CDD job offer – 1-year postdoctoral researcher in Raman microspectroscopy, signal processing and statistical analysis

Environment

MSC-Med laboratory (CNRS and Université de Paris) has a consolidated expertise in extracellular vesicles (EVs), from their bioproduction and loading with drugs / nanoparticles to their characterization and therapeutical application in regenerative medicine and drug delivery [1–3] as well as response of cancer-treatment [4].

The team obtained funding from Région Ile de France, Idex Université de Paris, and DRRT for launching the first facility in the Paris region dedicated to EVs. **IVETh** facility is a **center of expertise for research-grade production, engineering, purification and characterization of EVs for diagnosis and therapeutic purposes**.

IVETh facility relies on innovative and high-throughput methods for EV production and isolation and their characterization in terms of content and activities (asymmetric flow field-flow fractionation - A4F-MALS, Raman and SERS imaging / spectroscopy, as well as high-content screening cytomic method for potency tests on recipient cells). The direct applications are at the level of control quality for therapy (drug delivery / regenerative medicine) and diagnosis of diverse pathologies.

Background

Raman spectroscopy is a laser-based technique that gives a global molecular fingerprint. This technique can be label-free or can use the plasmonic effect of nanoparticles to enhance the Raman signal (SERS). Raman spectroscopy is particularly powerful to characterize tissue (cancer diagnosis) [5, 6] and has only been used recently for characterizing EVs. By combining our dual expertise on EVs and Raman spectroscopy, we would like to develop the biomolecular characterization of EVs using Raman spectroscopy with applications in quality control (for therapeutic EVs) or diagnosis (on EVs purified from biofluids). To this aim, the IVETh facility is currently acquiring a Raman confocal microscope (DXR3Xi, Thermofisher) allowing high throughput Raman imaging.

(Please see for specifications: https://www.thermofisher.com/fr/fr/home/industrial/spectroscopy-elemental-isotope-analysis/molecular-spectroscopy/raman-spectroscopy/dxrxi-raman-imaging-microscope.html)

Mission: MSC Med and IVETh platform are looking for a postdoc for developing protocols to acquire Raman spectra / images of EVs label-free or with SERS substrate / nanoparticles. The candidate will also have to perform data (pre-)processing, and statistical analyses including classification (machine learning). Raman data will be combined with data from other modalities from IVETh facility for multimodal classification. We are seeking an **extremely motivated, rigorous, ingenious postdoctoral researcher** to join our dynamic team and **participate to the exciting experience of launching a cutting-edge facility**.

Profile: Raman (micro)spectroscopy, data / image processing, statistical analysis, supervised machine learning classification, and teamwork skills are absolutely required. Expertise in cell culture and extracellular vesicles is desired but not mandatory.

Starting date: December 2021

Type of contract: 1-year CDD (renewable)

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References from the team related to the topic:

[1] Pinto, A. et al.: Immune Reprogramming Precision Photodynamic Therapy of Peritoneal Metastasis by Scalable Stem-Cell-Derived Extracellular Vesicles. *ACS Nano*, **15** (2), 2021, p. 3251–3263.
[2] Silva, A.K.A. et al.: Magnetic and Photoresponsive Theranosomes: Translating Cell-Released Vesicles into Smart Nanovectors for Cancer Therapy. *ACS Nano*, **7** (6), 2013, p. 4954–4966.
[3] Piffoux, M. et al.: Modification of Extracellular Vesicles by Fusion with Liposomes for the Design of Personalized Biogenic Drug Delivery Systems. *ACS Nano*, **12** (7), 2018, p. 6830–6842.
[4] Aubertin, K. et al.: Massive release of extracellular vesicles from cancer cells after photodynamic treatment or chemotherapy. *Scientific Reports*, **6**, 2016, p. 35376.
[5] Aubertin, K. et al.: Mesoscopic characterization of prostate cancer using Raman spectroscopy: potential for diagnostics and therapeutics. *BJU International*, **122** (2), 2018, p. 326–336.
[6] Aubertin, K. et al.: Combining high wavenumber and fingerprint Raman spectroscopy for the detection of prostate cancer during radical prostatectomy. *Biomed. Opt. Express, BOE*, **9** (9), 2018, p. 4294–4305.