RESEARCH TOPIC MECM_2

Deciphering the gut–prostate immune axis to improve response to anti-PD-1 immunotherapy

Curriculum

MECM Standard

Research Area

Immuno

Laboratory name

Tumour Microenvironment Unit

Research Supervisor

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Abstract

Prostate cancer remains poorly responsive to immune checkpoint inhibitors (ICIs), and the systemic mechanisms underlying therapy resistance are still incompletely understood. Emerging evidence indicates that tumors can influence distant immune compartments, including the gut, and that gut microbiota composition modulates immunotherapy efficacy.

This PhD project aims to dissect the crosstalk between primary tumors and the colonic immune microenvironment, with a particular focus on macrophage functional states and their impact on response to anti-PD-1 therapy.

The candidate will combine in vivo tumor models with high-dimensional immune profiling of tumor and colonic tissues using single-cell RNA sequencing, multiparametric flow cytometry, and spatial imaging approaches. The project also includes analysis of human samples to support the translational relevance of the findings. The PhD student will receive multidisciplinary training in tumor immunology, in vivo experimentation, and single-cell and spatial technologies, gaining expertise in mechanistic and translational cancer research.

Main technical approaches

The project will combine in vivo models with immune profiling to investigate tumor–gut immune crosstalk. The candidate will apply multiparametric flow cytometry, single-cell RNA sequencing, spatial imaging, and primary cell–based functional assays. Microbiota perturbation approaches will be used to dissect mechanisms of immune regulation.

The PhD student will receive hands-on training in in vivo experimentation and advanced immunological techniques. The position is best suited for candidates with a background in biomedical sciences, immunology, or related fields and a strong interest in experimental cancer research.

Scientific references

1. Marelli G. et al., Nature Immunology 2025

2. Pernigoni, N. et al., Science 2021

3. Di Luccia B, et al., Sci Immunol. 2024

4. Gopalakrishnan V, et al., Science, 2018

5. Spencer CN, Science 2021

Type of contract

PhD scholarship of € 21.000 gross per year awarded by Humanitas University. This sum is exempt from IRPEF income tax according to the provisions of art. 4 of Law no. 476 of 13th August 1984 and is subject to social security contributions according to the provisions of art. 2, section 26 and subsequent sections, of Law no. 335 of 8th August 1995 and subsequent modifications.

Borsa di dottorato pari a € 21.000 annui lordi erogata da Humanitas University. Importo non soggetto a tassazione IRPEF a norma dell'art. 4 della L. 13 agosto 1984 n. 476 e soggetto, in materia previdenziale, alle norme di cui all'art. 2, commi 26 e segg., della L. 8 agosto 1995, n. 335 e successive modificazioni.

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