

Studies of gemini surfactants as nanocarriers for siRNAZuzanna Pietralik, Maciej Kozak

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siRNA is a double-stranded RNA molecule with a length of about 20-25 base pairs, which is involved in the RNA interference process that consists in silencing of specific genes expression. The oligomers of siRNA have particular importance in gene therapy [1]. Gene therapy is extremely promising therapeutic method for the treatment of tumor, genetic disorders, neurodegenerative, autoimmune and infectious diseases. Very important in gene therapy is a delivery system (also known as vector), which improves the delivery of the new DNA or si-RNA into cells and protects the genetic material against degradation. A promising alternative to currently used vectors based on viruses seems to be gemini surfactants [2]. Such molecules have been recently an object of intense studies because they are characterized by low level of cytotoxicity and high transfection efficiency [3].

A series of SAXS studies were performed on a group of gemini surfactants which are quaternary salts (butane-, hexane- and pentane(bis-alkyloxyimidazolium) chlorides) mixed with single-stranded siRNA oligomers with a length of 21 base pairs (UGCAGGAUUCGAUGGAACCUU), to obtain four different values of N/P – the ratio of negative (siRNA) to positive charge (surfactant).

A series of the SAXS data sets were collected in DESY, at EMBL Beam Line X33 (Hamburg, Germany) [4], using synchrotron radiation ($\lambda=0.15$ nm) and Pilatus photon counting detector. Measurements were done at 20 °C for the range of the scattering vector $0.05 < s < 5.0 \text{ nm}^{-1}$. All data sets were normalized to the intensity of the incident beam, corrected for detector response and scattering of the buffer was subtracted using PRIMUS [5].

On the basis of SAXS data the shape and symmetry of mixed siRNA/gemini surfactant systems were evaluated. The group of tested surfactant forms stable complexes with siRNA molecules. SAXS data indicate that the obtained lipplexes form probably unilamellar micelles.

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