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. 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 showed the important role of TFEC, a transcription factor expressed by vascular cells, in the expansion of HSCs. We showed that TFEC controls many genes that are involved in HSC stimulation, leading to their survival and expansion. Indeed, HSCs are totally lost in embryos that were genetically modified to lose TFEC expression.

Project
We have identified new genes controlled by TFEC and we will study their role in the HSC niche. In parallel, we will try to identify new transcription factors involved in this process (by the use of single cell RNA sequencing). 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, 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.


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