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## NANOTHERANOSTICS IN DRUG TARGETING

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**Nanomedicine** is the application of nanotechnology to health care systems. It has potential impact on the easy and reliable diagnosis, monitoring and treatment of disease. There are lot of research potentials in the field of nanoparticulate systems to be utilized in the drug delivery and drug targeting. They have been used *in-vivo* to protect the drug entity in the systemic circulation, restrict access of the drug to the chosen sites and to deliver the drug at a controlled and sustained rate to the site of action [1]. Nanoparticles may be because of its size and functionalization characteristics able to penetrate and facilitate the drug delivery through the barriers. Nanoparticles have been used as a physical approach to alter and improve the pharmacokinetic and pharmaco-dynamic properties of various types of drug molecules. There are number of mechanisms and strategies found to be involved in this process, which are based on the type of nanomaterials used and its combination with therapeutic agents, such materials include liposomes, polymeric nanoparticles and non-viral vectors of nano-sizes for targeted drug therapy [2].

**Nanotheranostics** is the integration of diagnostic and therapeutic function in one system at nano size level, which attracts attention in personalized medicine. Because treating cancer is not a one-size-fits-all scenario, it requires therapy to be adapted to the patient's specific biomolecules. It identifies biomarkers to gain an understanding of the diagnosis and in turn treating the specific disorder based on the precise diagnosis. By predominantly utilizing the unique properties of nanoparticles to achieve biomarker identification and drug delivery, nanotheranostics can be applied to noninvasively discover and target image biomarkers and further deliver treatment based on the biomarker distribution. Different drug delivery systems such as liposomes, microspheres, nanoparticles, nonogels and nonbiocapsules have been used to improve the bioavailability of the drug in the brain, but microchips and biodegradable polymeric nanoparticulate carriers are found to be more effective therapeutically in treating brain tumor. The physiological approaches also utilized to improve the transcytosis capacity of specific receptors expressed across the BBB. It is found that the low density lipoproteins related protein (LPR) with engineered peptide compound (EpiC) formed the platform incorporating the Angiopep peptide as a new effective therapeutics [4].

The lipid based formulations comprise nanoemulsions, solid-lipid nanoparticles (SLNs), nano-structured lipid carriers (NLCs), liposomes, and niosomal systems, etc. have found more promising antitubercular activity as its intended for targeted drug delivery especially to the infected part. Further mannosylation of liposomes offers tremendous results in TB chemotherapy as it directly binds to mannose receptors available on the surface of alveolar macrophages resulting mycobacterium destruction. Niosomes may have superior drug targeting ability, chemical stability, osmotic activeness and *in vivo* activity in comparison to that of liposomes. SLNs and mannosylated SLNs are the advanced form of the lipid formulations, which found to enhance the drug uptake at the infected organ and show significant *in vivo* anti-tubercular activity with reduced toxicity [5].

Recently it has been found that the use of nanotechnology in the field of pharmaceutical biotechnology helps in improving the drug delivery strategy including the kinetics and therapeutic index to solve the delivery problems of some biotech drugs including the recombinant proteins and oligonucleotides.

Use of nanotechnological based formulations and nanomaterials are increasing day-by-day in wide range covering a broad typology of applications, from design and development of targeted drug delivery systems, manufacturing of pesticides, domestic appliances, textiles, to bioremediation engineering. There are therefore concerns about the environmental risks or bioaccumulation related issues that may arise particularly resulting from the application of drug loaded nano-carriers or effect of pesticides that reach the natural ecosystems. This is a major threat in present era, and need to be balanced against their undoubted benefits to human society [6].

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