

---

## PhD opportunity - Modulating X chromosome gene dosage and senescence induction

---

This PhD opportunity is offered through the [BEST Doctoral Programme](#), led by the **University of Toulouse** and co-funded by the **European Union** through **Horizon Europe – Marie Skłodowska-Curie Actions (MSCA COFUND)** and the **Toulouse Initiative for Research's Impact on Society (TIRIS)**. Thanks to this programme, **19 doctoral candidates** will be recruited through an international co-supervision scheme across three major TIRIS thematic pillars : Health & Well-being, Global Changes and Sustainable Transitions. The entire recruitment process will take place between November 2026 and April 2027 and will be managed by the **University of Toulouse (UT)**.

|                                                                                 |                                                                                                                                    |
|---------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| <b>Host Institution</b>                                                         | <a href="#">Center for Integrative Biology (CBI), Centre National de la Recherche Scientifique, University of Toulouse, France</a> |
| <b>Supervisor</b>                                                               | <b>Estelle Nicolas</b> - <a href="#">Developmental Regulation of Gene Dosage team</a>                                              |
| <b>Co-supervising institution</b>                                               | Universidade de Lisboa, Portugal                                                                                                   |
| <b>Co-supervisor</b>                                                            | Da Rocha Simão Teixeira                                                                                                            |
| <b>Contract duration:</b> 36-month <b>Starting date:</b> September/October 2027 |                                                                                                                                    |

### Research topic

Cellular senescence is a stable proliferation arrest in response to stresses such as oncogene activation. Even though it acts as a barrier against cancer, accumulation of senescent cells during ageing is associated to age-related diseases, such as cancers and neurodegenerative diseases. This negative effect is driven by the pro-inflammatory environment associated with senescent cells. Understanding the molecular mechanisms underlying cellular senescence is of major importance to improve our knowledge and therapeutical strategies in age-related diseases.

Males and females have different susceptibilities to many age-related diseases. For instance, men are more prone to develop cancers, which is largely unexplained by lifestyle factors. Sex characteristics, such as the sex chromosomes, could underlie these differences. In humans, as in most mammals, males have one active X chromosome and one Y chromosome, while females have two X chromosomes, one active (Xa) and one inactive (Xi). The Xi results from X-chromosome inactivation (XCI), a process of gene transcriptional silencing, which allows gene dosage compensation between the sexes. Importantly, the X chromosome harbors tumor suppressor genes and, reactivation of genes from the Xi has been shown in aged rodents and in cancers. However, it is currently unknown whether the reactivation of genes from the inactive X chromosome could happen during human ageing and during cellular senescence. Our hypothesis is that XCI, which allows a 2-fold

reduction in X-linked expression levels, restricts senescence induction by limiting the expression of drivers of senescence on the X chromosome.

The goal of the PhD project is to investigate whether the correct dosage regulation of X-gene expression is important to restrict human cellular senescence induction. The PhD candidate will combine CRISPR-based genomic engineering, genomic approaches including bioinformatics analyses, the use of human embryonic stem cells (hESCs) undergoing early differentiation, and classical molecular and cellular biology techniques.

**Keywords:** cellular senescence, X chromosome inactivation, gene dosage, sex-differences, aging, cancer susceptibility

## International Co-supervision

The project will be primarily conducted at the Center of Integrative Biology (CBI) in Toulouse (France) under the supervision of Estelle Nicolas from the [Developmental Regulation of Gene Dosage team](#), which provides the laboratory infrastructure, equipment and expertise required for the feasibility of the PhD project, including cell culture, molecular and cellular biology, genomics bioengineering, bioinformatics and microscopy.

This PhD project includes an international collaboration with the Stem Cell Epigenetics Lab (Lisbon, Portugal), led by S.T. Da Rocha, where the PhD candidate will spend 6 months to be trained on the use and genetic manipulation of human embryonic stem cells, transferring this knowledge back to Toulouse.

## Experience/Skills required :

- Hold, by 23 November 2026, a Master's degree or an equivalent qualification granting access to doctoral studies in France and not hold a doctoral degree.
- Have not resided in France or carried out your main activity in France for more than 12 months during the 36 months immediately preceding 23 November 2026. Periods of stay as a tourist, refugee, or time spent in national service, are not considered as residency.
- Have a B2 level of English
- The PhD candidate will combine genomic engineering approaches with omics and cell biology readouts, and is expected to have a strong biology background and follow training in advanced bioinformatics during the PhD.
- The PhD candidate is expected to be highly motivated and enthusiastic with a strong interest in the thematics of the PhD project, cellular senescence and gene expression regulation.
- We also expect a candidate with strong skills in interactive, collaborative and inclusive work.
- More details about the project can be found at [Adum.fr](https://adum.fr)  
([https://adum.fr/as/ed/voirproposition.pl?site=toulouse&matricule\\_prop=76733#version](https://adum.fr/as/ed/voirproposition.pl?site=toulouse&matricule_prop=76733#version))

## Application Process

**Call for application - 23 November 2026**

Applications must be submitted online through the application platform : [edd-projets.utoulouse.fr](http://edd-projets.utoulouse.fr)

**Please contact us at [isabelle.saves@utoulouse](mailto:isabelle.saves@utoulouse) before applying, or if you have any questions regarding CBI or the recruitment process. Please use the following email subject line: BEST call – [Supervisor name].**

**Eligibility check - 24 to 30 November 2026**



**Written evaluation** - 4 December to 15 January 2027

**Consolidation of pre-selected projects** - 19 January to 19 March 2027

**Oral evaluation** - 29 March to 4 April 2027

**Result** - April 2027

**Starting date:** September/October 2027 (Contract duration: 36 months)

For additional information: <https://doctorat.univ-toulouse.fr/cofund-best>

## About the CBI

Located in Toulouse, in the sunny southwestern of France, the [Center for Integrative Biology \(CBI\)](#) is a **fundamental biology research institute** affiliated with the [National Center for Scientific Research \(CNRS\)](#) - the largest public research organization in France - and the University of Toulouse. The institute brings together **47 research groups**.

The CBI aims to understand the mechanisms, dynamics and behaviors of living organisms, to advance knowledge on the current societal challenges. Research at the CBI use multidisciplinary and multi-scale approaches, from isolated molecules to whole organisms and animal societies, applied to numerous model organisms, from bacteria to man.

CBI offers an **international and interdisciplinary research environment**, with access to advanced facilities and opportunities for scientific and career development. The institute benefits from **a collaborative and international scientific culture**, and is committed to promoting equality, diversity and inclusivity.