**MARIE SKŁODOWSKA-CURIE POSTDOCTORAL FELLOWSHIPS 2021**

**EXPRESSION OF INTEREST FOR HOSTING MARIE CURIE FELLOWS**

## HOST INSTITUTION

NOVA University Lisbon | NOVA Medical School

## RESEARCH GROUP AND URL

Proliferation and fate regulation of stem cells.
http://cedoc.unl.pt/proliferation-and-fate-regulation-of-stem-cells-3/

## SUPERVISOR (NAME AND E-MAIL)

Catarina Homem
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## SHORT CV OF THE SUPERVISOR

**EDUCATION AND PROFESSIONAL EXPERIENCE**

2016-present: Group leader, Proliferation and fate regulation of stem cells. Chronic Diseases Research Center (CEDOC), NOVA Medical School (NMS), Lisbon, Portugal.

11/2015-06/2016 – Maternity leave

2009-2015: PostDoc at the Institute of Molecular Biotechnology of Austria (IMBA), Vienna, Austria.

2004-2008: PhD in Biology, University of North Carolina at Chapel Hill-USA

2004-2009: PhD Student, Laboratory of Dr. Mark Peifer, Cell adhesion and signal transduction in Drosophila, University of North Carolina at Chapel Hill (UNC-Chapel Hill)

2002-2003: PhD candidate – 1st year of classes. 3rd Gulbenkian PhD Programme in Biomedicine (PGDB3), Gulbenkian Foundation/Luso-American Foundation (FLAD).

1996-2000: BsC in Biochemistry, Porto University, Portugal.

**PUBLICATIONS**

(*Publications cited more than 50x)

Oliveira AC, Rebelo AR, Homem CC (2021) Integrating animal development: How hormones and metabolism regulate developmental transitions and brain formation. Dev Biol 4;S0012-1606(21)00029-4

Garcez M, Branco-Santos J, Gracio PC, Homem CC (2021) Mitochondrial Dynamics in the Drosophila Ovary Regulates Germ Stem Cell Number, Cell Fate, and Female Fertility. Front Cell Dev Biol 28;8:596819.

Rebelo AR, Garcez M, Homem CC. (2020) Tumor start-up: mitochondrial fusion makes it happen. EMBO J 1;39(23):e106927.

*Homem CC, Repic M, Knoblich JA (2015) Proliferation control in neural stem and progenitor cells. Nat Rev Neurosci. 16, 647-59.

*Homem CC, Steinmann V, Burkard TR, Jais A, Esterbauer H, Knoblich JA (2014) Changes in energy

metabolism triggered by Ecdysone and Mediator end proliferation in Drosophila neural stem cells. Cell 158, 874-888.Preview in Cell Stem Cell 15, 262-264, 2014

*Eroglu E, Burkard TR, Jiang Y, Saini N, Homem CC, Reichert H, Knoblich JA (2014) SWI/SNF complex prevents lineage reversion and induces temporal patterning in Drosophila neural stem cell lineages. Cell 156, 1259-1273.

Homem CC, Reichardt I, Berger C, Lendl T, Knoblich JA (2013) Long-Term Live Cell Imaging and Automated 4D Analysis of Drosophila Neuroblast Lineages. PLoS ONE 8(11): e79588. doi:10.1371/journal.pone.0079588.

*Homem CC, Knoblich JA (2012) Drosophila neuroblasts: a model for stem cell biology. Development 139, 4297-4310.

*Homem CC, Peifer M (2009) Exploring the roles of diaphanous and enabled activity in shaping the balance between filopodia and lamellipodia. Mol Biol Cell 20, 5138-5155.

Gates J, Nowotarski SH, Yin H, Mahaffey JP, Bridges T, Herrera C, Homem CC, Janody F, Montell DJ and Peifer M (2009) Enabled and Capping protein play important roles in shaping cell behavior during Drosophila Oogenesis. Dev Biol 333, 90-107.

*Homem CC, Peifer M (2008) Diaphanous regulates myosin and adherens junctions to control cell contractility and protrusive behavior during morphogenesis. Development 135, 1005-1018. Journal highlight: http://dev.biologists.org/cgi/reprint/135/6/e601

(Highly Recommended by Faculty of 1000)

Stevens TL, Rogers EM, Koontz LM, Fox DT, Homem CC, Nowotarski SH, Artabazon NB, and Peifer M (2008) Using Bcr-Abl to examine mechanisms by which Abl kinase regulates morphogenesis in Drosophila. Mol Bio Cell 19, 378-393.

