Medical University of Graz

Inflammatory Mechanisms in Diabetes Uncovered by Tissue Imaging and Machine Learning (“MIDAS”)

Summary

Thomas Pieber, Department of Internal Medicine, Division of Endocrinology and Diabetology

Supervisor:	Prof. Dr. Thomas Pieber
Availability:	This position is available.
Offered by:	Medical University of Graz
Application deadline:	Applications are accepted between February 10, 2020 00:00 and March 30, 2020 23:59 (Europe/Zurich)

Description

Background:

The autoimmune disease type 1 diabetes (T1D) is characterized by a destruction of the insulin-producing beta cells of the pancreas by the body’s own immune system. There are currently no therapies available to cure T1D. Only exogenous replacement of insulin serves as an effective treatment but it is also prone to complications. Searching for a T1D cure is still one of the hot topics in the areas of metabolic research and regenerative medicine.

Hypothesis and Objectives:

We hypothesize that the crosstalk between immune cells and beta cells in the islets of Langerhans induces a cascade of immune and stress responses that are causal for the decline in beta cell mass. MIDAS aims to thoroughly analyze the timing and nature of immune cell infiltration and the interaction of immune cells and beta cells in different stages of T1D. The overall goal of MIDAS is to understand the time- and location dependent mechanisms for beta cell decline in T1D by combining advanced imaging and machine learning techniques.

Methodology:

The PhD candidate will be using the following methods for research: mouse models, FACS, immunohistochemistry, western blot, qPCR, and primary cell culture. The student will be working in close collaboration with other universities and research groups.

References:

Atkinson, M. A. *et al.* How Does Type 1 Diabetes Develop?: The Notion of Homicide or -Cell Suicide Revisited. *Diabetes* **60**, 1370–1379 (2011).

Cnop, M., Welsh, N., Jonas, J.-C., Jo, A. & Lenzen, S. Mechanisms of Pancreatic Beta-Cell Death in Type 1 and Type 2 Diabetes. *Diabetes* **54**, 97–107 (2014).

Wang, Y. J. *et al.* Multiplexed In Situ Imaging Mass Cytometry Analysis of the Human Endocrine Pancreas and Immune System in Type 1 Diabetes.*Cell Metab.* **29**, 769–783.e4 (2019).

Pearson, J. A., Wong, F. S. & Wen, L. The importance of the Non Obese Diabetic (NOD) mouse model in autoimmune diabetes. *J.Autoimmun.* **66**, 76–88 (2016).

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