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Immunometabolism is an emerging field in immunology that attempts to understand the role of metabolism in immune cell function. For example, T cells undergo a dramatic switch in their metabolic program from oxidative phosphorylation to aerobic glycolysis upon activation. Additionally, it has been demonstrated that different immune cell subsets like monocytes, dendritic cells, and B cells utilize different metabolic pathways depending on the activation stimulus received.

A key interest of our lab is to identify metabolic pathways that can be targeted to selectively modulate the function of immune cell subsets. Our research focuses on the characterization of the metabolic pathways in various activated immune cell subsets with an emphasis on T cells and B cells. An initial aim is to link observed metabolic activities to respective immune functions in primary immune cells, e.g., T cell function and their polarization, or T cell – B cell interaction in germinal center reactions. Subsequently, the effect of metabolic reprogramming of these cells using metabolic pathway modulation (siRNA, overexpression, and use of pathway inhibitors) of immune function will be investigated in vitro and in vivo.

To characterize immune cell metabolism and function, several different metabolic read-outs (including SeaHorse technology, metabolomics and metabolic tracer analysis, targeted PCR and Reverse Protein Array technology) are in place and will be applied in combination with the analysis of immune function in the context of metabolic pathway modulation.

Selected Publications

Metabolic programming and PDHK1 Control CD4+ T cell subsets and inflammation.
Gerriets VA, Kishton RJ, Nichols AG, Macintyre AN, Inoue M, Ilkayeva O, Winter PS, Wood KC, Liu X, Priyadharshini B, Slawinska ME, Haeberli L, Huck C, Turka LA, Hale LP, Smith PA, Schneider MA, Locasale JW, Newgard CB, Shinohara ML, Rathmell JC
J Clin Invest. 2015 Jan;125(1):194-207

CCR7 is required for the in vivo function of CD4+ CD25+ regulatory T cells
Schneider MA, Meingassner JG, Lipp M, Moore HD, Rot A.
J Exp Med. 2007; 204(4):735-45.

In vitro and in vivo properties of a dimeric bispecific single-chain antibody IgG-fusion protein for depletion of CCR2+ target cells in mice.
Schneider MA, Brühl H, Wechselberger A, Cihak J, Stangassinger M, Schlöndorff D, Mack M.
Eur J Immunol. 2005 Mar;35(3):987-95.

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