RESEARCH ACTIVITY SHEET

2025 PhD selections

YOUR DETAILS

* Name & Surname: Diletta Di Mitri

* Affiliation Humanitas

PHD PROJECT DETAILS

* Title of the proposed project

Dissection of regional immunity to develop novel immunotherapies against cancer

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

While immune checkpoint inhibitors (ICIs) have revolutionized melanoma treatment, a significant proportion of patients remain unresponsive, underscoring the need to understand mechanisms of resistance. Emerging evidence points to the influence of both patient sex and the anatomical site of metastasis on antitumor immunity and ICI efficacy. This project aims to systematically dissect how sex- and site-specific features of the tumor immune microenvironment (TME) shape response to immunotherapy in metastatic melanoma. Using established murine models of primary tumors, lung, and lymph node metastases, we will characterize the immune landscape through multiparametric flow cytometry, single-cell RNA sequencing, and spatial profiling. We will investigate how the TME is modulated by anti-PD-1 treatment in male and female mice and test rational, sex- and site-tailored combinatorial therapies to overcome resistance. This research will provide novel insights into sex-based immune regulation in cancer and lay the groundwork for more effective, personalized immunotherapeutic strategies.

* Indicate the main research area for the project described above Immunology

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

* Provide up to 3 key words for project:

Tumor immunology, immunotherapy, metastasis

YOUR LABORATORY ACTIVITIES DETAILS

* Main topic/s of the lab

Tumor immunology

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

The research program of the Tumor microenvironment Unit is focused on the investigation of the mechanisms exploited by the tumor to escape from the immune response and to re-educate the immune infiltrate in its favor. We combine multi-parametric flow cytometry and advanced RNA sequencing approaches to dissect at the single cell level the mechanisms underlying the evasion of cancer from the immune recognition. We take advantage of transgenic mouse models developing cancer at different progression stages, in order to explore in vivo the interaction between the tumor and its immune microenvironment, to evaluate how immune subsets contribute to metastasis formation and to test new therapeutic approaches aimed at limiting cancer progression. The group is also investigating the correlation between the immune landscape of cancer patients and the resistance to therapies. Final scope is to offer new and efficient therapeutic strategies to treat cancer.

Lines of research:

. Investigation of the mechanisms underlying the interaction between tumor cells and infiltrating immune subsets

We are dissecting in vitro and in vivo the mechanisms utilized by the tumor to re-educate the innate immune compartment in its favor. We are working at the identification of molecules and signaling pathways that confer a pro-tumoral function to tumor-associated macrophages, neutrophils, natural killer cells. We are implementing pharmacological and genetic screening strategies to dissect the cancer-immune cells interaction. We are investigating how innate immune cells contribute to tumor progression and metastasis formation.

. Immune-profiling of cancer patients

We combine multi-parametric flow cytometry, spatial proteomic analysis and RNA sequencing approaches to provide a comprehensive characterization at single cell level of the immune landscape in cancer patients. We are investigating the cell dynamics within the tumor immune microenvironment and at the periphery to unveil mechanisms that drive and predict tumor progression and resistance to therapies.

* Recent bibliography (max 5 references)

Chemosensor receptors are lipid-detecting regulators of macrophage function in cancer. PMID: 40588561

Sex hormones, the anticancer immune response, and therapeutic opportunities. PMID: 40068594

C/EBPβ-dependent autophagy inhibition hinders NK cell function in cancer. PMID: 39609420

Lipid-loaded macrophages as new therapeutic target in cancer. PMID: 35798535

Lipid-loaded tumor-associated macrophages sustain tumor growth and invasiveness in prostate cancer. PMID: 34919143

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

Total members: 3 PhD, 4 postdocs, 1 predoc, 1 lab technician

Institutional page link

https://www.humanitas-research.com/groups/diletta-di-mitri-group/

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