



**POSTER #33**

## **COMPLEXATION OF BOVINE SERUM ALBUMIN (BSA) WITH CATIONIC AMPHIPHILES**

**Maor Ram-On** and Yeshayahu Talmon

Department of Chemical Engineering and the Russell Berrie Nanotechnology  
Institute (RBNI), Technion-Israel Institute of Technology, Haifa 3200003, Israel

The interaction between amphiphiles and polyelectrolytes has been widely investigated in recent years due to their potential application in industry and medicine, with special focus on gene therapy. The binding of polyelectrolytes to oppositely charged amphiphiles is dominated by electrostatic interactions, but hydrophobic forces and the molecular nature also play an important role in forming the final nano-complex nanostructure.

In this work we used direct-imaging cryogenic-temperature transmission electron microscopy (cryo-TEM) and small-angle x-ray scattering (SAXS) to study the nanostructure of complexes formed by bovine serum albumin (BSA) and the cationic amphiphiles 1,2-dioleoyl-3-trimethylammonium-propane (DOTAP) and didodecyldimethylammonium bromide (DDAB). The cationic amphiphiles and the BSA molecules carry opposite charges, thus forming multilamellar structures, where the protein molecules are sandwiched between the amphiphiles bilayers, screening the electrostatic repulsion. When complexes of these amphiphiles and negatively charged polyelectrolytes such as sodium poly(acrylic acid) or poly(styrene sulfonate), which are model systems for gene delivery system, are introduced to the BSA, their nanostructure changes. The negatively charged BSA molecules compete with the polyelectrolytes on the positive charged of the amphiphiles, leading to disassociation of the original complexes.

These findings suggest the relative strength of binding of the amphiphiles and the polyelectrolyte, and could explain why complexes of DNA and positively charged complexes (lipoplexes) are not stable in blood serum where BSA is abundant.

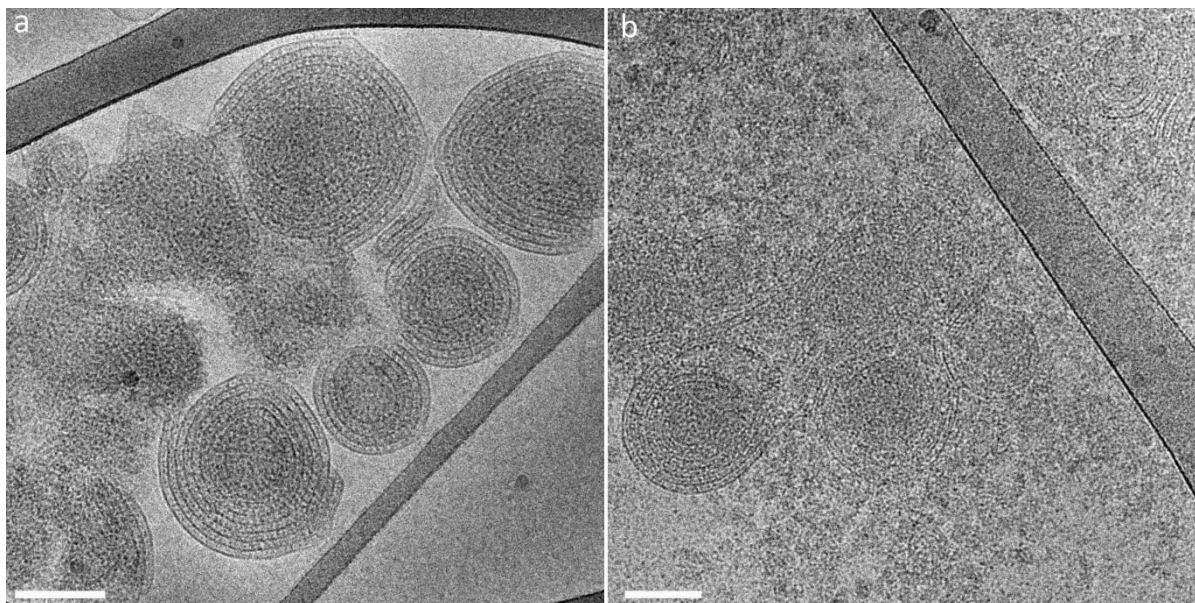


Figure 1. DDAB and BSA in 20mM HEPES, pH 7.4 at CR of 0.1 (a) and 1 (b). DDAB concentration is 10 mM. Bars correspond to 100 nm.

References:

1. Golan, S.; Aytar, B. S.; Muller, J. P. E.; Kondo, Y.; Lynn, D. M.; Abbott, N. L.; Talmon, Y., **Influence of Biological Media on the Structure and Behavior of Ferrocene-Containing Cationic Lipid/DNA Complexes Used for DNA Delivery**, *Langmuir* 2011, 27 (11), 6615–6621.
2. Ram-On, M.; Cohen, Y.; Talmon, Y., **Effect of Polyelectrolyte Stiffness and Solution pH on the Nanostructure of Complexes Formed by Cationic Amphiphiles and Negatively Charged Polyelectrolytes**, *J. Phys. Chem. B* 2016, 120 (26), 5907–5915.