

Development of High Performance Cationic Polymer Vector (Star Vector)

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The cationic polymers, which can generate nano-particles by formation of polyion complexes 'polyplexes' with nucleic acids irrespective of size and kind, and have low toxicity and immunogenicity, lack of pathogenicity, and ease of pharmacologic production, are highly expected as one of the major materials for non-viral vectors. However, the cationic polymers continue to suffer from relatively low levels of gene transfer compared to viruses, thus the drive to improve these polymers continues. Recently, we developed nano-structured hyperbranched cationic star-shaped polymers, called star vectors, for a novel non-virus vector by living radical polymerization. The star vectors could efficiently protect the plasmid from DNase degradation and the conjugated DNA complexes were satisfactorily stable even in serum and could store under an aqueous solution, freezing and freeze-drying with a little damage. The DNA complexes demonstrated satisfied transfection efficiency into COS-1 cells with a little cytotoxicity. Mice injected intravenously with the DNA complexes showed a higher level of gene expression in either liver, kidney or spleen. These results suggest the potential use of the star vector as a non-viral vector in clinic.