Internship Proposal

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Project Title:
Molecular mechanisms of immune aging and therapeutic approaches
Level:

Master Student

Project Summary:

Ageing of the hematopoietic system entails the functional decline of both adaptive and innate immunities (immunosenescence), while promoting chronic immune activation and low-grade inflammation (inflammaging). These features contribute to the increased susceptibility of the elderly population to a wide range of pathologies.
We have interdisciplinary exciting projects running in the lab (see below), centered around two objectives: first, to define causal mechanisms of immune aging; and second, to validate the regenerative potential of targeted therapies.
- CenAGE – A ‘centromeric view’ on ageing: unveiling centromere instability in ageing
- HEMAGE-REPAIR - Pharmacological targeting of DNA damage-driven hematopoietic aging
- THYMIN - The interplay between immunosenescence and aging: deciphering the regenerative role of FOXM1 in age-related thymic involution
- UnFOXingAge - Unveil FOXM1 as rejuvenation factor with therapeutic efficacy against age-related immune dysfunction and tissue pathologies
- REJUVENAGE – Rejuvenation effect of the FOXM1 gene therapy in progeria.
Please apply if you are interested on the topic and highly motivated for an exciting MSc project! We look forward to meet you!

Work to be developed by the student:

To achieve the proposed objectives, we set out a multidisciplinary team of researchers with complementary expertise in aging biology, immunology and bioinformatics, which is uniquely positioned to deliver unprecedented insight in the field of immune aging.
The students will combine high-dimensional cytometry with cell-based assays and high-

throughput sequencing approaches to determine mechanistic links for immune aging. The students will use mouse models to validate therapeutic interventions in vivo.

Students should hold a BSc covering biology, immunology and/or bioinformatics topics; BSc grade average >15; be fluent in English.

References:

- Ferreira FJ, et al. FOXM1 expression reverts aging chromatin profiles through repression of the senescence-associated pioneer factor AP-1. Nat Commun. 2025 Mar 25;16(1):2931. doi: 10.1038/s41467-025-57503-4. - Ribeiro R, et al. In vivo cyclic induction of the FOXM1 transcription factor delays natural and progeroid aging phenotypes and extends healthspan. Nat Aging. 2022 May;2(5):397-411. doi: 10.1038/s43587-022-00209-9.

- Barroso-Vilares M, et al. Small-molecule inhibition of aging-associated chromosomal instability delays cellular senescence. EMBO Rep. 2020 May 6;21(5):e49248. doi: 10.15252/embr.201949248.

- Macedo JC, et al. FoxM1 repression during human aging leads to mitotic decline and aneuploidy-driven full senescence. Nat Commun. 2018 Jul 19;9(1):2834. doi: 10.1038/s41467-018-05258-6.

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