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To Evaluate the Role of Nano-Particles in Drug Delivery and Design

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Introduction

Nanotechnology defined nanotechnology as "technology conducted at the nanoscale level, which is about 1 to 100 nanometers". Nanotechnological application is greatly important in the field of drug delivery because of its high specificity towards the target site, so it is able to reduce toxic side effects of drugs to normal cells. Reduce plasma fluctuation of drugs, high solubility, efficiency, reduces cost of products and enhancement of patience comfort are reasons that nanotechnology is used for drug delivery. Nanoparticles (NP) have emerged as important platforms for efficient diagnostics and therapeutics by merging the characteristic properties they possess at the nanometric scale with the feasible immobilization of specific ligands on the surface. Therefore, they have become ideal candidates for molecularly sensitive detection, highly efficient contrast agents for molecular imaging, as well as carriers for targeted drug and gene delivery, and therapeutically reagents for targeted photo thermal therapy [1]. The nanoparticle (NP) plays a vital role and it can conjugate with various drugs by different methods to deliver drugs to the target site. Abraxane® was the first nanoparticle drug formulation to receive US-FDA approval in 2005, which is Nanometer-Albumin-Bound (NAB) paclitaxel for head and neck cancer, metastatic breast cancer, non-small cell lung cancer and anal cancer.

Brain cancer is one of the most difficult malignancies to detect and treat mainly because of the difficulty in getting imaging and therapeutic agents past the blood-brain barrier and into the brain. Anti-cancer drugs such as loperamide and doxorubicin bound to nanomaterials have been shown to cross the intact blood-brain barrier and released at therapeutic concentrations in the brain. Recently Scientists have developed NPs of the size of macromolecules such as DNA and proteins that are smaller than diameter of a double stranded DNA (2nm). The smallest cellular form in the world is a bacterium named mycoplasma. Which has the size of 200nm but in comparison the largest NP is only 100nm in size. Quantum dots, chitosan, Polylactic/glycolic acid (PLGA) and PLGA-based nanoparticles have also been used for in vitro RNAi delivery. New Drug delivery system (DDS) has the ability to deliver drugs to specific target cells in various areas of the body without degradation in the gastrointestinal track. It includes delivery and targeting of pharmaceutical, therapeutical and diagnostic agents by the help of NPs to the cells such as cancer cells. The ultimate goal of NP drug delivery is to improve the proper treatment diagnostics and prevention of disease [2, 3]. DDS is defined by national institute of health in USA as, "Formulation of a device that enables the introduction of therapeutic substances in to the body and improves efficiency and safety by the control the rate, time and place of release of drug in the body."

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Conclusions

Nanotechnology can be developed in future to treat all type of diseases in human at the same time by producing multifunctional nano-particles. The introduction of biocompatible materials and devices that are engineered on the nanometer scale that interact with biological molecules and cells and provide specified diagnostic, therapeutic, and imaging functions will utterly change the way in which health care is provided in the future.

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