



CiMUS International PhD Programme

1. Project title:

RNA modifications in transposable elements during early cell fate transitions and cancer.

2. Research Project:

Early embryonic cells and stem cells make critical fate decisions that determine whether they remain pluripotent, acquire totipotent-like features or progress towards differentiation and tissue formation. These decisions are central to normal development and reproductive biology and underpin regenerative medicine strategies based on embryonic and induced pluripotent stem cells. Transposable elements (TEs) play a key role in these processes, acting as regulatory hubs in the genome, and their deregulation has been linked to developmental defects and ageing-related diseases, including cancer.

Chemical modifications on RNA (epitranscriptomics) are emerging as major regulators of RNA stability, translation and interaction with chromatin, yet their specific impact on TE-derived transcripts during early cell fate transitions and malignant transformation remains poorly understood and represents a clear gap in the field. This project will investigate how modifications of TE RNAs influence the balance between pluripotent, totipotent-like and cancer-related states. Using stem cell-based models of early development and cancer-relevant cellular systems, together with state-of-the-art molecular and deep-sequencing approaches, here we will map RNA modifications on TEs, perturb selected RNA-modifying enzymes and analyse how these changes affect gene expression, chromatin organisation and cell identity. The project also envisages the implementation of targeted epitranscriptomic editing strategies to modulate specific TE-associated RNAs (i.e., CRISPR/dCas13). In the long term, insights into TE-centred RNA modification signatures and their manipulation may open the door to improved stem-cell based regenerative approaches and highly specific RNA-based interventions in cancer.

3. Job position description:

We are seeking a highly motivated PhD candidate interested in RNA biology, stem cells and cancer to join this collaborative project within the CiMUS International PhD Programme. The position offers an excellent opportunity to work at the frontier of stem cell biology and epitranscriptomics, exploring how RNA modifications in TEs contribute to early cell fate decisions, regenerative potential and malignant transformation in an international, interdisciplinary environment at CiMUS.

The candidate will be integrated into two complementary research groups that combine expertise in pluripotency and cellular reprogramming with cutting-edge epitranscriptomics and



TE biology, linking basic mechanisms of gene regulation with the molecular basis of complex diseases and precision medicine. This project is ideal for a student who wants to work at the interface of stem cell biology and cancer, with the possibility of contributing to emerging RNA-based therapeutic concept. The doctoral training associated with this position follows the Principles for Innovative Doctoral Training of the European Commission and is designed to help the PhD candidate progressively gain scientific independence. The candidate will benefit from international networking and mobility (including an international research stay of at least three months and participation in conferences and specialised events), as well as structured training in transferable skills such as scientific communication, project management, research integrity, data management, entrepreneurship and interaction with industry and healthcare sectors. A personalised Career Development Plan (“exit strategy”) will be established with the supervisors to support future applications for competitive postdoctoral fellowships or other research-oriented career paths.

Key Responsibilities:

The PhD student will perform experiments using pluripotent and totipotent-like stem cell models, as well as cancer-relevant cellular systems, including knockout and rescue lines for RNA-modifying enzymes and TE reporter systems. The student will apply and help optimise molecular, transcriptomic and epitranscriptomic workflows (for example, TE-aware RNA-seq and related -omic approaches, as well as Oxford Nanopore Technologies) to characterise RNA modifications on TE-derived transcripts and analyse their dynamics during early cell fate transitions and cellular transformation. In close collaboration with the supervisors and bioinformatic support, the student will use dedicated analysis pipelines to examine how perturbing RNA-modifying enzymes affects TE expression, chromatin accessibility and gene regulatory networks linked to developmental and cancer-related phenotypes. The PhD student will present results in internal seminars, CiMUS workshops and scientific conferences, and will contribute to manuscript preparation and outreach activities.

Requirements for candidates:

The ideal candidate should hold a Master’s degree (or equivalent) in Biology, Biotechnology, Biochemistry, Biomedical Sciences or related fields, with a strong interest in gene regulation, RNA biology, TEs, stem cell biology and/or cancer. Previous experience in mammalian cell culture and standard molecular biology techniques is desirable, as well as familiarity with or motivation to learn basic data analysis and scripting (R/Python). A good level of English and the ability to work in a collaborative, interdisciplinary environment is essential, and candidates with an excellent academic record and prior research experience (for example, BSc/MSc thesis or research internships) will be particularly encouraged to apply.



4. Supervisor and Co-Supervisor

Name: Diana Guallar

Email: diana.guallar@usc.es

Research group: Epitranscriptomics & Ageing (EpiAgeing)

Link to the group website: <https://cimus.usc.gal/group/epitranscriptomics-ageing>

Name: Miguel Fidalgo

Email: miguel.fidalgo@usc.es

Research group: Stem Cells and Human Diseases (SC&HD)

Link to the group website: <https://cimus.usc.gal/group/stem-cells-and-human-diseases>