SoftBioMatter POSTDOCTORAL FELLOWSHIP

Mechanical Properties of Lipid Bilayers in relation to Sonoporation

Possible starting date: May 2012

Proposal:

A post-doctoral position is available at LPMCN (Lyon 1 Claude Bernard University), to work experimentally on the mechanical properties of membranes in the frame of the project SonInCaRe supported by ANR TecSan 2010 in collaboration with INSERM U556, "Control of Cavitation for Ultrasound Therapy" group (Lyon).

Several strategies have been designed for drug or gene delivery into cells (viral or not). Among nonviral methods, the process of ultrasound enhancement of molecule uptake, known as sonoporation, is based on the temporarily increase of cell membrane permeability and the poration of cell membrane, allowing molecules transfer. *In-vivo*, sonoporation is especially attracting because it is a non invasive technique and ultrasounds can be focused with a millimeter precision. Nevertheless, the transfection efficiencies of sonoporation are lower than those of other methods. These limitations are generally thought to be due to the lack of fundamental understanding of the mechanisms involved in sonoporation, in particular the interactions between air bubbles in cavitation and lipid membranes.

The project benefits from the large expertise of the INSERM partner in the design of regulated cavitation devices adapted for conventional cell culture plates under a microscope. The candidate will investigate the efficiency of sonoporation in relation with the mechanical properties of membranes. As a model system, he will use suspended lipid membranes on micropatterned substrates and cell monolayer cultures. Using fast fluorescence imaging techniques (resonant confocal and epifluorescence with fast camera), he will study pore formation in these systems in the vicinity of cavitating bubbles. AFM force measurements with a conventional or a modified cantilever supporting a vertical hanging glass fiber (Xiong et al, PRE 2009), will be used to measure mechanical properties of cell monolayers and suspended membranes used for the project (collaboration with E. Charlaix and A. Piednoir, LPMCN).

Profile:

The applicant should have a PhD in experimental physics, mechanical engineering or biophysics, and show strong interest for interdisciplinary work at the interface between physics and biology. Experience in membrane fabrication (supported membranes or giant unilamelar vesicles) and AFM would be appreciated. Informal enquiries may be made to Jean-Paul Rieu. This is a limited term contract with funding available for 12 monthes with a possible extension. If you are interested by this proposal, please send your CV, a motivation letter, and contact information of two researchers with whom you have worked in the past.

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