

Application of non-viral nanocarriers for gene delivery (Systematic Review)

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Abstract

Background & Aim: One of the most important challenges in gene therapy is the lack of efficient gene delivery systems. Nanocarriers are placed in two viral and non-viral categories. Despite the high transfer efficiency and fast gene delivery offered by viral carriers, their application has been decreased due to low transfer capacity, the possibility of activating proto-oncogenes, and the induction of potent immune responses. In contrast and despite lower efficiency, non-viral nanocarriers have had a growing usage in gene delivery studies due to advantages such as the capability of transferring big gene pieces, lower infection risk, low immunogenicity, structural flexibility, and ease of design.

Objective: This study assessed the studies published by Iranian researchers who deal with gene delivery using non-viral nanocarriers.

Methods: The necessary data for this review were obtained solely from the research articles published by May 2018 based on databases including, Iran Research Information System, SID, PubMed, Web of Science, Scopus and Science Direct.

Results: Iranian researchers have dealt with the production of non-viral nanocarriers and assessment of gene delivery using them in about 500 research articles. Among them, polymeric nanoparticles, including dendrimers (about 64%), liposomes (about 18%), metallic nanoparticles, and carbon nanotubes, were the most frequently used in gene delivery studies.

Conclusion: In studies by Iranian researchers, synthesis, improvement of transfection efficiency, and reduction of cytotoxicity of non-viral nanocarriers have been evaluated, and most of the non-viral nanocarriers are based on chitosan and polyethylene imine polymers. Targeted transfer of nanocarriers using different molecules such as Aptamers is about 30 articles, which requires more consideration.

Keywords: Gene delivery, Nanoparticles, Non-viral vector

How to cite this article: Askarian S, Sardar Abadi S, Fekri M. Application of non-viral nanocarriers for gene delivery (Systematic Review). Journal of Student Research Committee (JSRC) of Torbat Heydariyeh University of Medical Sciences. 2019; 1(2):36-44.