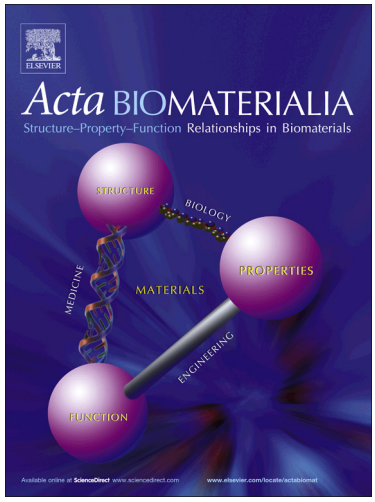

Review article

Exploring the Role of Peptides in Polymer-based Gene Delivery

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Exploring the Role of Peptides in Polymer-based Gene Delivery

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Abstract

Polymers are widely studied as non-viral gene vectors because of their strong DNA binding ability, capacity to carry large payload, flexibility of chemical modifications, low immunogenicity, and facile processes for manufacturing. However, high cytotoxicity and low transfection efficiency substantially restrict their application in clinical trials. Incorporating functional peptides is a promising approach to address these issues. Peptides demonstrate various functions in polymer-based gene delivery systems, such as targeting to specific cells, breaching membrane barriers, facilitating DNA condensation and release, and lowering cytotoxicity. In this review, we systematically summarize the role of peptides in polymer-based gene delivery, and elaborate how to rationally design polymer-peptide based gene delivery vectors.

Key words: polymers; peptides; functions; gene delivery

Abbreviation

CPPs, cell-penetrating peptides; CS, chitosan; DBP, DNA binding peptide; DMMAn, dimethylmaleic anhydride; EAP, eight-armed polyethylene glycol; EAPP, EAP-PEI copolymer; EGF, epidermal growth factor; EGFR, epidermal growth factor receptor; Eph, hepatocellular; EphA2, hepatocellular A2; FGFR, fibroblast growth factor receptors; HBPs, heparin binding peptides; mTat, modified Tat peptide sequence bearing histidine and cysteine residues; NLS, nuclear localization signal; NPCs, nuclear pore complexes; PAAs, poly(amido amine)s; PAMAM, polyamidoamine dendrimers; PC, PEI-cyclodextrin; PCM, primary cardiomyocyte-specific peptide; pDNA, plasmid DNA; PEG, polyethylene glycol; PEI, polyethylenimine; PLL, poly(L-lysine); RGD, arginine–glycine–aspartic acid; RVG, rabies virus glycoprotein; TAT, trans-activating transcriptional activator; WGA, wheat germ agglutinin.

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