Post-doctoral position at the Institut de Mécanique des Fluides de Toulouse (UMR 5502)

MECHANOBIOLOGY OF BONE TUMOR GROWTH

Identification
Key words: Tumor micro-environment, poro-mechanics, perfusion tests, X-ray tomography, structural modal analysis

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Institute: Institut de Mécanique des Fluides de Toulouse (IMFT), UMR 5502 CNRS-INPT-UPS, France. Website
Department: Group of Expertise on Pourous Media (GEMP)
Project length: 24 months (January 2016-December 2017)

Context
The project is conducted in a research group with a strong expertise in the study of fluid flow in porous media for industrial and medical applications. Few years ago, a biomechanics laboratory has joined the group altogether with clinicians, making this singular multidisciplinary team perfectly adapted for the development of the present projet. This project aims to develop an innovative mechanobiology approach to study tumor growth. To our knowledge, a mixed approach including complex theoretical models combined with experimental measurements has never been developed for cancers. In this context, the successful candidate will work on the experimental section of this challenging objective.

Project summary
Mechanical effects have been shown to play a crucial role in the dynamics of the tumor micro-environment (tumor and surrounding tissue), Shieh Ann Biomed Eng. 2011;39(5):1379-89. The general objective of this project is investigate the role of mechanical stimuli on tumor growth in bone cancer. The study focuses on a specific type of primary bone tumors, the osteosarcoma.

For this project, experiments on biological samples will be conducted to assess the tissues mechanical properties of the micro-environment (porosity, permeability and elasticity) using respectively X-Ray micro-tomography, a permeability device and a structural vibration system. Samples will be obtained from established collaborations with biologists, pathologists and clinicians. The devices are already available in the laboratory so that experiments on phantoms and artificial tissue can be conducted immediately at the start of the project. From these preliminary results, the candidate will improve the existing experimental set up, standardise the protocols and eventually develop new devices. In the following months, experiments on biological tissues will be conducted and the results will be compared with the theoretical/numerical data obtained in a complementary project. A dedicated apparatus will also be developed to impose external loadings on mice tumors with controlled cycles. While the candidate will not be in charge of the mice, he will work in close collaboration with the vet to test the set up accuracy and efficiency.

Profile
Successful candidates will have a strong background in experimental methods for fluid and/or structural mechanics and must have a Ph.D in one of those fields. Demonstrated motivation for work at the interface between disciplines (physics, biology, medicine ...) and in a collaborative environment is expected. Candidates with experience in X-Ray micro-computed tomography, perfusion tests and/or modal analysis will be given priority. Fluency in English and willingness to learn French (if not the native language) are expected. To apply, please email your resume and a cover letter to Pauline Assemat and Pascal Swider.

Administrative section
The post-doc position is funded for 2 years, starting from January 2016 (Gross salary: ~ 30000 € per year; Net salary, including healthcare: ~ 24000 € per year). The experimental costs will be covered by a Midi-Pyrénées region grant.