Project Title: Innate lymphoid cell (ILC)-mediated effector functions in contact hypersensitivity reaction in the skin

Project leader: Prof. Dr. Adelheid Cerwenka; Dr. Ana Stojanovic

Source of Funding: German Research Foundation (DFG), Transregional Collaborative Research Centre (TRR156): “The Skin as Sensor and Effector Organ Orchestrating Local and Systemic Immune Responses”

Project Description:

Skin immunity is orchestrated by specialized cells belonging to the innate and adaptive immune system. Innate lymphoid cells (ILCs), comprising cytolytic Natural Killer (NK) cells and other cytokine-producing “helper” ILC subsets, are among the first responders to infection and tissue damage, and have been involved in both immune protection and immune-mediated pathology. Interestingly, these innate immune cells were also shown to exert properties of immune memory, such as in the context of skin inflammatory allergic response.
In this project, the PhD candidate will investigate how NK cells and ILCs mediate and regulate skin inflammation, and how innate and adaptive immune memory is formed and co-regulated in these settings. We will applying state of the art (multi)omics approaches, interrogating transcriptome and epigenome, as well as mice with conditional gene deficiencies. Results will be further validated in human 3D skin models. Our project aims to address the basic biological questions regarding immune memory and to understand how this system operates in the pathological context (skin inflammation and allergy). Moreover, our insight in the orchestration of skin inflammation has potential to reveal novel therapeutic approaches to treat skin disease.

References:

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Ni J*, Wang X*, Stojanovic A*, Zhang Q, Wincher M, Bühler L, Arnold A, Correia MP, Winkler M, Koch PS, Sexl V, Höfer T, Cerwenka A: Single-cell RNA sequencing of tumor-infiltrating NK cells reveals that inhibition of transcription factor HIF-1α unleashes NK cell activity. **Immunity**, 52:1075-1087.e8, 2020. *equal contributions

Stojanovic A, Cerwenka A. ILC1-like NK cells as matchmakers for DC-T cell interactions. **Immunity**. 2021 Oct 12;54(10):2185-2187

Methods that will be used: conditional gene-deficient mice, multiparametric flow-cytometry, cell sorting and next generation sequencing (RNA-seq, ATAC-seq, spatial omics), *in vitro* cell culture-based methods, mouse models of skin inflammation and innate immune memory, human 3D skin models.

Collaboration Partners: The TRR156 is a research network comprising PIs from Mainz, Tübingen and Heidelberg/Mannheim that provides a stimulating research environment, including seminars, scientific retreats, and possibility to meet research leaders in the field. The Collaborative Research Centre allows intensive scientific exchange of methods and ideas. The PhD candidates will have access to state-of-the-art research technologies, and cell and

molecular biology techniques and methodology (expression profiling, bioinformatics, flow cytometry, cell imaging, and animal models). The education includes a well-structured training program and intensive supervision. The students are also enrolled in the Graduate Academy, which offers a wide range of technological and soft-skill training.

Profile of candidate's qualification: The successful candidate must hold a university degree in Biology or related fields (master or equivalent) and must demonstrate very good spoken and written English skills. Desired prerequisites are profound knowledge of cell and molecular biology and immunology. In addition, it is essential to bring in a high-degree of motivation, as well as a passion for science and for developing independent scientific ideas.

Keywords: Immunology, Innate Immunity, Immune Memory, NK cells, Innate Lymphoid Cells, Skin inflammation

Please apply to the project online, or send your application directly to adelheid.cerwenka@medma.uni-heidelberg.de deadline 10.October 2023

https://my-hbigs.uni-heidelberg.de/site/index.php?a=bzJzZGVRUzJOTHdDTjBPbzJpTzN4UVB2eUNIMGxSU3ZwVXV1aUZPR052RUIxVjk4dmM2L1lIcjltZnlDUnpLNys1WXdRWGJldDFYOFVNT1lKSGd2Wi91V01FRjJ4N2RWL0ZERG1DUjRMMmRTMXVvcEhvSUJiWS9IQjNzbVc4SXo%3D