is not repaired and causing the cells to grow becomes cancerous. Environmental factors which, from a scientist's standpoint, include smoking, diet, and infectious diseases as well as chemicals and radiation in our homes and workplace along with trace levels of pollutants in food, drinking water and in air. Other factors which are more likely to affect are tobacco use, unhealthy diet, not enough physical activity, however the degree of risk from pollutants depends on the concentration, intensity and exposure.

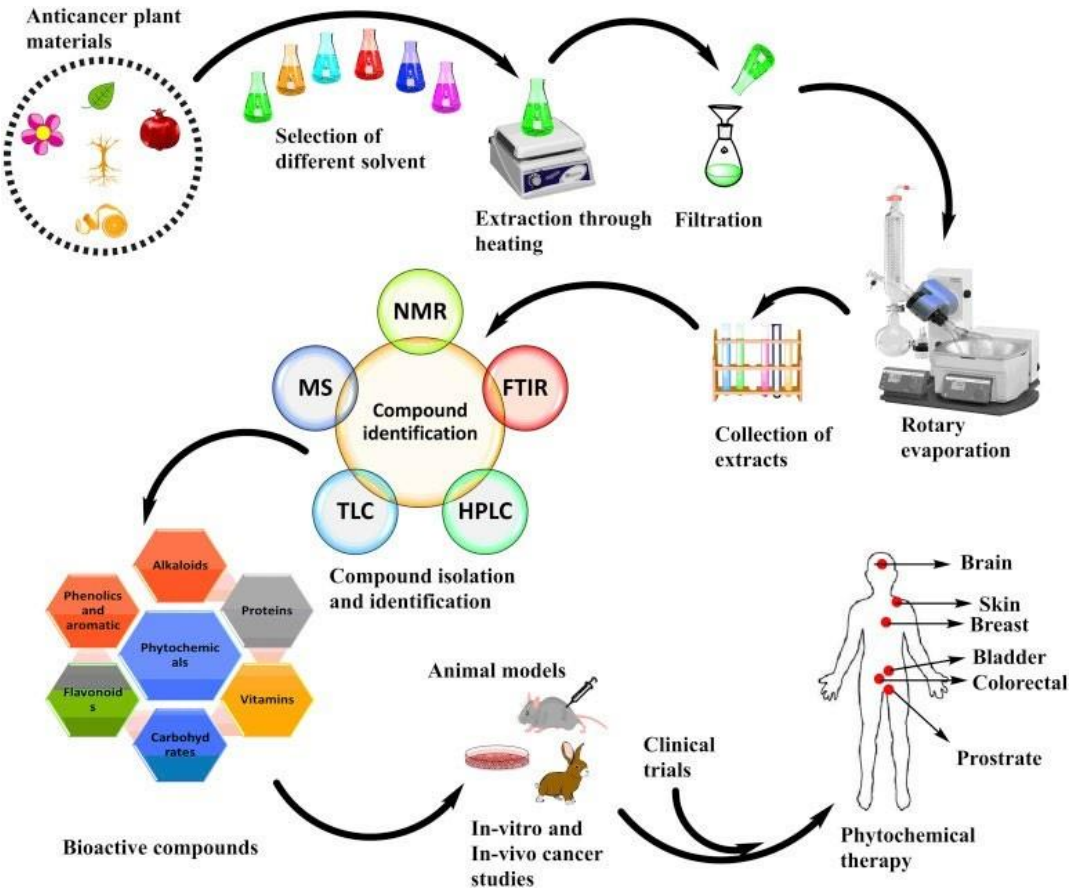

Figure 2: Plant derived anticancer properties.

Acknowledgement

None

Conflict of Interest

None

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