

## **Water-T2 Spectroscopy Mapping: A Non-Invasive Quantitative MRI Method for Assessing Specific Histopathological Changes in Skeletal Muscle in Neuromuscular Diseases**

We are seeking a highly motivated PhD candidate to join our multidisciplinary research team at the NMR Laboratory of the Institute of Myology (IoM). As a global leader in neuromuscular research, the IoM integrates medical care, fundamental and applied research, clinical trials, and education, focusing on both healthy and diseased muscle. The IoM is internationally recognized for pioneering groundbreaking research and participating in numerous clinical studies and trials.

The NMR Laboratory plays a pivotal role in advancing the IoM's mission by developing and clinically applying innovative quantitative MRI (qMRI) methods to improve the diagnosis and monitoring of muscle diseases. As part of our team, the PhD candidate will be at the forefront of these advancements, with the unique opportunity to work with state-of-the-art MRI systems and collaborate with a team of expert physicists, engineers, and clinicians.

**About the Project:** This PhD project focuses on developing a clinically applicable qMRI method to characterize specific histopathological tissue alterations in skeletal muscle, which are currently only assessable through muscle biopsy. We have previously demonstrated that the multi-exponential behavior of water T2 relaxation in healthy skeletal muscle reflects the tissue water compartmentation at a histological level. Moreover, we have recently demonstrated the sensitivity of these multi-exponential relaxometry metrics to specific histological alterations, and their capacity to distinguish between different myopathies.

Leveraging our 7-tesla preclinical and 3-tesla clinical MRI systems, the candidate will explore advanced imaging and spectroscopic techniques, building on our previous work that demonstrated the feasibility of non-invasive histopathological tissue characterization.

### **Key Responsibilities:**

- **NMR Pulse-Sequence Development:** Learn and apply advanced NMR pulse-sequence programming under the guidance of expert physicists.
- **Post-Processing Tool Design:** Implement post-processing tools for quantitative MRI data analysis.
- **In Vivo Experiments:** Conduct preclinical and clinical experiments.

- **Scientific Dissemination:** Actively contribute to the team's scientific output by presenting research findings at international conferences and publishing them in peer-reviewed journals.

**What We Offer:**

- The opportunity to work with state-of-the-art MRI systems and contribute to groundbreaking research with direct clinical impact.
- Mentorship from leading experts in MRI physics, biomedical engineering, and neuromuscular disease.
- A dynamic and collaborative research environment at one of the world's foremost institutions for neuromuscular studies.
- Involvement in high-impact, international research projects shaping the future of medical imaging and clinical research.

**Profile:** Strong interest in mathematical modeling of physical systems, programming, and signal processing. Any knowledge or experience in Nuclear Magnetic Resonance (NMR) is highly valued. The ideal candidate should have a passion for experimental and life sciences, along with excellent communication and teamwork skills. A solid foundation in linear algebra and experience with solving inverse problems is required. Given the multidisciplinary nature of this project, the candidate must demonstrate independent thinking and scientific maturity to navigate complex challenges.

**Location:** Laboratoire de Résonance Magnétique Nucléaire - Institut de Myologie - Hôpital de la Pitié-Salpêtrière, Paris.

**Duration :** 36 months.

**Start date:** September 2025

**Project partners:** Ecole Doctorale EOBE - Université Paris-Saclay

**Salary:** ~ 1700 euros net + healthy insurance and restaurant tickets.

**Application:** Interested candidates should submit their application package by email to **Ericky Caldas de A. Araujo** ([e.caldas@institut-myologie.org](mailto:e.caldas@institut-myologie.org)). The application package should include a cover letter detailing your research interests and qualifications and a comprehensive academic CV. Contact information for referees would be appreciated. Submissions in both English and French are welcome. Interviews will start in October 2024.