

PhD position

1. Position identification

Title of post : PhD student

Type of contract : contrat doctoral

Category (A,B or C) : /

Contract/project period : 01/10/2024-30/09/2027 **Expected date of employment :** 01/10/2024

Proportion of work : 100%

Workplace : Faculté de Pharmacie, Laboratoire de Bioimagerie et Pathologies - LBP, UMR 7021 CNRS, 74 route du Rhin, 67401 ILLKIRCH

Desired level of education : Master 2 or equivalent

Experience required : /

Contact(s) for information on the position (identity, position, e-mail address, telephone) : André Klymchenko, DR1 CNRS ; andrey.klymchenko@unistra.fr; Tel: +33 368 85 42 55

Date of publication : 12/07/2024

Closing date for the receipt of applications : 15/08/2024

2. Research project or operation

This PhD position is supported by the "EV-GRAFT" grant. In the PhD project, we aim at developing new molecular probes for chemical functionalization of the surface of extracellular vesicles (EVs) in order to track their fate at multiple scales (from cell to organism), sense their microenvironment and control their biodistribution and targeting. Extracellular vesicles (EVs) impact a large spectrum of biological processes by mediating cell-cell communication in various physiological and pathological contexts. Given their abundance in biofluids and their biocompatibility, they are emerging as novel and promising diagnostic and therapeutic targets. Therefore, development of new molecular tools to study EVs is very important. The project is composed of 3 work packages. 1) We will develop robust fluorescent molecular tools (MemGraft) for covalent labeling of EVs allowing conventional and super-resolution fluorescence imaging as well as multimodal imaging in combination with electron microscopy. We will compare MemGraft probes to classical EVs probes and determine their impact on EVs functionality in different models. 2) We will design MemGraft probes allowing to sense EVs lipid organization and surrounding pH and then apply them in vitro and in vivo in collaboration with biology partner (Dr. Vincent Hyenne, INSERM UMR_S1109). 3) We will manipulate EVs through surface functionalization by tailor-made MemGraft probes in order to capture EVs in complex environment and control their cell specific targeting and biodistribution.

The project builds on the complementarity and pre-existing collaboration between Andrey Klymchenko, an expert in fluorescent probes, biomembranes and bioimaging and Vincent Hyenne, an expert in EVs biology, animal models and correlative imaging. The project will benefit from state-of-the-art molecular design, biochemistry, advanced optical and electron microscopy imaging techniques, and complementary animal models (mouse and zebrafish) adapted to the in vivo functional study of EVs.

The new set of MemGraft probes will enable to decipher EVs surface (lipids, proteins and the environment) during their journey in vitro and in vivo and uncover mechanisms controlling their uptake, trafficking and fate. This project will result in a new molecular toolkit for fundamental and preclinical research on EVs and biological membranes in general. The PhD student will gain multidisciplinary knowledge and skills in organic chemistry, bioorganic chemistry, chemical biology, membrane biophysics, advanced fluorescence spectroscopy and microscopy, bioimaging, etc. The PhD student will be also exposed to highly interdisciplinary environment of the host team, composed of chemists and biophysicists as well as within the consortium with the biology partner.

3. Activities

➤ **Description of the research activities :**

Research on the project ANR EV-GRANT

➤ **Related activities :**

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1/2

4. Skills

➤ **Qualifications/knowledge :**

Organic chemistry, bioorganic chemistry, chemical biology, fluorescence spectroscopy

➤ **Operational skills/expertise :**

Conduct research at the interface of chemistry and biology

Conduct organic synthesis and characterization of new dyes

Fluorescence characterization of new dyes

➤ **Personal qualities :**

Motivation, communication, emotional intelligence, team spirit, adaptability, critical thinking

5. Environment and context of work

➤ **Presentation of the laboratory/unity :**

Team « Photoactive materials and bioimaging » : 4 researchers/teachers, 8 PhD students, 4 postdoctoral researchers

➤ **Hierarchical relationship :**

PhD supervised by the team leader, A. Klymchenko

➤ **Special conditions of practice (notice attached):**

To apply, please send your CV, cover letter and diploma before August 15, 2024,

to :

André Klymchenko, andrey.klymchenko@unistra.fr