



Bachelor/Master Thesis immunometabolism – role of key metabolites in macrophage metabolism and function



Who are we?

The immuno-metabolism group (head: Prof. Karsten Hiller), located at the Braunschweig Integrated Centre of Systemsbiology (BRICS), investigates cellular and mitochondrial metabolism of immune cells during bacterial infection, cancer, metabolic complications and neuro-degeneration. The team has developed a strong expertise in stable-isotope assisted metabolomics and metabolic flux analysis both on a whole cell as well as on a mitochondrial sub-compartment level

Project background

Macrophages are innate immune cells playing significant role in inflammatory processes. Inflammation is tightly controlled in order to destroy pathogens and repair damaged tissues in an efficient and fine-tuned manner. Improper action of macrophages leads to chronic inflammation as shown in various diseased states including chronic infection, autoimmune diseases, cancer, diabetes and neurodegenerative diseases. Cellular metabolism of macrophages is precisely coupled with macrophage function and activation, thereby to investigate macrophage metabolism will not only bring about scientific insight involved in macrophage activation, but also provide potential molecular targets to control various diseases.

Thesis content

Recently we have identified two metabolites exerting modulatory effects in macrophages. To extend these discoveries, we plan to further investigate the role and mechanism of these metabolites in macrophages under different activation states, including classic activation (pro-inflammatory) and alternative activation (anti-inflammatory, pro-fibrotic and pro-tissue repair). In this study, the successful candidate will work with primary and immortalized macrophages to explore this exciting topic. In addition, the candidate has chances to access other ongoing projects about macrophage immunometabolism in this lab.

Methodology:

cell culture, metabolomics (gas chromatography–mass spectrometry), stable isotope labeling-assisted flux analysis, Seahorse, YSI, gene expression, ELISA.

Interested?

Students with strong interests in immunology and metabolism are encouraged to apply.

More background knowledge can be found in our latest review article:

<https://pubmed.ncbi.nlm.nih.gov/3610128/>

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