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Macrocyclic amphiphilic non-viral vectors for gene delivery

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Abstract

At the basis of gene therapy stays as fundamental process the delivery of proper nucleic acids into the cell nucleus. This process needs efficient and safe vectors able to condense and protect DNA filaments, masking their phosphate negative charges and thus promoting membrane crossing. Due to their intrinsic properties, Cell Penetrating Peptides, and in particular the arginine-rich ones, have attracted attention in this field as adjuvant for DNA cargo in cell membrane crossing.

The work reported in this PhD thesis concerns the synthesis of new potential non-viral vectors designed and built on macrocyclic scaffolds with well-defined cationic and lipophilic domains. They are functionalized with arginines, lysines, guanidinylated amino acids or ammonium ions. Their ability in DNA binding and condensation and their transfection properties in vitro were investigated also looking for establishing relationships between activity and structural features.

Keywords: cell transfection, gene delivery, calixarenes, β-cyclodextrins, non-viral vectors, basic amino acids, arginine.