EuroSciCon

October 04-06, 2018
Moscow, Russia

17th Edition of International Conference and Exhibition on

Pharmaceutics and Novel Drug Delivery Systems

Xiang Zhao et al., Int J Drug Dev & Res 2018, Volume 10
DOI: 10.21767/0975-9344-C1-003

Morphology, structure and function characterization of PEI modified magnetic nanoparticles gene delivery system

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Modified magnetic nanoparticles are used as non-viral gene carriers in biological applications. To achieve successful gene delivery, it is critical that nanoparticles effectually assemble with nucleic acids. However, relatively little work has been conducted on the assemble mechanisms between nanoparticles and DNA, and its effects on transfection efficiency. Using biophysical and biochemical characterization, along with atomic force microscopy (AFM) and transmission electron microscopy (TEM), we investigate the morphologies, assembling structures and gene delivering abilities of the polyethylenimine (PEI) modified magnetic nanoparticles (MNPs) gene delivery system. In this gene delivery system, MNP/DNA complexes are formed via binding of DNA onto the surface of MNPs. MNPs are favorable to not only increase DNA concentration but also prevent DNA degradation. Magnetofection experiments showed that MNPs has low cytotoxicity and introduces highly stable transfection in mammalian somatic cells. In addition, different binding ratios between MNPs and DNA result in various morphologies of MNP/DNA complexes and have an influence on transfection efficiency. Dose–response profile indicated that transfection efficiency positively correlate with MNP/DNA ratio. Furthermore, intracellular tracking demonstrate that MNPs move though the cell membranes, deliver and release exogenous DNA into the nucleus.

Biography

Xiang Zhao has his expertise in the novel transformation platform technology using the magnetic nanoparticles as DNA carriers. He has provided an important experimental basis for the application of MNPs for effective magnetofection and applications in the genetic transformation of plants and animals.

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