

Application of Nanotechnology in Biomedicine: A Major Focus on Cancer Therapy

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Abstract

Most of mortality worldwide occurs because of cancer diseases. Nanostructures are the new compounds that have become one of the most important technologies for using in different fields over the past two years especially in medicine. In between, nanotechnology has the potential to cancer detection and therapy. This study is a review of prospects in applications of nano-materials for cancer detection and treatment. We have summarized the nano-materials (metal nanospheres, nanorods, nanoshells and nanotubes) in medical applications targeting cancer. We also discuss advances in established nanoparticle technologies such as liposomes, polymer micelles, and functionalization about tumor targeting, controlled release and drug delivery. This paper will discuss the therapeutic applications of different nano-materials with a major focus on their applications for the treatment of cancer. Briefly, the toxicity of conventional nanostructures was also mentioned in this paper.

Introduction

Life is a series of processes in nano-scale in the cell. So, every possible structural similarity with their natural sources in living cells will allow nanoparticles to react with biological molecules on the surface or inside the cells and as results; they would influence cellular responses in a dynamic and selective way. Materials in such dimensions have attracted much more attentions for medical applications. Several therapeutic options at the nano-scale are rising for the treatment of severe diseases such as cancer [1]. Some features of nano-particles such as shape, chemical structure and especially size have directly affected their biological operates [2]. Gene delivery, drug targeting, cell labeling, biosensor, treating in high temperature condition, imaging, diagnosis and treatment of cancers are the most important operates of nano-materials in medicine [3-5]. Therapeutic potential of nano-materials is the most important applications, which have recently attracted more attentions. Clinical application of various forms of nano-materials such as nanoparticles, nano-rod, the nanowires, nanotubes, and nano-fibers studied. The optical, magnetic and biological properties of nanoparticles are important in the study their of biological processes and medical applications. Role of nanoparticles in the clinical treatments; especially in cancer is rapidly rising. Nanoparticles induce apoptosis in cancer cells by several mechanisms, comprising producing active oxygen and