

CONTRATOS PREDOCTORALES 2021 SEVERO OCHOA

PROJECT TITLE / JOB POSITION TITLE:

Developing Patient-Derived Organoids as Hematological Cancer Models based on Lymph Node-Inspired 3D Hydrogels

RESEARCH PROJECT / RESEARCH GROUP DESCRIPTION:

The Max Planck Partner Group “Dynamic Biomimetics for Cancer Immunotherapy” (Nanomol department) is currently focused on the design, fabrication, and engineering of healthy and malignant artificial secondary lymphoid organs, based on the synthesis of novel bionanomaterials consisting of synthetic 3D hydrogels, with the objective of improving novel adoptive cell therapies for the treatment of cancer. Immunotherapies have shown very promising results, i.e. complete remissions in aggressive hematological cancers and melanoma, but still have some scientific and technical limitations that we are aiming to alleviate, by improving the current cellular reproduction systems and producing organoids, i.e. animal-free biological models.

The fabrication of artificial lymphoid organs, especially of lymph nodes, is tackled through different angles, which include the 3D printing of synthetic bionanomaterials or their incorporation into a microfluidic system to obtain an organ-on-a-chip. Moreover, we assess the performance of the artificial organs in-house with lymphocytes of human healthy donors in collaboration with the “Blood and Tissue Bank of Barcelona”, which allow fast testing and prototype improvement. Finally, we work in collaboration with IDIBAPS-Hospital Clínic de Barcelona, one of the most prestigious clinical settings in Spain, to develop patient-derived organoids of hematological cancers based on our bionanomaterials.

Last but not least, the PhD researcher will join the multidisciplinary and international team of the Nanomol department, which has a wide expertise in the synthesis, processing, and study of molecule-based materials with chemical, electronic, magnetic, and biomedical properties.

Keywords: Bionanomaterials, hydrogels, biomimetics, artificial organs, organoids, biomedicine, immunotherapy, cancer.

JOB POSITION DESCRIPTION:

The PhD student will be involved in the synthesis, physicochemical characterization (NMR, X-ray tomography, rheology, SEM, confocal microscopy, etc.), and processing (e.g. through 3D printing) of synthetic 3D hydrogels to act as artificial lymph node extracellular matrix.

She/he will also perform cell culture studies to evaluate the effectivity of such bionanomaterials, where primary human T cell proliferation, differentiation, and functionality will be analyzed through optical and fluorescence microscopy, ELISA, flow cytometry, etc.

Finally, the formation of organoids of hematological cancers will require the coculture of different types of cells, including monocytes and dendritic cells together with lymphocytes. We will analyze them through different microscopy techniques, and perform functionality assays with immune checkpoint inhibitors and CD19-targeted CAR T cells that will be evaluated by flow cytometry, ELISA, etc.

What we are looking for:

- Master degree in Chemistry, Biotechnology, Materials Science, Nanotechnology, Biomedicine or related fields.
- Experience in click chemistry, rheology, and SEM will be appreciated.
- Experience with (primary) cell culture, optical and fluorescence microscopy, and cytometry will be appreciated.
- Good level of oral and written English (B2).
- Highly motivated person with good capacity for team work and eager to acquire new knowledge and skills.

GROUP LEADER:

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RELATED LINKS TO THE POSITION

URL: <https://projects.icmab.es/nanomol/>

Title link: **Nanomol department**