Department of Internal Medicine II

Dissecting the Molecular Pathology of Heart and Skeletal Muscle Disease

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Molecular Cardiology

The main focus of the laboratory is to dissect novel genetic and molecular pathways of pathological cardiac and skeletal muscle development and growth using state-of-the-art forward and reverse functional genomics approaches in animal models (e.g. zebrafish, mouse). The long-term goal of our research is to identify novel therapeutic targets for cardiac and skeletal muscle diseases (in vivo high-throughput small compound screens). Currently, at the International Graduate School in Molecular Medicine Ulm, the following experimental PhD and MD projects are being pursued. To develop targeted treatment strategies for human myofibrillar myopathies (MFM), the PhD project
of John Bührdel aims to elucidate the genetic basis and the precise molecular mechanisms that translate known MFM mutations into the myopathic phenotype using functional genomics in zebrafish. In a second PhD project, Steven Rudeck aims to dissect the molecular pathways leading to myofibril assembly and to identify new candidate genes such as SMYD1 and UNC-45 involved in human cardiac and skeletal muscle myopathies. Furthermore, in an attempt to develop novel molecular treatment strategies for heart failure, the PhD project of Sofia Hirth aims to further elucidate the role of ILK-signaling in cardiac stretch sensing and mechanotransduction. The main goal of the PhD project of Julia Segert is to unravel the precise genetic and molecular mechanisms that translate Nexilin mutations into the cardiomyopathic phenotype using in vivo and in vitro model systems.

The experimental MD research project of Tobias Zimmermann aims to decipher the molecular and cellular mechanisms that control cardiomyocyte proliferation and heart regeneration in zebrafish. To dissect the functional role of DCM-associated genes and disease modifying SNPs derived from GWA studies, the MD student Manuel Rattka uses state-of-the-art in vivo reverse genetics approaches.

The zebrafish is an excellent model to study cardiovascular and muscle development and function using forward and reverse functional genomics approaches.