

MASTER THESIS RESEARCH PROJECT IN REGENERATIVE ANGIOGENESIS

Engineering signaling microenvironments for the coupling of angiogenesis and osteogenesis in bone regeneration

Project Background

Large bone defects due to trauma, surgery or other pathological conditions cannot be repaired by spontaneous regeneration and their treatment is an unmet challenge in clinical practice. Use of tissue-engineered bone grafts is promising for the repair of clinical-size defects but has yet to make a significant impact for patients. One of the critical issues to be solved towards this goal is the need to coordinate the formation of a vascular supply within the engineered grafts to form adequate amounts of physiological bone tissue. Beyond supplying nutrients and oxygen, vasculature also plays a crucial regulatory roles, exchanging a complex crosstalk of paracrine signals that coordinate progenitor commitment, i.e. a so-called angiocrine function. For successful bone regeneration it is important that the processes of angiogenesis and osteogenesis are functionally coupled, as during physiological development and repair. However, whether and how this can be actively regulated under therapeutically relevant conditions is unknown.

Short Project Description

In this project, we aim at dissecting the molecular crosstalk between pro-osteogenic endothelium and osteogenic progenitors by a combination of transcriptomic (single-cell RNAseq) and functional approaches. To this end, we will take advantage of a protein engineering approach to decorate fibrin matrices with tunable and homogeneous concentrations of growth factors and recapitulate their physiological matrix-bound presentation.

If you are interested in learning about angiogenesis and osteogenesis and would like to be a part of this project for your master's thesis, please contact us. The selected candidate will have the opportunity to be trained on advanced histology, state-of-the-art multiplexing microscopy, molecular biology and data analysis.

This work will take place in the Regenerative Angiogenesis Lab (<https://biomedizin.unibas.ch/en/research/research-groups/banfi-lab/>) directed by Prof. Andrea Banfi at the University of Basel under the supervision of Dr. Nunzia Di Maggio.

Contact

Motivated candidates should send their CV and a brief motivation letter to Prof. Andrea Banfi (andrea.banfi@unibas.ch) and Nunzia Di Maggio (Nunzia.Dimaggio@usb.ch).