Post doc subject: Challenge "Interfaces"

Post doc Advisor:

- Bensamoun Sabine, Chargée de Recherche (CR1)

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Context of the study:

This project is part of the activities of the Laboratory of Excellence (LABEX) at the Université de Technologie de Compiègne (UTC) in France on the Control of Technological Systems of Systems (MS2T) (www.labexms2t.fr). It is more specifically part of the Research topic 3: Optimized design of technological SoSs. The Labex funded in 2015 the Challenge "Interfaces led by Dr. Legallais: Tissues and cell Interfaces in muscle-skeleton system: Application to the design of bioartificial SoS" **The system of systems (SoS) of interest is a tissue engineered muscle-tendon-bone continuum.**

Since 2004, Sabine Bensamoun has collaborated with the **Department of Biochemistry and Molecular Biology (**Mayo Clinic, Rochester, USA) to characterize the mechanical and morphological properties of bone and tendon tissues isolated from control and transgenic (KO: knock out, deletion of TIEG1 gene) mice. Since this time, they have published a series of manuscripts related to these areas and are now continuing their collaboration, which aims at **understanding the behavior of muscle**, **to study the interactions** between bone, tendon and muscle tissues leading to the musculoskeletal motion.

This project has been associated in the Challenge "Interfaces", in order to perform studies linking the biomimetic SoS developed and pathology of the musculoskeletal system represented by the TIEG1 KO mice.

Post doc description:

The purpose of this project will be to use the previous structural and functional results, obtained on bone and tendon tissues, and the future ones performed on muscle tissue from **control** (WT: wild type) mice **to have a better knowledge of the healthy musculoskeletal system. These morphological and mechanical data are of importance for the reconstructed tissue and** will allow a complete **understanding at different scales of the interactions between bone, tendon and muscle tissues. Moreover, this study will provide a better analysis of the interfaces such as tendon-muscle.**

In addition, the **TIEG1 KO animal model** could be used to **mimic pathological conditions** present **in Human musculoskeletal system.**

The role of the post doc will be to continue the muscle characterization at the cellular level from control and TIEG1 KO mice. **Primary cell culture** protocols will be **set up** from slow and fast twitch muscles extracted from control and TIEG1 KO mice. The **challenge** will be to set up the process allowing for the analysis of the myoblast behavior. A significant amount of slow and fast twitch muscles will be necessary to perform these tests and the department of Biochemistry and Molecular Biology at the **Mayo Clinic** will also provide muscle tissue. **Adhesion, spreading and proliferation** of myoblasts isolated from WT and TIEG1 KO mice will be characterized with and without substrate. Indeed, **the electro spun support,** developed for the reconstructed tissues, could be used as a **muscle environment** for the myoblasts extracted from control and transgenic mice. Subsequently, **mechanical tests** will be applied to these myoblasts to analyze their behaviors under various stress conditions, using the Bose Biodynamic device (Equipex FIGURES) or other in house traction device.
This characterization will **allow a better understanding of the interactions between the myoblasts and the fibroblasts (tendon) cells. The muscle cell behavior could be transferred to the analysis of the reconstructed tissues.**

Subsequently, these interactions will be analyzed from a **pathological musculoskeletal system**. In this purpose, TIEG1 KO animal model will be used to **mimic osteoporosis** or other human pathological conditions present within the musculoskeletal system.

Candidate's profile:

The post doc must have a strong background in physiology, cellular and molecular biology, applied to skeletal muscle tissue. Knowledge in the effects of TIEG1 gene on biological tissues is expected. A good English level is also requested.

Documents required to apply:

Send to sabine.bensamoun@utc.fr

- Curriculum vitae
- Motivation letter
- At least two references and/or recommendation letters
- A statement of research experience and interests

Location:

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