PhD project No. 16, Prof. Mueller

Scientific Areas	Innate and adaptive immunity
Project title	A) Macrophage heterogeneity and B cell activation B) Stroma - macrophage cross-talk in lymphoid organ development and homeostasis
Host country	France
Supervisor, institution	Christopher G. Mueller, University of Strasbourg, France
Co-Supervisor, institution	Marta Trüb, University of Basel
Mentor, institution	Transgene, Illkirch-Graffenstaden, France
Secondment institution	University of Basel, Switzerland

Short description of the supervisor's lab with introduction to the topic

The general topic of the lab is the immune microenvironment with applications to infectious diseases, immunopathology and cancer. We focus on lymphoid stromal cells, macrophages and B cells. We have recently discovered a novel crosstalk between lymph node mesenchymal cells and lymphatic endothelial cells regulating the niche for sinusoidal macrophages.

Topic description, including techniques to be used

Project A): Macrophage heterogeneity and B cell activation

Lymph node macrophages are highly diverse but how this heterogeneity translates to functional specialization is insufficiently understood. This project aims to investigate the functional relationship between sinusoidal macrophage diversity and B cell activation and differentiation. Using gene deletion or blocking antibodies in mice, normal macrophage differentiation is altered and the consequences on the production of antigen-specific germinal cell, memory B cells and plasma cells is investigated. Functional relevance is tested in the context of viral infections.

Techniques: Mouse experimentation, flow cytometry, microscopy (wide-field, confocal, light-sheet), RNA sequencing - bioinformatics, virus infections

Project B): Stroma - macrophage cross-talk in lymphoid organ development and homeostasis

Owing to their precocious presence in tissues during embryogenesis together with their ability of self-renewal, macrophages may play a more important role in development and immune homeostasis than previously anticipated. We posit that by interacting with mesenchymal and endothelial stromal cells macrophages regulate the development and homeostasis of lymphoid organs. By combining detailed cellular and molecular profiling, cell depletion and gene knock-mice we wish to address the question of lymph node development and B cell homeostasis by the macrophage - stroma cross-talk.

Techniques: Mouse experimentation, mouse development, RNA sequencing – bioinformatics, flow cytometry, microscopy (wide-field, confocal, light-sheet).

Recommended applicant's training (technical expertise and knowledge)

Techniques: Mouse experimentation, flow cytometry (+FlowJo software), microscopy
Knowledge: Good background in immunology, a plus: B cell biology

Maximum two relevant publications

Camara et al., 2019, Immunity : Lymph Node Mesenchymal and Endothelial Stromal Cells Cooperate via the RANK-RANKL Cytokine Axis to Shape the Sinusoidal Macrophage Niche.
Onder et al., 2017, Immunity 47: Lymphatic Endothelial Cells Control Initiation of Lymph Node Organogenesis.

The EURIdoc programme has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement number 101034170.

Ethics description

1. Humans	
This research involves human participants.	YES ☐ / NO ☒
This research involves physical interventions on the study participants.	YES ☐ / NO ☒
2. Human Cells /Tissues	
This research involves human cells or tissues, such as blood.	YES ☐ / NO ☒
3. Personal Data	
This research involves personal data collection and/or processing.	YES ☐ / NO ☒
This research involves further processing of previously collected personal data (secondary use).	YES ☐ / NO ☒
4. Animals	
This research involves involve animals, such as mice.	YES ☒ / NO ☐

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