Post-doctoral research associate

Laboratory & Institut : Institute of Biosciences and Biotechnologies, CEA Cadarache.

Duration: 2 years

Supervisors : Dr. Sandra Prévéral / Dr. Damien Faivre

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Website : https://www.cite-des-energies.fr/biam/

Subject: Magnetotactic bacteria and their motion in complex tumor environments

The institute focuses on interdisciplinary research in the field of environmental biology, biofuel, and health and environmental biotechnology (https://www.cite-des-energies.fr/biam/). In particular, the team of molecular and environmental microbiology attempts to understand how microorganisms interact with their environment and to develop new actuators and sensors. In this context, the group working on biotechnology applications of magnetotactic bacteria invites applications for a:

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Magnetotactic bacteria are peculiar microorganisms that orient in magnetic fields with the help of a dedicated organelle, the magnetosome chain, which acts as an intracellular compass needle. In this way, their swimming, powered by their flagella, is guided by the magnetic field; the bacteria can be understood as self-propelled compass needles. In a biomaterials context, magnetotactic bacteria have been proposed as drug delivering microsystems. Guided by chemical, biological and physical cues, they can be seen as microrobots specifically seeking tumor environments as they would swim in their natural aquatic environment characterized by pores and obstacles.

In this project, we aim at implementing a microfluidic system simulating the tumor vascular environment. We will study the magnetic guidance of magnetotactic bacteria in such microfluidic chips filled with serum. We will also implement a flow to simulate a realistic blood flow in the system. In parallel, we will develop and adapt a 3D, spheroid-like cellular model to study bacterial targeting and penetration in a context mimicking the tumor environment.

Pôle international de R&D sur les énergies bas-carbone

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The candidate will be responsible for all the experimental parts of the project. This will include microbiology for growing the bacteria and cell biology for the spheroid part. She/he will develop microfluidic devices and will use a custom-design microscope to study the swimming behavior in controlled magnetic conditions. Special emphasis will be laid on interdisciplinary research so that close collaboration with MRI scientists (S. Mériaux, Neurospin) and clinical colleagues (B. Cambien, U. Nice) will be expected.

Qualification :

Candidates should have a PhD or doctoral degree in biophysics, biotechnology, physics, materials science, chemistry or microbiology. Proficient English is required. Good theoretical and practical skills in the lab and for the redaction of scientific communications are expected. Skills in microfluidics, optical microscopy and cell biology will be highly appreciated.

Recent papers on the subject:
- *Behr J, Carnell LR, Stein R, Pfister F, Friedrich B, Huber C, Lyer S, Band J, Schreiber E, Alexiou C, Janko C. In Vitro Setup for Determination of Nanoparticle-Mediated Magnetic Cell and Drug Accumulation in Tumor Spheroids under Flow Conditions. Cancers.* *https://doi.org/10.3390/cancers14235978*
- *Mirkhani N, Christiansen MG, Gwisai T, Menghini S, Schuerle S. Spatially selective delivery of living magnetic microrobots through torque-focusing. Nat Commun.* *https://doi.org/10.1038/s41467-024-46407-4*

Documents :

Please include CV, publications' list, motivation letter and at least 2 names for reference letters to your application