

**Internship offer**  
**M2 Musculo-Skeletal system, Locomotion, Exercise (MuSkLE)**

**Title of the Internship:** Phenotype of canine chondrocytes across age and condition of hip and stifle joints

**Laboratory** (name, n°, website): Laboratory of biomechanics and impact mechanics (LBMC, UMR\_T9406), <https://lbmc.univ-gustave-eiffel.fr/en/>

**Research team** (name, website): « Maintaining good health » theme, <https://lbmc.univ-gustave-eiffel.fr/en/recherche-1/translate-to-english-themes-de-recherches/translate-to-english-maintenir-le-corps-en-bonne-sante>

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**Project description including a short introduction, aim/objectives and methods/approach to be used**

10 million French people are affected by osteoarthritis, 65% of whom are over 65 (“Arthrose · Inserm, La science pour la santé,”). While the World Health Organization recommends lifelong physical activity and limiting sedentary lifestyles, it is not yet clear what the recommended intensity and regularity of physical activity should be in relation to age. In particular, movement should be maintained as much as possible, even when joints are affected by osteoarthritis (Holden et al., 2021). In this context, it is necessary to better understand the state of articular cartilage cells, the chondrocytes, throughout life, since it is these cells that create the balance between degradation and synthesis of the extracellular matrix. To do so, they are able to respond to biological, biochemical and biomechanical signals. However, the question arises as to whether these properties are modified or altered with ageing or the development of osteoarthritis.

As part of a recent collaboration between the Lyon Veterinary School, VetAgro Sup with Dr Samuel Buff, and the LBMC, a collection of canine articular tissues has been set up for the multidisciplinary and multiparametric study of articular cartilage and its environment during aging and the development of osteoarthritis. Osteoarthritis is a major issue in veterinary medicine, as 20% of dogs over one year of age suffer from osteoarthritis, and treatments are similar to those used in humans. In addition, many similarities have been noted in terms of the animal's lifestyle, the development of the pathology and the genes involved in comparison with humans.

The aim of this internship is therefore to assess the phenotype of chondrocytes during aging and the development of osteoarthritis in dogs.

As a first step with the collaboration between VetAgro Sup and LBMC, joint tissues from the hip and stifle (knee) will be harvested post-mortem from 20-40 kg dogs of different ages with healthy joints or at an early stage of osteoarthritis, while samples of osteoarthritic femoral heads will be obtained following hip replacement surgery by Dr. Thibaut Cachon. Chondrocytes will be isolated from cartilage for analysis. The expression of various genes can be assessed to investigate chondrocyte differentiation (catabolism, anabolism, dedifferentiation or osteocyte differentiation), quiescence, senescence or even death, as well as markers of tissue inflammation (Hojo and Ohba, 2019). Membrane markers could be used to assess chondrocyte membrane fluidity, a property linked to the mechanical properties of these cells, as well as membrane peroxidation, which could be a marker of tissue ageing (Tiku et al., 2000). This characterization of chondrocytes will lay the groundwork for analysis of their response to mechanical stimuli. Moreover, these results could help us to identify the different mechanisms that can lead to osteoarthritis with age.

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**References:**

Arthrose · Inserm, La science pour la santé [WWW Document], n.d. . Inserm. URL

<https://www.inserm.fr/dossier/arthrose/> (accessed 2.12.24).

Hojo, H., Ohba, S., 2019. Insights into Gene Regulatory Networks in Chondrocytes. *International Journal of Molecular Sciences* 20, 6324. <https://doi.org/10.3390/ijms20246324>

Holden, M.A., Button, K., Collins, N.J., Henrotin, Y., Hinman, R.S., Larsen, J.B., Metcalf, B., Master, H., Skou, S.T., Thoma, L.M., Wellsandt, E., White, D.K., Bennell, K., 2021. Guidance for Implementing Best Practice Therapeutic Exercise for Patients With Knee and Hip Osteoarthritis: What Does the Current Evidence Base Tell Us? *Arthritis Care & Research* 73, 1746–1753. <https://doi.org/10.1002/acr.24434>

Tiku, M.L., Shah, R., Allison, G.T., 2000. Evidence Linking Chondrocyte Lipid Peroxidation to Cartilage Matrix Protein Degradation: POSSIBLE ROLE IN CARTILAGE AGING AND THE PATHOGENESIS OF OSTEOARTHRITIS \*. *Journal of Biological Chemistry* 275, 20069–20076. <https://doi.org/10.1074/jbc.M907604199>

**Skills required:** knowledge in cell and molecular biology, motivation.