*Fox DT, Homem CC, Myster SH, Wang F, Bain EE, Peifer M (2005) Rho1 Regulates Drosophila Adherens Junctions Independently of p120ctn. Development 132, 4819-4831.

**AWARDS AND FELLOWSHIPS**

2018: ERC Starting Grant (European Research Council)
2017: HHMI and Wellcome Trust International Scholar (Howard Hughes Medical Institute)
2016: EMBO Installation Grant
2015: Starting FCT Investigator Grant
2015: Exploratory Project FCT
2009-2011: EMBO long term Postdoctoral fellowship
2002-2007: 5-year PhD studentship in Biomedicine awarded by Foundation Calouste Gulbenkian and Foundation for Science and Technology (FCT)

**REVIEWER AND EDITORIAL ACTIVITIES**

2021-present: Review editor for Stem Cell Research (specialty section of Frontiers in Cell and Developmental Biology, Frontiers in Genetics, Frontiers in Oncology and Frontiers in Bioengineering and Biotechnology)
2019-present: Member of Editorial Board of Plos Biology
2017-present: Reviewer for E-Life (Awarded a recognition gift)
2017-present: Reviewer for Developmental Biology (Awarded a Certificate of Outstanding contribution)
2017-present: Reviewer for EMBO Journal
2013-2015: Co-Reviewer for journals as Cell, Cell Stem Cell or Science

## 5 SELECTED PUBLICATIONS

- Oliveira AC, Rebelo AR, Homem CC (2021) Integrating animal development: How hormones and metabolism regulate developmental transitions and brain formation. Dev Biol 4;S0012- 1606(21)00029-4

- Garcez M, Branco-Santos J, Gracio PC, Homem CC (2021) Mitochondrial Dynamics in the Drosophila Ovary Regulates Germ Stem Cell Number, Cell Fate, and Female Fertility. Front Cell Dev Biol 28;8:596819.
- Rebelo AR, Garcez M, Homem CC. (2020) Tumor start-up: mitochondrial fusion makes it happen. EMBO J 1;39(23):e106927.
- *Homem CC, Repic M, Knoblich JA (2015) Proliferation control in neural stem and progenitor cells. Nat Rev Neurosci. 16, 647-59
- *Homem CC, Knoblich JA (2012) Drosophila neuroblasts: a model for stem cell biology. Development 139, 4297-4310.


## PROJECT TITLE AND SHORT DESCRIPTION

***Metabolic control of Stem Cell fate: Epigenetic regulation by Acetyl-CoA levels.***

Stem Cells (SC) are responsible for the development and the adult regenerative processes, giving rise to specialized cell types. Dysregulation of SC differentiation may not only cause developmental defects but can also cause serious diseases such as cancer. So, a full understanding of the mechanisms controlling stem cell fate regulation is crucial.

Metabolism has recently been proposed as one of the main elements involved in cell differentiation control. Several studies point out that the cellular metabolic state conveys to the epigenome through post-translational modifications of histones[1]. The epigenetic changes alter chromatin dynamics, strongly implicated in cell fate commitment by transcriptome regulation[2]. The metabolic intermediate Acetyl-CoA is the substrate of histone acetylation reactions and has been suggested to play a relevant role in the metabolic regulation of stemness[3]. Despite the increasing evidence of its importance, it is still unknown how Acetyl-CoA levels impact the epigenome and the fate transcriptional programs. The goal of this proposal is to identify the mechanisms by which Acetyl-CoA regulates epigenome and hence the transcriptome to control cell fate.

To address this objective, we will use Drosophila Neural Stem Cells (NSCs) –neuroblasts (NB) – as a model. We will generate several tools to manipulate the levels of Acetyl-CoA by overexpression or downregulation of the Acetyl-CoA generating and degradation pathways in NBs in vivo. We will quantitatively investigate the consequence of Acetyl-CoA abundance in levels of chromatin acetylation by mass spectrometry. We will more specifically ask if Acetyl-CoA levels trigger region and gene-specific changes by analyzing the acetylation patterns upon different Acetyl-CoA levels by Chip-Seq. We will further look for interactions between Acetyl-CoA synthesis enzymes and histone´s acetylation complexes as a mechanism to confer histone modification region specificity. Ultimately, we will inquire about the transcriptional regulation of fate and stemness genes exerted by the epigenetics changes found.

Altogether, we seek to elucidate the role of Acetyl-CoA as an important regulator of epigenetics thus connecting metabolism and cell fate.

## SCIENTIFIC AREA WHERE THE PROJECT FITS BEST*

Life Sciences (LIF)