Austin Journal of Nanomedicine & Nanotechnology

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Austin Publishing Group

Editorial

Nanocomposites in Cancer Diagnosis and Treatment

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Received: October 10, 2014; **Accepted:** October 13, 2014; **Published:** October 14, 2014

Editorial

Nanotechnology has been taking predominant steps in all the scientific background that focuses mainly in bringing out the solution for environmental and medicinal problems. Nanotechnology provides a different understanding when a nanoparticles is compared to their bulk counterparts. The metallic nanoparticles copper, iron, gold and silver have been used as efficient carriers for imaging and medicinal diagnostics [1]. Metallic nanoparticles bound with single stranded DNA's paves way for medicinal diagnostics, imaging and biomedical applications. Nanotechnology plays a major role in the health care system. Nano-drugs have superior qualities such as increased aqueous solubility of the drug, protects the drugs from the degradation, prolonged release of the drug thereby increasing bioavailability of the drug and appropriate form in all routes was well administered [2,3]. The novelty in nanopartical based drugs provided enhanced pharmacokinetics characteristics that lacks in conventional medicine [4,5].

There are two ways of targeting the drugs. The drugs such as Carbiplatine, Paclitaxel, and Doxorubicin are used to treat cancer along with nanoparticles. In 1980's it was reported that pegylated liposome nanoparticles that encapsulated doxil was six times efficient than that of free doxorubicin based on targeted delivery [6]. Passive targeted drug delivery provides enhanced permeability as the nanoparticles move into the porous cancerous cells [7,8]. N-(2-Hydroxypropyl) methyacrylamide given as an interveinal drug to EL-4 lymphoma cells of a mouse has produced cent percent success on treatment [9]. The second type of targeting is active targeting like a lock and key mechanism, where specified receptors bind to the targeted cancer cells. An oligonucleotide sequence called aptamers bound with paclitaxel-polylactide composite enhanced the process of cancer treatment [10]. The core shell Nanoparticles has applications in biosensing devices using the properties like Fluorescence, Electrochemical, Magnetic and Localized Surface Plasmon Resonance. The gold nanorods loaded, chitosan conjugated and pluronic based nanocarriers were used as imaging agents for cancer cells and as hyperthermic agents for photothermal cancer therapy. Positive results were reported that a tumor developed in the mouse disappeared in six days proving that nanoparticles are used as efficient drug carriers [11].

Magnetite and maghemite are the only two magnetic nanoparticles used for biomedical applications. Magnetite bound with gold nanorods with dumbbell shape and necklace like structure were used as imaging and photothermal ablation of cancer cells and detection of various pathogens. Magnetic nanoparticles are preferred as they provide stability and with low toxin [3]. Jacalin, a protein obtained from the crude extract of *Artocarpus integrifolia* was tagged with fluorescein by adding FTIC solution at pH 8. This protein recognizes GAlβ-3GalNAC which is disaccharide present on tumor cells, which attracts Tcells. Gold Nanoparticles was synthesized by the presence of generation 4-polyamidoamine dendrimer (PAMAMG4) was bound to jacalin. This has showed significant anticancer activity in breast, bladder and prostate cancer. Gold nanoparticles are used as sensitizers which are used to detect the tumor cells based on the aptamers, which basically acts as bioimaging agents. Gold coated silica nanoparticles used for rapid tumor destruction with minimal damage to normal cells. Semiconductor quantum dots are used as biomarkers for cancer cells due to precise ability to detect them at even very low concentrations [12].

Quantum dots loaded micelles can be used for identification, targeting and treatment at early stages of cancer. Due to the fluorescent property, carboxyl functionalized silica coated quantum dots have efficient targeted probes for cancer cells [13]. One of the reason behind the failure in the treatment is the multi drug resistance due to the decreased concentration of the drug to the targeted site hypothesis is that it is due to the membrane glycoprotein induced drug outflow. In order to overcome this problem, antisense deoxyoligoucleotides using folic acid conjugated with hydroxypropyl chitosan nanoparticles were used to reduce the outflow and prevent tumor drug resistance. The ceramic nanoparticles are known for their scavenging property as they can cause low reactive oxygen species or stop producing reactive oxygen species or as antioxidants. Some of the fine examples are Yttrium oxide, Cerium oxide and Aluminum Oxide. Even though nanoparticles are used as excellent efficient carriers there are some backfire that occurred during the therapy like damage to the plasma membrane due to reactive oxygen species followed by toxicity, platelet aggregation and cardiovascular tissue damage [14]. Thus concluding that functionalization of nanoparticles in the form of nanocomposites is efficient in drug targeting and treatment.

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Citation: Gurunathan B and George GB. Nanocomposites in Cancer Diagnosis and Treatment. Austin J Nanomed Nanotechnol. 2014;2(6): 1037.

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Austin J Nanomed Nanotechnol - Volume 2 Issue 6 - 2014
ISSN : 2381-8956 | www.austinpublishinggroup.com

Citation: Gurunathan B and George GB. Nanocomposites in Cancer Diagnosis and Treatment. Austin J Nanomed Nanotechnol. 2014;2(6): 1037.