European School of Molecular Medicine

RESEARCH ACTIVITY SHEET

2025 PhD selections

YOUR DETAILS

* Name & Surname: Marta Kovatcheva

* Affiliation IFOM

PHD PROJECT DETAILS

* Title of the proposed project

Investigating the developmental origins of cancer

* Short description of the project (up to 300 words)

Carcinogenesis involves genomic instability and uncontrolled proliferation. A growing hypothesis suggests that early cancer transformation may reactivate embryonic pathways, resembling the trophectoderm (TE) in early development. Both cancer and TE cells share features like tissue invasion, angiogenesis, immune tolerance, and high mutational burdens. The concept of 'trophectodermization' in pre-malignant cells offers a promising framework for understanding cancer development, though it remains underexplored. In this project, we will use *in vitro* and *in vivo* models of cell reprogramming to explore the epigenetic and metabolic regulation driving the emergence of the TE state, and to examine whether we can control this process. *In vivo,* we will assess whether limiting entry into the TE state can serve as a potential strategy for cancer control, and whether different states give rise to different types of tumorigeneses. By understanding 'trophectodermization', we hope to identify key regulatory mechanisms influencing TE fate; these insights could lead to new cancer therapies and strategies to mitigate tumorigenesis.

* Indicate the main research area for the project described above Cancer Biology

If needed indicate a second research area for the project described above Molecular Biology

* Provide up to 3 key words for project:

reprogramming, transformation, differentiation

YOUR LABORATORY ACTIVITIES DETAILS

* Main topic/s of the lab

Cell plasticity & Aging

* Short description of the lab activity (up to 500 words)

The concept of “cell plasticity” refers to the capacity of a cell to adopt different identities without any genetic mutations. A classic example of cell plasticity occurs during development, when embryonic stem cells differentiate into the immense diversity of cell types we see in the adult body. It is now appreciated that cell plasticity also plays an important role in adult tissues, particularly in the context of injury and regeneration, where it is indispensable for tissue repair. However, cell plasticity is also a salient feature of cancer and can contribute to tumorigenesis, resistance to therapy, and metastasis.
Our lab is interested in understanding and manipulating these dichotomous roles of cell plasticity. Our ultimate goal is to find ways to harness cell plasticity programs for enhanced tissue regeneration, and to control them in order to limit tumorigenesis, cancer progression, and relapse. To approach this, we use a combination of molecular and cell biology, and organoid models in vitro, in vivo mouse models, and next-generation sequencing technologies.

* Recent bibliography (max 5 references)

- DOI: 10.1038/s41418-024-01417-z
- DOI: 10.1158/0008-5472.CAN-24-0529
- DOI: 10.1038/s44318-024-00259-2
- DOI: 10.1038/s41467-024-51363-0
- DOI: 10.1038/s42255-023-00916-6

* Group composition: total members, and roles distribution (PhD, postdoc, technician, etc.)

2 postdocs, 1 PhD student, 2 temp Fellows

Institutional page link

https://www.ifom.eu/en/cancer-research/programs/cell-plasticity-aging.php

Lab website link, if any

Social media links, if any

If you prepare a video to promote your lab/project, please include the link below