

## Collaborative Research Centre 1002: Modulatory Units in Heart Failure

**Widespread disease Cardiac Insufficiency: New German Collaborative Research Centre (Sonderforschungsbereich, SFB) searches at the cellular level for new insights and an even better treatment. The German Research Foundation (DFG) supports the new Centre, led by the University Medical Center Göttingen, with over 10 million euros for at first four years.**



Under the theme „Modulatory Units in Heart Failure“ (Modulatorische Einheiten bei Herzinsuffizienz), the German Research Foundation (Deutsche Forschungsgemeinschaft, DFG) promotes a new Collaborative Research Center (Sonderforschungsbereich, SFB) since 01 July 2012. Seven departments at the University Medical Center Göttingen collaborate with the 'Max Planck Institute for Dynamics and Self Organization' and the 'Max Planck Institute for Biophysical Chemistry' in the development of new therapeutic procedures. Speaker of the Collaborative Research Centre 1002 is Prof. Dr. Gerd Hasenfuß, Director of the Department of Cardiology and Pneumatology, University Medical Center Göttingen, and Chair of Heart Research Center Göttingen.



Board and subproject leaders of the new Collaborative Research Center 1002. Photo: HZG

With a prevalence of 2%, cardiac insufficiency is one of the most common diseases in Europe and of considerable clinical and socioeconomic relevance. During the last ten years, no fundamentally new therapies could be developed to treat cardiac insufficiency. The prognosis remains unchangedly bad. According to a recent publication in JAMA 2011, one-year mortality is 30%. This is an improvement of only 2.1% compared to 1998. The incidence increases continuously as demographics change.

The aim of the Collaborative Research Center therefore is to develop innovative methods for the treatment of cardiac insufficiency. This includes new therapies to treat pumping deficiencies and arrhythmias. The new methods will be developed by means of identifying specific localized therapy targets.

The Collaborative Research Center is divided into three project areas. The first project area investigates 'functional intracellular micro-domains'. These are e.g., cAMP- and cGMP micro-domains which specifically and selectively regulate subcellular functional compartments by coupling to superficial membrane receptors. The project area further assesses the functional micro-domains of the sodium- and calcium channels and their influence on subcellular local ion processes. This project area is supported by new imaging techniques such as STED microscopy (Stimulation Emission Depleted Microscopy) and new fluorescence resonance techniques.

The second project area examines cellular sensor complexes. These involve  $K_{ATP}$  channels as energy sensors, mechanosensors which sense changes in length and tension of the cardiac muscle, as well as sensors of cellular stress mechanisms.

The third project area explores the cardiac stroma and thus the interaction of the different cells within the heart muscle. Non-myocytes represent by far the largest cell fraction of the heart. In recent years it has been shown that non-myocytes emit signals to myocytes and vice versa, and that these signals regulate crucial processes within the heart muscle. Cell-cell communication therefore is an important subject in this context, where myocytes, fibroblasts, immune cells, and endothelial cells are of major significance. In this context, the relevance of connective tissue in the development of arrhythmias is analyzed, and it is planned to investigate the cellular bases for a new defibrillation technology (Low Energy Antifibrillatory Pacing, LEAP).

All three project areas will use human tissue whenever possible. This includes the investigation of cardiac muscle cells and cardiac muscle tissues that are developed from the patient's skin cells or hair using cell biological techniques (iPS-cells).

The speaker of Collaborative Research Center, Prof. Hasenfuß, commented that "with the establishment of the new SFB 1002 we have reached an important milestone in Göttingen. The SFB and the projects of the German Center for Cardiovascular Research (Deutsches Zentrum für Herz-Kreislauf-Forschung, DZHK) complement each other optimally. Whereas the SFB investigates the basis for new treatment procedures, the DZHK focuses on the prompt translation of the results into clinical practice."

#### FURTHER INFORMATIONEN

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