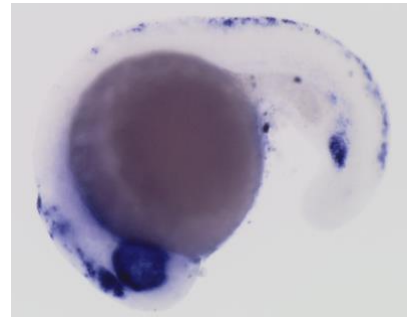


Using Zebrafish to understand Blood Stem Cells.

Pr. Julien Bertrand – Master Thesis – CMU/UniGE

Research interests

Our group studies many aspects of the molecular and cellular mechanisms involved in the establishment of the hematopoietic/blood and cardiovascular tissues in the vertebrate embryo. We use zebrafish as a model of investigation. More precisely, we investigate the initial specification of Hematopoietic Stem Cells (HSCs) as well as their expansion and differentiation into different lineages. Both these aspects of HSC biology are intimately linked to endothelial cells. Indeed, HSCs derive from hemogenic endothelial cells in the aorta, and then expand in a very specific vascular niche. The use of zebrafish allows an unprecedented access to embryonic development, to its manipulation, therefore allowing to unravel new mechanisms that are conserved with other vertebrates, such as mammals. Recently, we performed single-cell RNA sequencing on endothelial cells sorted from early embryos, in order to understand the molecular mechanisms involved in the birth and expansion of HSCs.



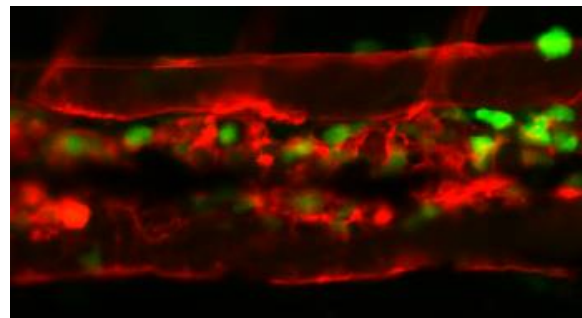
Project

We have identified many new genes that are potentially involved in HSCs generation (early aorta) or in the establishment of the vascular niche that will expand HSCs. We need first to validate these genes in terms of expression pattern, then functionally. The identification of such genes will allow to create a human vascular niche that will support the expansion of human HSCs, in order to ameliorate our current protocols of regenerative medicine / gene therapy.

Methods

Molecular biology (cloning, transgenesis, CRISPR/Cas9....), in situ hybridization, micro-injections into 1-cell stage embryos, live imaging, flow cytometry.

Key words: zebrafish, embryonic development, hematopoiesis, stem cells, hematopoietic niche.



Publications of the group linked to the project

Christopher Mahony and **Julien Y. Bertrand**. *How HSCs colonize and expand in the fetal niche of the vertebrate embryo: an evolutionary perspective*. (in press – **Frontiers in Cell and Developmental Biology** 2019)

Christopher B. Mahony, Corentin Pasche and **Julien Y. Bertrand**. *Oncostatin M and Kit-Ligand control hematopoietic stem cell fate during zebrafish embryogenesis*. **Stem Cell Reports** 2018 Jun 5; 10(6):1920-1934

Christopher B. Mahony, Richard J. Fish, Corentin Pasche and **Julien Y. Bertrand**. *Tfec controls the hematopoietic stem cell vascular niche during zebrafish embryogenesis*. **BLOOD** 2016 sep8; 128(10):1336-45.

Julien Y. Bertrand*, Neil C. Chi*, Buyung Santoso, Didier Y.R. Stainier and David Traver. *Haematopoietic stem cells derive directly from aortic endothelium during development*. **Nature** 2010 Mar4; 464(7285):108-11.

Contact

Department of Pathology and Immunology

CMU #F09.2761 – Rue Michel Servet, 1 – 1211 Genève 4

Email: Julien.Bertrand@unige.ch

Tel: 022 379 5570

Fax: 022 379 5746