

Bachelor/Master thesis position in translational stem cell biology at the Institute for Pharmacology and Toxicology

Group of Prof. Katrin Streckfuß-Bömeke, Molecular Pharmacology and Toxicology

Start: from June 2026

Who would like to work with patient-derived stem cells as part of an interdisciplinary team?

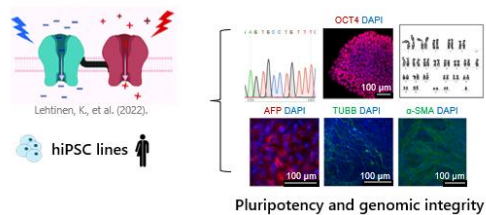
Topic: *Generation and characterization of CRISPR/Cas9 genome-edited optogenetic iPSC lines*

This project investigates **how the heart's rhythmic electrical and mechanical activity shapes interstitial non-myocytes, especially fibroblasts and macrophages, embedded among cardiomyocytes**. These non-myocytes are not just passive bystanders and are exposed to depolarization, repolarization, and the pulsatile forces of systole and diastole. We hypothesize that cyclic stimulation fundamentally alters their structure, function, and signaling to cardiomyocytes, potentially reshaping our understanding of cardiac tissue dynamics.

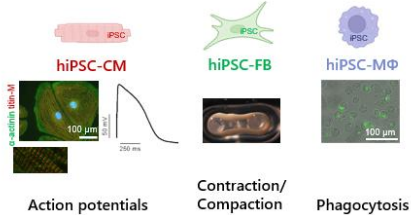
To analyze this in a human model, we want to generate optically steerable cardiomyocytes (CM), fibroblasts (FB) and macrophages (M Φ) from iPSCs. Therefore, we need to create a genetically modified human iPSC line containing optically steerable ion channels using CRISPR/Cas9 editing. Successful genetic editing will be verified through genotyping, assessment of genomic integrity and characterization of pluripotency. After differentiation of iPSCs into functionally mature cardiomyocytes, fibroblasts, and macrophages, proper ion channel expression and functionality need to be verified in the differentiated cell types.

Aim: Express optogenetic ion channels in transgenic hiPSC lines to derive optically steerable CM, FB, and M Φ

A: Generation of optogenetically steerable hiPSC lines via CRISPR-Cas9



B: Differentiation into functional hiPSC-CM, FB, and M Φ



Methods:

- iPSC culture
- CRISPR/Cas9 editing and DNA cloning
- Differentiation of iPSCs into diverse cell types (e. g. iPSC-derived cardiomyocytes, macrophages or cardiac fibroblasts)
- Molecular biology techniques like DNA/RNA isolation, (q)PCR and immunofluorescence
- Functional assessment of optically steerable hiPSC-CM, FB and M Φ

Interested? Questions? Please send an email to katrin.streckfuss-boemeke@uni-wuerzburg.de