Open Ph.D. projects

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Title of the research topic: The alternative macrophage polarization modifying effects of hypoxic microenvironment in mouse and human macrophages

Description of the research topic: The different microenvironmental signals-activated transcriptional programs tightly regulate the macrophages' heterogeneity and plasticity. One of the endpoints in functional macrophage polarization is IL-4 and IL-13-induced alternative (M2) macrophage polarization. M2 macrophages play an important role in defense against multicellular parasites, the development of fibrosis and allergic asthma, and tumor progression. In these pathological processes, the M2 macrophage polarization often occurs in hypoxic conditions. Nevertheless, the M2 macrophage polarization modifying effects of the hypoxic microenvironment and its functional consequences remained unexplored.

Therefore, we aim to investigate the interactions between the M2 macrophage polarizing signal IL-4 and the hypoxic microenvironment in murine bone marrow-derived and human monocyte-derived macrophages by combining transcriptomic, epigenomic, and immunological approaches. In the course of our work, we are looking for answers to the following questions:

- How can the hypoxic microenvironment modulate the M2 polarization-specific transcriptional and epigenetic program in macrophages?

- Which transcription factors play a role in the interactions between the M2 polarizing cytokine IL-4- and hypoxia-activated signaling pathways?

- How can these interactions influence the functional properties of macrophages?