University of Basel

DBM Basel
Department of Biomedicine

OPEN MASTER THESIS PROJECT

LEARNING FROM DEVELOPMENT TO UNDERSTAND DISEASE ONSET IN A MOUSE MODEL FOR FIBRODYSPLASIA OSSIFICANS PROGRESSIVA.

Project

Fibrodysplasia Ossificans Progressiva (FOP) is a rare human condition characterized by abnormal bone formation (i.e. heterotopic ossification) triggered by the R206H mutation in the ACVR1 receptor which leads to excessive BMP signaling. Intriguingly, the manifestation of FOP occurs postnatally despite embryonic activity of the receptor and the goal of this project is to uncover the common gene regulatory networks between developmental defects caused by ACVR1^{R206H} and the onset of heterotopic ossification using a mouse model for FOP.

Project Aims: The starting point for the proposed master's project is the observation that, in both humans and mice, skeletal defects originate from abnormalities arising during embryogenesis.
Aim1: By investigating cellular and molecular changes in mouse FOP mutant embryos from the earliest developmental stages, we aim to identify the molecular alterations that give rise to skeletal defects.
Aim2: The effects of excessive BMP signalling on developmental defects in FOP will be investigated by genetically modulating BMP antagonists to fine-tune pathway activity. Cellular, molecular, and phenotypic alterations will be analysed in embryos. Elucidating the mechanisms that enable embryos to buffer or delay the emergence of developmental abnormalities will provide insights relevant for identifying potential therapeutic strategies for FOP. This project encourages student interaction with several group members.

Methodologies: Over approximately 9 months, the research project will immerse the student in a diverse array of molecular and cellular techniques. These include mouse genetics to investigate gene interplay affecting disease onset, phenotypic studies on cartilage and bone formation and the isolation and 3D culturing of limb mesenchymal progenitors from both wild type and FOP model for comparative analysis of molecular and cellular differentiation. Advanced techniques such as fluorescent RNA in situ hybridization (HCR) and immunofluorescence will enable detailed cellular studies.

This project provides the student with a valuable combination of scientific methodology, analytical thinking, and innovative research skills. Participation in research seminars, journal clubs, and the master thesis writing process will strengthen their ability to effectively communicate scientific findings in English, offering an enriching educational and research experience.

This project can be started as agreed with the master student.

Interested? Then drop us an email with your CV to arrange for an interview and project discussion. We look forward to hear from you!

Contact

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