ESRF	**Experiment title: Time-resolved SAXS studies of liquid crystalline nanosystems relevant to drug delivery to brain**	**Experiment number**: SC- 3358
Beamline: ID02	**Date of experiment**: from: 22.06.2012 to: 25.06.2012	**Date of report**:
Shifts: 9	**Local contact(s)**: **Theyencheri Narayanan** **(email: narayan@esrf.fr)**	*Received at ESRF:*

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Report:

Structural changes occurring on a millisecond time scale during the uptake of DNA by cationic lipid nanocarriers are monitored by time-resolved small-angle X-ray scattering (SAXS) coupled to a rapid-mixing stopped-flow technique. Nanoparticles (NPs) of nanochannel organization are formed by PEGylation, hydration and dispersion of a lipid film of the fusogenic lipid monoolein in a mixture with positively charged and PEGylated amphiphiles, and are characterized by inner cubic structure of very large nanochannels favorable for DNA upload. The rapid kinetics of complexation and assembly of these cubosome particles with neurotrophic plasmid DNA (pDNA) is revealed thanks to the high brightness offered by the synchrotron X-ray source. The rate constant of the pDNA/lipid NP complexation is estimated from dynamic SAXS patterns recorded at 4 millisecond time resolution. pDNA upload into the highly hydrated channels of the cubosome carriers leads to a fast nanoparticle-nanoparticle structural transition and lipoplex formation involving tightly packed pDNA.

The results of the project, realized at the ID02 beamline, were published in the article:

Angelov, B., Angelova, A., Filippov, S., Narayanan, T., Drechsler, M., Štěpánek, P., Couvreur P.; Lesieur, S. ***J. Phys. Chem. Lett.*****,** 2013, *4*, 1959–1964 (impact factor 6.585).

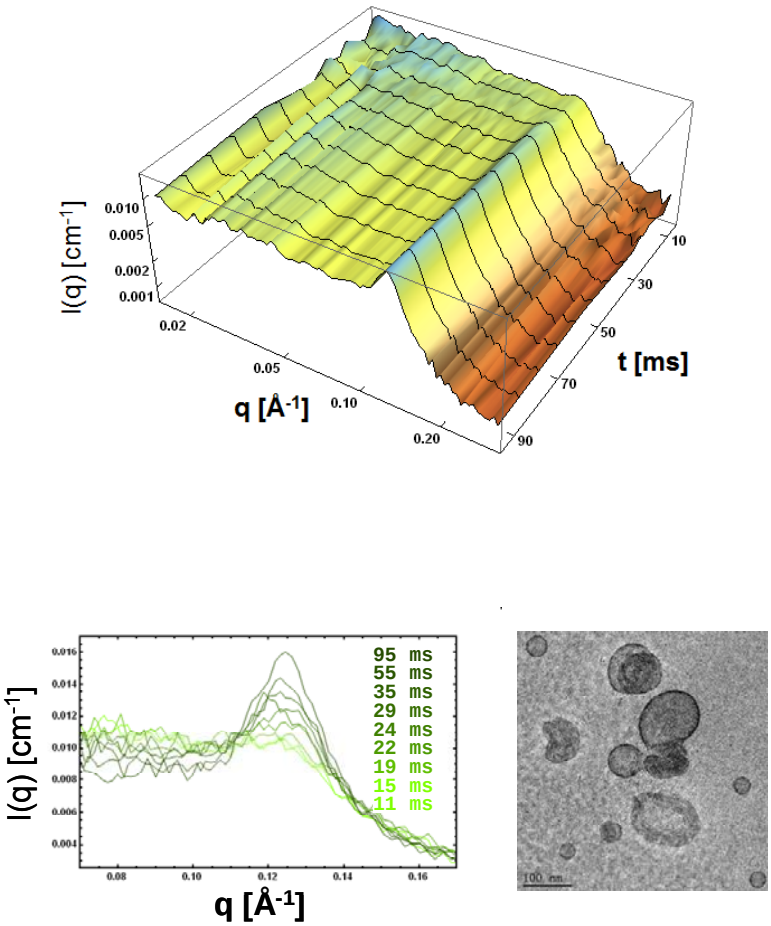

Figure 1. Millisecond range kinetic pathway of plasmid DNA (pDNA)/cationic lipid nanoparticle assembly revealed by time-resolved SAXS (4 ms exposure time), coupled to stopped-flow rapid mixing, and allowing for real-time monitoring of the complexes formation between pDNA and nanochannel-type fusogenic lipid carriers.