PhD project No. 8, Dr Tavian

Scientific Area	Hematopoiesis and immune cell differentiation
Two project titles	A) Identification of genes implied in hematopoietic specification B) Characterization of hemogenic endothelium
Host country	France
Supervisor, institution	Dr Manuela Tavian, University of Strasbourg
Co-Supervisor, institution	To be confirmed
Mentor, institution	Dr Laura Fontenille, AZELEAD, Montpellier, France
Secondment institution	A) and B) University of Strasbourg, France and INSERM UMR-S1113

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

The Tavian group studies the mechanisms underlying the emergence and proliferation of hematopoietic stem cells (HSC) during embryonic development. We previously showed that HSC emerge in the AGM (aorta, gonads and mesonephros) region inside the embryo but pre-hematopoietic cells (pre-HSC) are detected earlier in the subaortic mesoderm and are identifiable by the expression of the angiotensin converting enzyme (ACE / CD143). Based on these results, we recently performed a transcriptomic analysis of different cell populations involved in the process of hematopoietic emergence: pre-HSC, HSC and hemogenic endothelial cells. This has revealed differentially expressed genes between the different populations.

Topic description, including techniques to be used

Project A)

The focus of this project will be to understand the cellular and molecular events leading to the specification and activation of a hematopoietic program during human embryonic development from pre-HSC. This research program will have the following objectives: (i) validate the expression at the protein level of the genes differentially expressed in pre-HSC by immunofluorescence, (ii) quantify their expression by flow cytometry and define the cell sorting protocols; (iii) carry out functional approaches on the sorted cells, by in vitro culture in order to define their hemogenic ability.

Techniques: culture of human HSC and progenitors, flow cytometry sorting and analysis, immunohistochemistry and immunofluorescence, transcriptomic analysis, RT-qPCR.

Project B)

This project will aim at (i) validate the function of genes and signaling pathways differentially expressed in hemogenic endothelial cells by modulating their expression by shRNA-knockdown techniques (ii) and at define their function *in vivo* by designing morpholinos and knocking-down them in zebrafish embryos.

Techniques: transcriptomic analysis, flow cytometry sorting and analysis, lentiviral transduction of primary cells, confocal microscopy

Recommended applicant's training (technical expertise and knowledge)

Techniques: Flow cytometry, immunohistochemistry, immunofluorescence, confocal microscopy RT-PCR, cell culture.

Knowledge: Basic knowledge in Molecular and Cell Biology as well as in development/physiology skills in bioinformatics analysis are desirable.

Maximum two relevant publications

Julien E, Biasch K, El Omar R et al. Renin-angiotensin system is involved in embryonic emergence of hematopoietic stem/progenitor cells. Stem Cells 2021.

El Omar R, Julien E, Biasch K et al. CDX2 regulates ACE expression in blood development and leukemia cells. Blood Adv 2021;5(7):2012-2016.

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 animals, such as mice.	YES ☒ / NO ☐

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