

Cancer Science & Pediatrics 2019: Multi-targeted agents made by “Mother Nature” in the prevention and treatment of cancer - Ajaikumar B Kunnumakkara - India Indian Institute of Technology, India

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Despite the advances in the diagnosis, prevention and treatment of cancer, it remains as one of the most dreadful diseases in the world. Therefore, there is an urgent need for developing more efficacious drugs for the treatment of this disease. Most of the drugs developed today are mono-targeted, however, research over the past two decades established that cancer is a multi-gene disorder and there are so many molecular alterations taking place in a cancer cell. Therefore, multi-targeted agents are incredibly useful in the treatment of this disease. In the recent years it has been proved that multi-targeted natural products are safe, efficacious and affordable for the prevention and treatment of this disease. Several natural products have been shown to modulate different signaling pathways in cancer cells and inhibit cancer cell proliferation, survival, invasion, angiogenesis and metastases in several preclinical and clinical studies. In addition, many of the natural products have been shown to inhibit chemoresistance and radiation resistance in cancer cells and make them more sensitive to chemotherapy and radiotherapy, respectively. Moreover, some of these compounds are known to protect normal cells from the deleterious effects of chemotherapy and radiation. Therefore, the present talk will summarize the recent developments of natural products in the prevention and treatment of cancers.

Although the incidences are increasing day after day, scientists and researchers taken individually or by research group are trying to fight against cancer by several ways and by different approaches and techniques. Sesquiterpenes, flavonoids, alkaloids, diterpenoids, and polyphenolic represent a large and diverse group of naturally occurring compounds found in a variety of fruits, vegetables, and medicinal plants with various anticancer properties.

In this review, our aim is to give our perspective on the current status of the natural compounds belonging to these groups and discuss their natural sources, their anticancer activity, their molecular targets, and their mechanism of actions with specific emphasis on apoptosis pathways, which may help the further design and conduct of preclinical and clinical trials. Unlike pharmaceutical drugs, the selected natural compounds induce apoptosis by targeting multiple cellular signaling pathways including transcription factors, growth factors, tumor cell survival factors, inflammatory cytokines, protein kinases, and angiogenesis that are frequently deregulated in cancers and suggest that their simultaneous targeting by these compounds could result in efficacious and selective killing of cancer cells.

This review suggests that they provide a novel opportunity for treatment of cancer, but clinical trials are still required to further validate them in cancer chemotherapy.

Cancer is a major public health problem and the second leading cause of mortality around the world, mainly Europe and the United States with an incident rate of about 2.6 million cases per year. It is characterized by unscheduled and uncontrolled cellular proliferation in the spectrum of cell. Cancer incidence in developing countries has been prevailed by tumor types that are related to viral, genetic mutations, and bacterial contamination. Cancer has a high incidence and a long period of latency on its development and in the progression of the sickness. There are numerous risk factors known concerning the development of cancer including age, geographic area, and race. However, cancer is mostly a preventable disease.

Regardless of whether a cancer specifically results from a genetic mutation and viral or bacterial contamination, the recent extensive research indicated that most cancers are caused by dysfunction of many genes coding for proteins such as, antiapoptotic proteins, growth factors, growth factor receptors, transcription factors, and tumor suppressors, which constituted the target for cancer treatment. Prevailing treatment options have limited therapeutic success in cancer in the past decade.

The concept of chemoprevention is gaining increasing attention because it is a cost-effective alternative for cancer treatment. Cancer chemoprevention by natural compounds, especially phytochemicals, minerals, and vitamins, in several studies under both in vitro and in vivo conditions has shown promising results against various malignancies. In the development of bioactive chemical, natural products have a rich and long history. Herbal medicines, as an important novel source with a wide range of pharmaceutical potential, are being used to treat human ailments including almost all kinds of cancer.