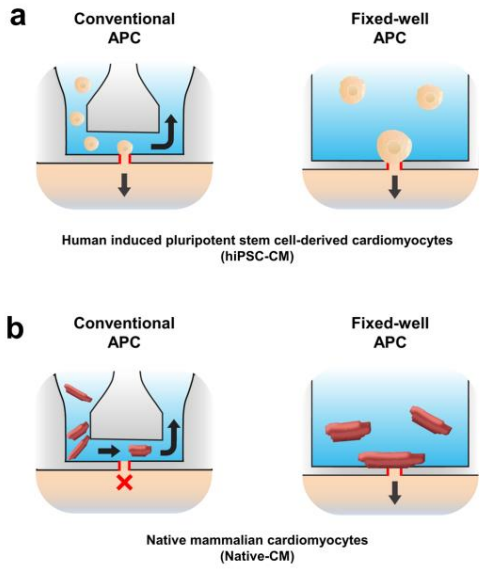
nanion

Adult mammalian cardiomyocytes successfully recorded for the first time on a high throughput automated patch clamp system!

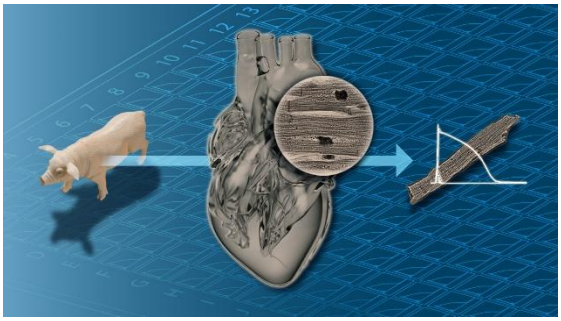
Munich, Germany, October 10th 2022: Together with our collaborators at the University Medical Center Göttingen (UMG) we demonstrate for the first time successful recordings of all expected ion channel currents and action potentials from freshly isolated mammalian atrial and ventricular cardiomyocytes on the SyncroPatch 384. This work has recently been published in Communications Biology.

Freshly isolated cardiomyocytes on APC

In July this year Nanion Technologies announced the installation of the SyncroPatch 384 at the Multiscale Bioimaging Cluster of Excellence (MBExC) of UMG. We now congratulate Prof. Niels Voigt, Will Seibertz and their co-authors on publishing their work in Communications Biology (part of the Nature Portfolio). The publication shows the use of acutely isolated adult mammalian atrial and ventricular cardiomyocytes for the first time on an automated patch clamp (APC) system. The fixed well format of the NPC-384 chip supports the capture of large cardiomyocytes and thus offers an advantage over microfluidic APC chips. The new approach offers a significant advantage over conventional patch clamp which requires skilled personnel and is low throughput.



Getting the most out of fewer animals



Compared to the smaller diameter induced pluripotent stem cell-derived cardiomyocytes (hiPSC-CMs), a lower number of native cardiomyocytes were necessary in the cell suspension to attach to 50% of available patch-clamp apertures, with comparable success rates for both cell types. Additionally, the authors demonstrate that they could generate substantially more electrophysiological data from 3 animals in a short time period compared with conventional patch clamp. Due to ethical considerations, the use of animals for research should be kept to a minimum and the use of higher throughput methods, such as APC, for functional screening is a desirable step towards reducing the number of animals sacrificed for disease modeling and cardiac safety screening purposes.

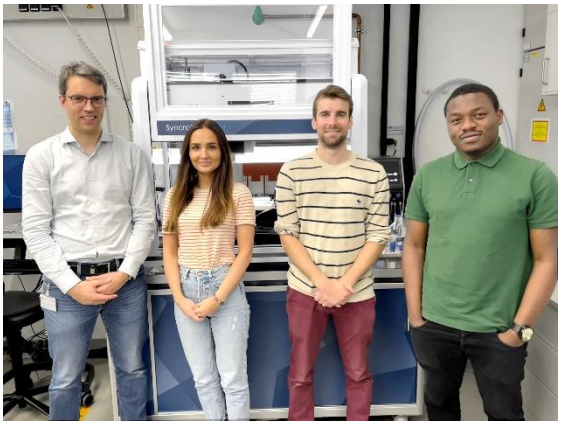
From APs to Z factor analysis

Voltage and current clamp recordings were conducted for biophysical and pharmacological characterization of L-type Ca^{2+} channels, inward rectifier currents and action potentials in native atrial and ventricular cardiomyocytes. All

parameters could be recorded from a single cell using a specially designed multi-parametric protocol, the 'CAPER' protocol. This protocol took advantage of the internal perfusion capability of the SyncroPatch 384, along with external solution exchange and multiple voltage protocols which were applied. Furthermore, to conserve chip usage, the 32-well mode of operation was utilized meaning that part of the chip can be used for each experiment. The calculation of the Z factor, a statistical parameter used in high throughput screening (HTS) to evaluate the overall quality of an assay, consistently showed good to excellent values of assay robustness and reproducibility in multiple plates of primary cells over different days.

The fixed-well format of the NPC-384 chip coupled with the intensive cellular isolation procedure developed by scientists at UMG has led to freshly isolated adult cardiomyocytes to be used for the first time on an automated patch clamp system and paves the way for robust cardiac disease modeling studies, drug development initiatives, and personalized treatment strategies.

Co-author and Senior Scientist, Nanion Technologies, Dr. Markus Rapedius has been working with UMG to record freshly isolated cardiomyocytes and hiPSC-CMs on the SyncroPatch 384. "It has been a pleasure to work with Professor Niels Voigt, Will Seibertz and co-workers to bring together their expertise in cardiac electrophysiology and isolating cardiac tissues combined with our deep knowledge of high throughput APC. We are very much looking forward to continuing this fruitful collaboration."



Prof. Niels Voigt, Aistė Liutkutė, Will Seibertz and Dr. Funsho Fakuade with the SyncroPatch 384 at the UMG.

University Medical Center Göttingen and MBExC associated investigator Professor Niels Voigt, "The application of APC in freshly isolated cardiomyocytes will allow the development of automated strategies for the characterization of cellular electrophysiology in cardiac patient samples. Thereby this work represents a first step towards personalized approaches for the treatment of cardiac arrhythmias such as atrial fibrillation."
For more information about our lab, please visit: www.molecular-pharmacology.de

About Nanion Technologies

Nanion Technologies is a leading provider of instrumentation for ion channel drug discovery and screening. Founded in 2002, Nanion has grown over the last 20 years to a company with over 100 employees worldwide. Nanion's team has developed and successfully established four generations of APC instruments along with further product lines for cell monitoring and toxicity screening, parallel bilayer recordings, and membrane transporter protein measurements. For more information, please visit: www.nanion.de

About the MBExC Cluster of Excellence

The **MBExC** employs a unique and multiscale approach to investigate the disease-relevant functional units of electrically active cells, from the molecular to the organ level to understand the relationship between heart and brain diseases, to link basic and clinical research, and to develop new therapeutic and diagnostic approaches with social implications. For more information, please visit: www.mbexc.de