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The SAXS studies of complexation dicationic gemini surfactants with low molecular nucleic acids DNA and siRNA

W. Andrzejewska*, M. Skupin and M. Kozak

Department of Macromolecular Physics, Faculty of Physics, A. Mickiewicz University, ul.Umultowska 85, 61-614 Poznań, Poland

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*email: andrzejewskaw@gmail.com

Specific physico-chemical properties of dicationic (gemini) surfactants are the reason for a broad their use in studies as delivery systems of therapeutic molecules (i.e. nucleic acids) into cells. To support the cell transfection process, the carrier molecules must connect with a therapeutic molecules and form stable complexes [1,2]. Due to the self-assembly process, in solution complexes between nucleic acids and gemini surfactants are organized in different structural forms, such as for example: lamellaes, micells or hexagonal phase.

Very promising method to study of such systems is small angle scattering of synchrotron radiation (SAXS). This method is able to demonstrate structural changes occur within the studied delivery systems [3,4].

The presented here experimental results concern the structural analysis (SR-SAXS) of mixtures of bis(1-dodecyl imidazole) derivatives with low molecular DNA and RNA. The presence of characteristic diffraction peaks (see Figure 1) indicates probable formation of cubic and hexagonal phases in the studied solutions.

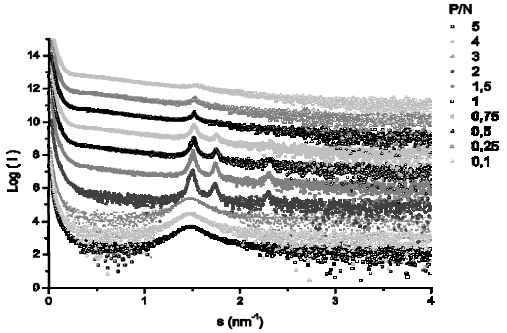

Figure 1.

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P-05

SAXS studies of zwitterionic lipoplexes – nanosystem based on phospholipids and surfactants as innovative delivery systems for gene therapy

P. Egierska, M. Skupin*, B. Urban*, J. Wolak, W. Andrzejewska, Z. Pietralik and M. Kozak

Departament of Molecular Physics, Faculty of Physics, Adam Mickiewicz University, 85b, Umultowska, 61-614 Poznań, Poland

Keywords: small angle scattering of synchrotron radiation, gene therapy, sulfobetaine derivatives

*misiaskupin@gmail.com ;*barbaraurban2@gmail.com

In the recent years there has been a number of technological breakthroughs that have allowed clinical trials in gene therapy [1]. Progress in molecular medicine, especially discovering new routes and methods for gene delivery has provided promising means of treatment of genetic disorders and cancers. Development of effective gene carriers which can increase specificity of targeting and decrease harmfulness to adjacent healthy tissues is very important. Suitable for this purpose are thought to be delivery nanosystems based on lipid-surfactant mixtures [2]. The aim of this study was to determine the possibility to use amphoteric surfactants (zwitterionic alkyl derivatives of sulfobetaine [3]) as complexing agents for nucleic acids, with potential applications for gene delivery [4]. A series of the small angle scattering of synchrotron radiation (SR-SAXS) measurements was performed on selected lipoplexes based on short DNA duplex (21 bp) and zwitterionic surfactants.

The poster presents the structural analysis of these DNA/zwitterionic surfactant systems on the basis of scattering data. The SAXS data for selected DNA/zwitterionic surfactant systems were collected P12 beam line of EMBL Hamburg Outstation on PETRA III storage ring at DESY. The measurements were performed on solutions in 10 mM sodium phosphate pH 7.5 with different DNA/surfactant molar ratio.

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