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## Trimeric surfactants – new effective carries for gene therapy

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One of the most important goal of modern medicine is to develop biocompatible, effective, non-toxic and synthetic systems to transport of therapeutic substances into cells. The selection of the most suitable carrier can provide successful treatment for both congenital andacquired diseases. Due to the low toxicity, biocompatibility, and simplicity of the manufacturing process, complexes based on surfactants and lipids are thought to have great potential as carriers, especially for gene therapy, in which genetic material is the therapetic substance [1, 2]. Such systems represent a compromise between the biocompatibility provided by natural lipid molecules and toxicity of surfactants, which presence is necessary due to binding abilities that ensure the effectiveness of complexation of nucleic acids [3, 4].

Our studies focus on trimeric (also known as trigemini) surfactants as they are characterised by better surface-activeproperties, than their dimeric or monomeric counterparts. This study was performed on mixed system composed of two types of trigemini surfactant and lipids (DMPC, DOPE, DPPC). The ability to bind nucleic acids was tested on three types of DNA varying in size i.e. 21 bp, 200 bp or 20 kbp.

To obtain structural information about formed systems, small angle X-ray scatering (SAXS) measurements using synchrotron radiation were performed at Beam Line P12 (EMBL Outstation c/o DESY Hamburg, Germany).Additionally, to characterize conformational changes in thelipid structures and to investigate the nature of phase transitions in solution, infrared spectroscopy (FTIR) and differential scanning calorimetry (DSC) were used. To get an insight into process of complex formation with nucleic acid, circular dichroism (CD) spectroscopy and electrophoretic experiments were performed.

Results indicate that trigemini surfactants formed stable complexes with DNA more efficiently than gemini surfactants, (i.e. at lower concentrations in solution). The addition of lipids also improves the efficiency of the complexation.

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