

# Synthesis of polyplexes as nanocarriers for plasmid DNA delivery systems

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Human gene therapy is an emerging technology that may have the significant potential for treatment of inherited and acquired diseases such as cancer, Huntington's chorea, AIDS, cardiovascular diseases, and many others. These therapeutic approach, based on permanently or transiently replacing genetic defects with exogenous nucleic acids, gives an opportunity to increase efficiency of treatment. The main challenge in gene therapy is to develop carriers that can efficiently deliver nucleic acids directly through plasma membrane. One of the most promising group of delivery systems are polymeric nanoparticles as their chemical structure can be modified to allow designing nanocarriers with desired physicochemical properties.

In the present work we were focused on preparation of safe, non-toxic and biodegradable polymer-based gene nanocarriers (polyplexes) as non-viral vectors for gene delivery. The nanocarriers composed from plasmid DNA (pDNA) and encapsulated with synthetic (poly-L-Lysine (PLL), poly-L-glutamic acid (PGA)) and/or natural (chitosan (CHI), alginate (ALG)) were synthesized using self-assembly technique. The encapsulation process were performed using layer-by-layer (LbL) method that allowed to obtain multilayer shells (PLL/PGA, CHI/ALG). All polyplex nanoparticles were characterized by size, size distribution and zeta potential. Cytotoxicity tests of the synthesized nanosystems and their stability in the simulated body fluid (SBF) was also determined.

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