

Nanof ormulation of Curcumin and Its Derivatives as Adjunctive Therapy for the Prevention and Treatment of Malignancies

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Abstract

Introduction: Cancer is defined as the abnormal cell growth. It has always been a great health problem all over the world despite growing advances in its prevention and treatment strategies, which can cause life-threatening malignancies with high financial costs for patients as well as the health care system. Mounting evidence suggested that curcumin is potentially able to act as chemo-preventive and chemotherapeutic agent in different types of cancer. Nanotechnology has shown promising effects in the treatment of cancer. Nanof ormulation provides improvements in bioavailability, biodistribution, specificity, and pharmacokinetics of drugs delivered to the site of tumor. The aim of current study is to comprehensively review the pharmacological effects and molecular mechanisms of nanof ormulated curcumin and its derivatives as adjunctive therapy in preventing and treating malignancies.

Methods and Results: Electronic databases including “Scopus”, “PubMed”, and “ScienceDirect” were searched with the keywords “cancer” in title/abstract, along with “curcumin” and “nanof ormulation” in the whole text. Data were collected from the inception date until June 2017. Articles that had assessed nanof ormulations of curcumin derivatives in an in vitro or in vivo model of cancer were selected for this study, and conventional formulations without using a nanonization technique were excluded. Various curcumin nanof ormulations have been prepared as anticancer agents including PLGA nanoparticles, cyclodextrin/cellulose nanocrystals, folate-modified PLA-PEG micelles, dendrosomal nanoparticles and lipid-polymer hybrid nanoparticles. Curcumin nanof ormulations perform their anticancer activity via several cellular mechanisms, including induction of cell cycle arrest at different phases of cancer cell cycle, activation of caspase enzymes, reduction of tumor vascularization, reducing tumor cell invasion and metastasis, induction of mitochondrial damage, as well as apoptosis in the neoplasm.

Conclusions: Nanof ormulations of curcumin, result in better bioefficacy for the prevention and treatment of cancer. The most important improvement in nanof ormulated curcuminoids, in comparison to their free molecules, is their better antineoplastic function and improved bioavailability that can result in production of natural anticancer agents with passive targeting of cancerous cells. However, a long path lies ahead of commercializing these agents, including assessment of their safety and efficacy in healthy as well as cancerous subjects in clinical settings.

Key words: malignancy; cancer, curcumin, nanof ormulation, antioxidant

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