



Experiment title: DNA-surfactant interactions at the air-water and solid water interface

Experiment number:
SC-1992

Beamline: ID10b	Date of experiment: from: 17-may-2006 to: 23-may-2006	Date of report: 15-feb-2007
Shifts: 18	Local contact(s): Dr. Oleg KONOVALOV	<i>Received at ESRF:</i>

Names and affiliations of applicants (* indicates experimentalists):

Victor Erokhin*, University of Parma

Tatiana Berzina*, University of Parma

Svetlana Erokhina*, University of Parma

Luigi Cristofolini*, University of Parma

Yuri Gunaza*, University of Parma

Report: Two papers have been published resulting from the experiment.

1. Publication on Langmuir 23, 4414-4420 (2007):

INTERACTION OF DNA OLIGOMERS WITH CATIONIC LIPIDIC MONOLAYERS:

COMPLEXATION AND SPLITTING

Svetlana Erokhina¹, Tatiana Berzina^{1,2}, Luigi Cristofolini^{1,2}, Oleg Konovalov³, Victor Erokhin*^{1,2,4}, and Marco P. Fontana^{1,2}

1 Department of Physics, University of Parma, Viale Usberti 7 A, 43100 Parma, Italy

2 Centro SOFT CNR-INFN, Rome, Italy

3 European Synchrotron Radiation Facility, 38043 Grenoble Cedex, France

4 Institute of Crystallography Russian Academy of Sciences, Leninsky pr. 59, Moscow, Russia

Abstract

Interactions of native DNA with octadecylamine (ODA) and hexadecyldimethylammonium bromide (HTAB) monolayers at the air/water interface were studied by π -A isotherms, ellipsometry and X-ray reflectivity. We show that the microscopic structure of ODA-DNA complexes is definitely consistent with a single stranded form for DNA. On the contrary, with HTAB DNA complexes in its native form. The crucial difference in the behavior of these two fairly similar lipids is due to the presence of the amine group in ODA. These results should be relevant to applications such as DNA chips and sensors.

Structural study of the DNA - dipalmitoylphosphatidylcholine (DPPC) complex at the air-water interface.

Luigi Cristofolini*^{1,2}, Tatiana Berzina^{1,2}, Svetlana Erokhina¹, Oleg Konovalov³, Victor Erokhin^{1,2,4}

1 Department of Physics, University of Parma, Viale Usberti 7 A, 43100 Parma, Italy

2 Centro SOFT CNR-INFN, Italy

3 European Synchrotron Radiation Facility, 38043 Grenoble Cedex, France

4 Institute of Crystallography Russian Academy of Sciences, Leninsky pr. 59, Moscow, Russia

ABSTRACT

We present here results that demonstrate the formation of a complex of DNA with zwitterionic dipalmitoylphosphatidylcholine (DPPC) monolayer at the air-water interface, in the presence of Ca^{2+} ions; in particular we show that the presence of Ca^{2+} cations is essential for the formation of the complex of DPPC with DNA. We characterize the resulting structure by x-ray reflectivity and by null-ellipsometry. We show that DNA maintains its native double helix form when attached to the zwitterionic lipid monolayer, at difference with the case of ammine containing monolayers. Our findings are discussed in view of other works recently appeared on the interaction of DNA with zwitterionic phospholipids, emphasizing the role of DPPC as a potential vector for transfer of genetic material into mammalian cells by nonviral gene therapy and also suggesting Langmuir/Blodgett layers of zwitterionic phospholipids as a method for non-conventional DNA immobilization.