Biodegradable capsules as non-viral vectors for *in vitro* delivery of PEI/siRNA polyplexes for efficient gene silencing

Carolin Ganas, Annika Weiß, Moritz Nazarenus, Susanne Rösler, Thomas Kissel, Pilar Rivera Gil, Wolfgang J. Parak

PII: S0168-3659(14)00680-4
DOI: doi: 10.1016/j.jconrel.2014.10.006
Reference: COREL 7402

To appear in: *Journal of Controlled Release*

Received date: 6 June 2014
Accepted date: 3 October 2014

Please cite this article as: Carolin Ganas, Annika Weiß, Moritz Nazarenus, Susanne Rösler, Thomas Kissel, Pilar Rivera Gil, Wolfgang J. Parak, Biodegradable capsules as non-viral vectors for *in vitro* delivery of PEI/siRNA polyplexes for efficient gene silencing, *Journal of Controlled Release* (2014), doi: 10.1016/j.jconrel.2014.10.006

Biodegradable capsules as non-viral vectors for *in vitro* delivery of PEI/siRNA polyplexes for efficient gene silencing

Carolin Ganas[1,#], Annika Weiß[1,#], Moritz Nazarenus[1], Susanne Rösler[2], Thomas Kissel[2], Pilar Rivera_Gil[§,1,*] Wolfgang J. Parak[1,3,*]

[1] Fachbereich Physik, Philipps-Universität Marburg, 35037 Marburg, Germany
[2] Fachbereich Pharmazie, Philipps-Universität Marburg, 35037 Marburg, Germany
[3] CIC Biomagune, 20009 Donostia-San Sebastián, Spain
[#] both authors contributed equally to this manuscript
[§] present address: Department of Physical and Inorganic Chemistry, Rovira i Virgili University and the Chemistry Technology Center of Catalonia (CTQC), 43007 Tarragona, Spain
[*] Corresponding authors: pilar.rivera@urv.cat, wolfgang.parak@physik.uni-marburg.de

ABSTRACT

The efficiency of siRNA delivery is demonstrated to be improved by encapsulating the siRNA within a non-viral carrier based on layer-by-layer assembly of oppositely charged biodegradable and biocompatible polyelectrolytes. In comparison to other non-viral delivery vehicles such as polycation-based complexes, a smaller amount of siRNA was necessary to produce *in vitro* gene silencing as early as 20-30 hours after incubation. Colloidal carriers based on assembled biodegradable polyelectrolytes offer several advantages, such as efficient intracellular delivery after endocytosis followed by release to the cytosol, as well as protection of the siRNA, which is crucial for its therapeutic activity.

KEYWORDS

transfection, gene silencing, non-viral vectors, siRNA, polyplexes, microcapsules

Chemical compounds

polyethylenimine (PubChem CID: 9033); poly-L-arginine (PubChem CID: 6322); dextran sulfate (PubChem SID: 57288723); polyallylamine (Pub Chem CID: 7853); polystyrene sulfonate (Pub Chem CID: 75905)