Exjobb: Mapping of immune system cells in the mouse brain using a new, highly-multiplexed, single-cell resolution tissue imaging platform

Organisation: KTH-CBH, Dept. of Protein Sciences, Div. of Cellular & Clinical Proteomics
Location: SciLifeLab, Solna
Credits: 30 p
Deadline for submitting application: 2018-12-21
Contact person: Dr. Burcu Ayoglu (burcu.ayoglu@scilifelab.se)

Description:

Background: Over the last 20 years, there has been a dramatic reevaluation of the type of cellular immune responses that can and do occur within the central nervous system (CNS). Current scientific evidence indicate that the CNS is an active immunological site with various resident, as well as infiltrating immune cell populations. These immune cell populations play an essential role in tissue homeostasis, but knowledge of immune composition, phenotype, and interactions with specialized cell types of the brain is limited. To interrogate the neuroimmune landscape, it is necessary to analyze the expression of a multitude of proteins with single-cell resolution while preserving the spatial information, which is not possible to achieve using standard tissue imaging approaches.

Goal: The goal of this project is to build high-dimensional, single-cell resolution proteomic maps of the tissue immune cell landscape in the brain. For this, we will use a multidisciplinary strategy combining immune cell biology, neuroimmunology, antibody-based proteomics and tissue imaging.

What and How: As our main tool, we will use a novel, highly-multiplexed, single-cell resolution tissue imaging platform called CODEX (CO-Detection by indEXing, first beta-system in Europe available at SciLifeLab's Cell Profiling Facility). Based on the principle of cyclic detection of DNA-indexed antibody panels, CODEX allows simultaneous co-staining for up to 50 proteins, which exceeds multiplexing capacity of existing antibody-based tissue imaging platforms.

The student will use already collected fresh-frozen mouse brain tissue samples for optimization of the imaging platform with commercially available immune cell marker panels. The student will also build and validate additional DNA-conjugated antibody panels for co-staining of main cell types in the brain (neurons, astrocytes, oligodendrocytes and microglia). Finally, the student will learn and apply various image and data analysis approaches for analysis of cellular neighborhoods in brain's immune cell landscape.

Working environment: The student will be supervised and hosted by Dr. Burcu Ayoglu at the Division of Cellular and Clinical Proteomics, Department of Protein Sciences at KTH-CBH School of Engineering Sciences in Chemistry, Biotechnology and Health. The degree project work will be carried out at SciLifeLab as a collaboration with Assoc. Prof. Emma Lundberg, Prof. Cecilia Williams (Dept. of Protein Sciences-KTH/SciLifeLab) and Ass. Prof. Jan Mulder (Dept. of Neuroscience-KI), enabling the student to experience and network in an international and versatile research environment.

Requirements: We are looking for a student with a strong interest in learning more about the immune system and/or the immune system and CNS interaction. Ideally, candidates have basic experience in laboratory methods used in molecular biology, and/or in microscopy.

Application information: For submitting your application (including a 2-page CV), please email Dr. Burcu Ayoglu (burcu.ayoglu@scilifelab.se).