University Medical Center Freiburg | Institute of Neuropathology

TRR 417
CELLULAR COMMUNICATION IN THE STROMA OF COLORECTAL CANCER

PhD Position (m/f/d)

Tumor Immunology and Inflammasome Biology

Laboratory of Professor Dr. Olaf Groß · Joint supervision with Dr. Dr. Christopher Berlin

Funded by DFG CRC-TRR 417 · TV-L E13, 65 % · 3.5 years, extension possible · Start as soon as possible

The laboratory

Our group studies cellular danger sensing and the ensuing downstream signaling, and how these are integrated with metabolism, cell biology, and programmed cell death, with a focus on macrophages and the NLRP3 inflammasome. We work across scales, from molecular mechanism to relevance in health and disease, and develop precision tools to modulate these pathways for research and therapy. Recent work identified inhibition of oxidative phosphorylation and consequent suppression of intrinsic apoptosis as common upstream events of NLRP3 activation (Saller *et al.*, *Immunity* 2025) and yielded the first specific pharmacological small-molecule NLRP3 activators, which now enable precise control of NLRP3 activity to dissect its functions *in vivo* and to elucidate its therapeutic potential. Our discovery of their anti-cancer activity forms the basis of this project.

The project

The overall goal of this project is to define the molecular and multicellular mechanisms underlying the anti-cancer effect of pharmacological NLRP3 activation. The position is part of the DFG Collaborative Research Centre TRR 417 “Cellular Communication in the Stroma of Colorectal Cancer: From Pathophysiology to Clinical Translation”. Within TRR 417, the project addresses the role and therapeutic potential of NLRP3 in the tumor microenvironment of primary and metastasized sporadic colorectal cancer (CRC), in close collaboration with the laboratory of Christopher Berlin (Department of General and Visceral Surgery). Preliminary data show that myeloid cell-restricted inflammasome activation reduces tumor growth and inhibits metastasis in organoid systems and preclinical CRC models. The candidate will dissect the cellular and molecular consequences of inflammasome activation in tumors and characterize intercellular crosstalk and effector mediators, with a focus on IL-1-independent mechanisms and on positive feedback loops between macrophage NLRP3 activity and T cell responses within the tumor microenvironment. The work draws on a broad methodological portfolio including single-cell transcriptomics.

Profile

Master’s degree in molecular medicine, immunology, biochemistry, biology, or a related discipline. Solid background in cell and molecular biology, with hands-on experience in primary immune cell culture, flow cytometry, and standard molecular biology. Clear interest in innate immunity, signal transduction, and cancer biology. Experience with organoid culture or single-cell transcriptomics analysis is an asset. Working language: English.

What we offer

Embedding into the structured doctoral programme of the Integrated Research Training Group (IRTG) of TRR 417, with networking and exchange across the consortium. Co-supervision by Prof. Groß and Dr. Berlin and day-to-day mentoring by senior staff scientists in both groups. Access to the chemical biology and signaling research pipeline of the Groß group, the preclinical cancer models and organoid biobank of the Berlin group, and consortium-level infrastructure for spatial transcriptomics and mass spectrometry imaging. Additional integration into the Cluster of Excellence CIBSS and a network of further DFG-funded consortia at the Freiburg site.

Application

Please submit a single PDF containing a cover letter (stating motivation and research interest) and a CV including prior research experience, degree certificates, and contact details of two referees. Send applications to career@trr417.de and olaf.gross@uniklinik-freiburg.de, using the subject line “*P07 PhD application*”.

The University Medical Center Freiburg is committed to equal opportunity. Applications are welcome regardless of gender, background, or disability.

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