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Exploring the Potential of Medicinal Plants as Potent Anticancer Agents

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Editorial

Cancer is one of the deadliest and dreadful diseases leading to a massive increase in the mortality rates every year. Any abnormal proliferation of cells that invades the adjacent tissues and causes the destruction of these tissues can lead to cancer. Two classes of genes play a crucial role in this malignant transformation of normal cells—oncogenes and tumor suppressor genes. Any dysregulation in these genes due to genetic alterations can lead to cellular transformation. Though it is often impossible to evaluate the specific cause for specific cancer, there are certain factors known to increase the risk of cancer such as tobacco use, alcohol, environmental pollutant, infectious agents, custom habits and sedentary lifestyles.

Chemotherapy may have been successful in the treatment of cancer but the traumatic side effects post the treatment are the reasons making it even scarier. The history of medicinal plants or medicinal herbs dates back to the prehistoric times. The chemical constituents of these medicinal plants hold multiple therapeutic benefits and are involved in a number of physiological responses in the body. The National Cancer Institute has screened around 114,000 extracts for anticancer activity. Therefore, there is a need to evaluate the potential of these extracts as the source of anticancer activity or whether these extracts can be exploited to reach cancer blocking or remedial effects in human body.

Development of cancer involves alterations in the epigenetic processes. Hypermethylation of tumour-suppressor genes on CpG islands is firmly established as the cause leading to gene silencing and inactivation of tumor-suppressor genes. Over the recent years, drugs which can inhibit or reverse epigenetic alterations have been in the pipeline.

5-azacytidine (Azacitidine; Vidaza) and 5-aza-2'-deoxycytidine (Decitabine; Dacogen) which are both DNMTi 11 and HDACi such as suberoylanilide hydroxamic acid (SAHA, Vorinostat, Zolinza) and FK228 (Romidespin, Istodax) are some of the chemically derived epigenetic drugs which have been developed and underwent trials. However, the challenge lies in engineering a chemically derived drug which is specific to cytotoxicity of cancer cells and nontoxic to the normal cell population. The research industry, therefore, is now determined to cornerstone and identify naturally derived compounds for cancer treatment with a special focus on those derived from plant species and their natural products.

Different forms of cancer, amongst the human population, share similar characteristics or genotypes such as their insensitivity to signals which inhibit cell growth, thus leading to their uncontrolled replication. The cancer cells have the property to evade the process of apoptosis, while the angiogenesis is sustained within the tumor tissue

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allowing survival of cancer cells. Different plant-derived compounds have demonstrated properties to inhibit cancer cell activities such as proliferation of cancer cells and inducing apoptotic cell death.

With breathtaking advancements and discoveries in naturally derived drugs, newer technologies are surfacing for the application and dosage of these anticancer compounds. For these compounds to be a successful alternative to existing cancer treatments such as chemotherapy, the mode of administration of these compounds should be as effective as possible. The evolution in the field of nanotechnology has given a direction to the research for the use of nanoparticles (NPs) as a delivery system to target the drugs to specific target sites. Some compounds that have demonstrated anticancer activities may be limited in their clinical development due to the need for high dosages.

Today, the research and development sector is aiming to use NPs to control release of the drug and enhance target specificity by using magnetic mesoporous silica NPs with a gelatine membrane; Paclitaxel can be controlled externally using a magnetic field. This has shown to be successful in increasing the drug's ability to inhibit growth of tumors and reduce unwanted side effects on the other tissue areas as the drug's distribution is controlled. Success has also been seen with the drug quercetin using superparamagnetic magnetite NPs against breast cancer (MCF-7) cell lines. This research demonstrated enhanced activities of the NPs in cytotoxicity of MCF-7 cells compared to free or pure quercetin. NPs in their use for anticancer treatment are of growing interest and show promising results as a natural alternative to existing treatments.