

Poly-L-lysine/hyaluronan nanocarriers as a novel nanosystem for gene delivery

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Abstract:

The present research comes up with a novel DNA-loaded poly-L-lysine (PLL)/hyaluronan (HA) nanocarrier (DNA-loaded PLL/HA NCs) for gene delivery applications, as a promising candidate for gene delivery into diverse cells. A straightforward approach was employed to prepare such a nanosystem through masking DNA-loaded PLL molecules by HA. Fourier-transform infrared (FTIR) spectroscopy, dynamic light scattering (DLS), field emission-scanning electron microscopy (FE-SEM) and transmission electron microscopy (TEM) were used to analyse the interaction of the molecules as well as the physicochemical properties of the NCs. The NCs showed a negative charge of -24 ± 3 mV, with an average size of 138 ± 6 nm, in an ellipsoid-shape with smooth surfaces. The DNA loading efficiency (LE) measured by DNA absorbance was around 95 %. The MTT assay showed that the developed NCs are non-toxic to the cells. Furthermore, the uptake of the DNA-loaded PLL/HA NCs by the human embryonic kidney (HEK)-293T cells was evaluated by a flow cytometry method, and demonstrated high potential cellular uptake over 90% for transferring the gene to HEK-293T cells at the optimised conditions. Therefore, the DNA-loaded PLL/HA NCs are the potent strategy for developing nanosystems for gene delivery applications.

Keywords: Gene delivery, Nanocarriers, Hyaluronan, Poly-L-Lysine