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Nanoemulsions in Cancer Therapeutics

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Editorial

The uncontrolled growth of abnormal cells is defined as cancer. The conventional therapies for cancer may include combinations of radiation, chemotherapy and surgery. These are proven to cause severe damage to normal cells and other major side effects as well. The advent of nanotechnology, via its versatile properties, has brought forth a major impact in cancer therapy. Nanosystems comprising of nanoparticles, nanoemulsions, nanocapsules, liposomes, micelles, dendrimers, polymer-drug conjugates, and immune conjugates have shown enhanced therapeutic efficacy by improving circulation time of drug, prolonging half-life, controlling and sustaining release, enhancing site specificity, etc. [1]. Yet, the toxicity and stability aspects of these nano-based materials are not fully established in human systems. On the other hand, nanoemulsions use oils and surfactants, and the safety limits of these components are well known. Therefore, nanoemulsions could potentially be used with fewer risks [2]. Nanoemulsions are colloidal dispersions of two immiscible liquids stabilized by emulsifying agents with their mean diameter in the nanometer range. The advantages of nanoemulsions lie in their small droplet size, optical clarity, good physical stability, improved bioavailability, non-toxicity and non-irritability [3].

In recent years, there has been a growing interest in spice-based nanoemulsions for cancer therapy. The phenolic components from spices are known to possess potent anticancer activity, and they are found to be effective against cancers of liver, breast, large intestine, stomach, skin, bladder and colon [4]. However, the efficacy of these spice-based and other essential oils is constrained due to their poor aqueous solubility and high lipophilicity [5]. Focusing on these issues, researchers have shown great interest in the development of spice oil-based nanoemulsions in view of their biocompatibility and higher efficacy. In a study, the eugenol-loaded nanoemulsions have demonstrated apoptosis of both colon (HTB37) and liver (HB8065) cancer cell lines via reactive oxygen species, as evidenced through flow cytometry and microscopy [6]. A solid dosage form of curcumin nanoemulsions was designed to enhance the oral bioavailability of curcumin [7]. In another study, a curcuminoid nanoemulsion was developed, and demonstrated that mitochondria and death receptor pathways were responsible for A549 and H460 apoptosis [8]. A nanoemulsion formulation was developed using two spices, Drimys angustifolia Miers and D. brasiliensis Miers. These reduced cell viability of U-138 MG (human glioblastoma) and T24 (human bladder carcinoma) cell lines, as demonstrated by MTT assay and cell counting. D. brasiliensis also exhibited late apoptosis as evidenced by cytometry analysis [9]. Thus, spice-based nanoemulsions have played a significant role as cancer medicine, and further investigations are warranted in this area.

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