

SEMS: RESEARCH PROJECT DESCRIPTION

1. Project Background and Description

Design of next generation RNA delivery vectors

A studentship in the chemistry of RNA delivery vectors is available in the group of Prof J. Gautrot at QMUL (<http://biointerfaces.qmul.ac.uk>). RNA delivery plays an increasing role in biotechnologies and the development of a new generation of therapeutics, from the treatment of cancer to the development of new RNA vaccines. Our lab has recently demonstrated the excellent performance of polymer brushes for the delivery of RNA, but the precise engineering of their chemical and physico-chemical structure for such applications remain vastly unexplored. In this project, novel polymer brush architectures enabling the delivery of RNA with antiviral will be designed. Their physico-chemical properties and assembly with RNA macromolecules will be characterized. Finally, the performance of these new vectors to deliver RNA to model cells in vitro, and to establish the basis of a strong protein expression response that may lead to immunization, will be studied.

2. Project Scope

Within this project, you will be trained in the growth of polymer brushes from nanoparticles and their characterization using techniques such as ellipsometry, FTIR, XPS and AFM. You will develop an exciting range of polymer brush chemistries that aim to efficiently capture RNA macromolecules and selectively deliver them upon cytosolic entry. To understand the mechanism of action of these polymer coatings, you will study how their physico-chemistry impacts on their interaction with RNA molecules, using techniques such as surface plasmon resonance, quartz-crystal microbalance and neutron reflectometry. Finally, you will work with collaborators (clinicians and virologists) and be trained in assays aiming to evaluate the impact of these delivery vectors on protein expression.

3. Desired Skills from the Student

Candidates are expected to have a background in chemistry or materials science, with a particular interest in the study and characterization of surface chemistry.

4. Supervisory Team

Add supervisory team details

Primary: Prof. Julien Gautrot.

Secondary: Prof. Steffi Krause.

Additional: Dr Maria-Teresa Cutino-Moguel (Barts Hospital).