Abstract

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Title of Thesis: Nanoparticle carriers for nucleic acid-based vaccines: a literature review

Nucleic acid-based vaccines represent a groundbreaking advancement in vaccine development, due to the possibility of *in situ* antigen expression and the progress in genetic engineering. However, due to their low *in vivo* stability, most of these vaccines rely on carriers, known as vectors, to enhance stability and ensure targeted delivery to antigen-presenting cells, thereby stimulating an immune response. We generally classify vectors into viral and non-viral types, with this work focusing on nanoparticle-based non-viral vectors.

The aim of this thesis is to provide an up-to-date overview of the most commonly used nanoparticle systems for delivering nucleic acid-based vaccines – lipid nanoparticles, peptide-based systems, polymeric nanoparticle systems, and inorganic nanoparticles. It was found that these systems often form hybrid nanoparticle systems, combining their advantages, such as cationic nanemulsions, lipid-polymer hybrid nanoparticles, lipopolyplexes, and polymer-protamine combinations. The thesis concludes with a discussion of inorganic nanoparticle systems and the NanoVac system, which is currently being researched by Luna Labs and shows promising prospects for the future.

Keywords: vaccines, antigen, DNA, plasmid, RNA, immune system