MARIE SKŁODOWSKA-CURIE POSTDOCTORAL FELLOWSHIPS 2021

EXPRESSION OF INTEREST FOR HOSTING MARIE CURIE FELLOWS

HOST INSTITUTION

NOVA University Lisbon | NOVA Medical School

Harvard Medical School

RESEARCH GROUP AND URL

Conde Nanolab
https://www.conde-nanolab.com/

Shi Lab
https://connects.catalyst.harvard.edu/Profiles/display/Person/43651

SUPERVISOR (NAME AND E-MAIL)

João Conde
joao.conde@nms.unl.pt)

Jinjun Shi
jshi@bwh.harvard.edu

SHORT CV OF THE SUPERVISOR

João Conde is an Assistant Professor and Group Leader at NOVA Medical School of Universidade Nova de Lisboa, ToxOmics, CEDOC. He received his PhD in Biology, specialty in NanoBiotechnology from the NOVA University and Universidad de Zaragoza in 2014, under the FP7 European Consortium NanoScieE+ – NANOTRUCK for the development of multifunctional gold nanoparticles for gene silencing. After, he was a Marie Curie Fellow at the Massachusetts Institute of Technology, Harvard-MIT Division for Health Sciences and Technology and in School of Engineering and Materials Science, Queen Mary University of London. From 2017 to 2019, he was a Junior Investigator at Instituto de Medicina Molecular. In 2019, he won an ERC Starting Grant to build a genetic biobarcode to profile breast cancer heterogeneity. He is also co-founder of the biotech company TargTex, Targeted Therapeutics for Glioblastoma Multiforme.

The main aspects related to the recognition and diffusion of his early contributions are: nearly 80 articles in journals of Cancer therapy, Materials Science and Biomedicine (Nature Materials, Nature Nanotechnology, Nature Communications, PNAS, Accounts of Chemical Research, Progress in Materials Science, ACS Nano, Advanced Materials, JACS, Angewandte Chemie, Advanced Functional Materials, Trends in Cancer, Trends in Biotech., Biomaterials, etc.), more than 30 articles are as 1st author and more than 25 articles as corresponding author and cited more than 5000 times (h-index 36). Several of them have been selected as cover page of journals such as Nature Nanotechnology (Covid-19 Special issue), Adv. Functional Materials, Trends in Cancer, JACS, Angewandte Chemie, ACS Sensors, Biomaterials Science, ACS Applied Bio Mat, Adv. Healthcare Materials, Analytical & Bioanalytical Chemistry and BioTechniques. Moreover, 6 international patents were submitted and approved, all with relevant developments in nanomaterials-based platforms for cancer therapy and diagnosis. He was also awarded with several international awards, including the Nanomaterials 2020 Young Investigator Award, the 2021 Biomaterials Science Emerging Investigators, the Top2% Most cited in Nanoscience/Nanotechnology from PLOS Biology, the Wellcome Image Awards 2017, the Nano-Micro Letters Researcher Award, and the National Cancer Institute Image award.

Conde Lab is focused on the application of multifunctional nano-and-biomaterials for cancer therapy and diagnosis, especially for tumour imaging and targeting, gene therapy/editing and drug delivery.

Jinjun Shi is an Associate Professor of Anaesthesia, Harvard Medical School, Center for Nanomedicine, Brigham and Women's Hospital.
Shi Lab is interested in basic and applied science in the field of nanomedicine. The research involves a highly interdisciplinary combination of nanotechnology, biomaterials, drug delivery, immunotherapy, and antioxidative therapy for biomedical applications in cancer, atherosclerosis, ischemic injury, and other diseases. We have developed various nanoparticle platforms for delivery of therapeutics ranging from small molecules to RNAs and proteins, with the synthetic nanoparticle vaccines now under clinical trials for treatment of inflammatory diseases. The current research focuses include: i) RNAi nanotechnology for gene silencing; ii) mRNA delivery for restoration of tumor suppressors; and iii) development of stimuli-responsive nanomaterials and bioinspired antioxidative polymers.
Dr. Shi earned his B.S. from Tsinghua University and Ph.D. in Chemistry from Texas A&M University. Prior to joining the Harvard Medical School faculty, he received his postdoctoral training at Brigham and Women's Hospital with Dr. Omid Farokhzad and at Massachusetts Institute of Technology with Dr. Robert Langer.

5 SELECTED PUBLICATIONS

Publications:

- "Local triple-combination therapy results in tumour regression and prevents recurrence in a colon cancer model". João Conde*, N. Oliva, Y. Zhang and N. Artzi. Nature Materials (2016). Highlighted in Science Translational Medicine.

- "Implantable hydrogel embedded dark-gold nanoswitch as a theranostics probe to sense and overcome cancer multidrug resistance". João Conde*, N. Oliva, N. Artzi. PNAS (2015). Highlighted in Nature Reviews Drug Discovery.

Patents:

- Theranostic Nanoprobes for Overcoming Cancer Multidrug Resistance and Methods. U.S. Application No. 62/118101. MIT Case No. 17685K, MIT Docket No. 17685.117921.

- Micro-RNA delivery compositions, devices, and methods. U.S. Application No. 62/353622.

- Functionalized nanoparticles and compositions for cancer treatment and methods. U.S. Application No. 62/334538.

PROJECT TITLE AND SHORT DESCRIPTION

Cancer Lipid Hydrogel

Breast cancer is the most common cancer diagnosed among European and USA women (excluding skin cancers) and is the second leading cause of cancer death among women after lung cancer. Along similar lines, metastases are the primary cause of mortality in breast cancer, and in fact one in eight women are diagnosed with and develop invasive/metastatic breast cancer. However, currently, breast cancer therapy lacks effective anti-metastatic strategies. Accordingly, our specific aim is to knockout a combination of genes associated with breast cancer progression and metastasis (CXCR4, CXCR7, Lcn2) in in vivo mice model of metastatic breast cancer using liposomal CRISPR/Cas9 complex that is embedded within an injectable hydrogel. The liposomes will be designed to specifically target breast cancer cell (via anti-ICAM1 antibody functionalization) and allow endosomal scape (via GALA peptide functionalization), with the aim of achieving a high transfection efficiency. The ultimate goal of the project is to create an injectable hydrogel for local delivery of liposomal CRISPR/Cas9 complex to the breast cancer tumors. To this end, the hydrogel carrier will be designed to be degradable by matrix metalloproteinases (MMPs), that are major extracellular enzymes involved in cancer initiation, progression, and metastasis. To the best of our knowledge, this is the first time that a multiple-gene knockout is proposed for in vivo inhibition of breast cancer progression and metastasis, by local delivery of a combinatorial liposome embedded hydrogel system. This proposal achieves the aims of the European Research Area and is highly relevant to the Marie Curie Programme and to long-term career development.

SCIENTIFIC AREA WHERE THE PROJECT FITS BEST*

Life Sciences (LIF)