P-38

Conformational changes of peptides based on human Cystatin C steric zipper region in the presence of gemini surfactants

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Keywords: human Cystatin C, peptides, steric zipper, circular dichroism

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Human cystatin C (hCC) is a monomeric protein which exhibits amyloidogenic properties. This protein refolds to produce very tight, two-fold symmetric dimers. The dimerization process occurs *via* three-dimensional domain swapping. The crystal structure of native protein provided some clues about the tendency of hCC to dimerization and suggested a mechanism for its aggregation [1]. One of possible driving forces of this process may be provided by the presence of amyloidogenic steric zipper motif in the hCC sequence that undergoes significant exposure as a result of the domain swapping.

The aim of this project was an investigation of the influence of dicationic (gemini) surfactants on conformations of amyloidogenic peptides using variety of spectroscopic methods (CD, FTIR or spectrofluorimetry). In this work we used a synthetic peptides corresponding to the steric zipper motif derived from the cystatin C sequence, which has the ability to form cross-beta structure. The gemini surfactants used in the work are bis-imidazolium dichlorides with general formula C12JCn (n=2-12), where n stands for the number of methylene groups in the spacer group [2].

Acknowledgments: This research project has been financed by the funds from the National Science Centre (Poland) granted on the basis of decision No. DEC-2012/06/M/ST4/00036

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P-39

Nanocarriers of siRNA based on selected gemini surfactants

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Keywords: synchrotron radiation, small angle X-ray scattering, siRNA, gemini surfactants, gene carriers

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Gemini surfactants belong to one of the most intensively studied group of chemical compounds, because of their specific properties like ability to formation of complex spatial structures and to the stable binding of the nucleic acids [1]. The process of complex formation between cationic gemini surfactants and nucleic acids is very interesting and important from the point of view of gene therapy. The most essential thing is to find the best vector for gene delivery into infected or genetically damaged cells [2-5].

In particular, the aim of this study was to analyzed nanocomplexes of cationic gemini surfactants (1,n-alkanebis[(oksymethyl)dimethyldodecylammonium] dichlorides)) with siRNA oligomers using agarose gel electrophoresis, small angle scattering of synchrotron radiation, circular dichroism spectroscopy and polarization microscopy.

Prepared by us nanocomplexes were found to be stable and the process of their formation was reproducible, efficient and immediate. Their morphology, spatial nanostructure and conformation of nucleic acid inside them was characterized. Based on this knowledge we categorized our systems as potential gene carriers.

Acknowledgments: This work was supported by the funds from the National Science Centre (Poland) granted on the basis of decision no. DEC-2011/01/B/ST5/00846.

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