

## Optical Mapping Of Cardiac Excitation And Arrhythmias

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Optical mapping is a tool used in cardiac electrophysiology to study the heart's normal rhythm and arrhythmias. The optical mapping technique provides a unique opportunity to obtain membrane potential recordings with a higher temporal and spatial resolution than electrical mapping.

Basic Concepts of Optical Mapping Techniques in Cardiac ...

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Optical Mapping of Cardiac Excitation and Arrhythmias ...

Optical mapping is a high-resolution fluorescence imaging technique, that uses voltage- or calcium-sensitive dyes to visualize electrical excitation waves on the heart surface. However, optical mapping is very susceptible to the motion of cardiac tissue, which results in so-called motion artifacts in the fluorescence signal.

High-Resolution Optical Measurement of Cardiac Restitution ...

Optical mapping of cardiac excitation using voltage- and calcium-sensitive dyes has allowed a unique view into excitation wave dynamics, and facilitated scientific discovery in the cardiovascular field.

Macroscopic optical mapping of excitation in cardiac cell ...

Cardiac optical mapping is a fluorescent imaging method to study electrical behaviour and calcium handling in the heart. • Optical mapping provides higher spatio-temporal resolution than electrode techniques, allowing unique insights into cardiac electrophysiology in health and disease from a variety of pre-clinical models. •

Cardiac optical mapping – State-of-the-art and future ...

We developed a new method for ratiometric optical mapping of transmembrane potential ( $V_m$ ) in cardiac preparations stained with di-4-ANEPPS.  $V_m$ -dependent shifts of excitation and emission spectra establish two excitation bands (<481 and >481 nm) that produce fluorescence changes of opposite polarity within a single emission band (575–620 nm).

A Novel Approach to Dual Excitation Ratiometric Optical ...

Over the last few decades, dual optical mapping of  $V_m$  and intracellular  $Ca^{2+}$  in intact hearts has provided a wealth of information toward a more complete understanding of normal cardiac ECC and the mechanisms of ventricular arrhythmias. 16, 22, 23 In mammalian hearts, the majority of the intracellular  $Ca^{2+}$  transient is comprised of  $Ca^{2+}$  release from and reuptake into the SR (approximately 70% in the rabbit heart). 24 Thus, the ability to precisely discern whether changes in intracellular ...

Optical Mapping of Sarcoplasmic Reticulum  $Ca^{2+}$  in the ...

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Optical Mapping of Cardiac Excitation and Arrhythmias ...

Blebbistatin is used in optical mapping of cardiac preparations to minimize motion artifacts caused by heart contraction. It has been shown to have minimal effect on the heart's electrical activity, including ECG parameters, atrial and ventricular effective refractory periods, and atrial and ventricular activation patterns [ 14 , 24 ].

Properties of blebbistatin for cardiac optical mapping and ...

Simultaneous optical mapping from Langendorff perfused mouse hearts has the potential to elucidate mechanisms underlying

heart failure, arrhythmias, metabolic disease, and other heart diseases. Visualization of activation, conduction velocity, action potential duration, and other parameters at a myriad of sites cannot be achieved from cellular level investigation but is well solved by optical mapping 1,5,6 .

Optical Mapping of Action Potentials and Calcium ...

Optical mapping, usually performed using synthetic dyes for membrane voltage or cytoplasmic calcium, offers a high resolution view of cardiac activity. In cardiomyocyte monolayer cultures, an alternative, non invasive dye free imaging modality also has been applied (Hwang et al. 2004; Burton et al. 2015), albeit in only a few studies. Among other advantages, dye free imaging works at all wavelengths, which simplifies its integration with spectrally restricted opsins used for actuation.

All optical control of cardiac excitation: combined high ...

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Optical Mapping of Cardiac Excitation and Arrhythmias by ...

While over the last two decades optical mapping of excitation (voltage and calcium dynamics) has facilitated the detailed characterization of such arrhythmia events, until recently, no precise tools existed to actively interrogate cardiac dynamics in space and time.

All optical control of cardiac excitation: combined high ...

optical mapping of excitation (voltage and calcium dynamics) has facilitated the detailed characterization of such arrhythmia events, until recently, no precise tools existed to actively interrogate cardiac dynamics in space and time. In this work, we discuss the combined use of

All optical control of cardiac excitation: combined high ...

Abstract. Sarcoplasmic reticulum (SR)  $Ca^{2+}$  cycling is key to normal excitation-contraction coupling but may also contribute to pathological cardiac alternans and arrhythmia. To measure intra-SR free  $[Ca^{2+}]$  ( $[Ca^{2+}]_{SR}$ ) changes in intact hearts during alternans and ventricular fibrillation (VF). Simultaneous optical mapping of  $V_m$  (with RH237) and  $[Ca^{2+}]_{SR}$  (with Fluo-5N AM) was performed in ...

Optical mapping of sarcoplasmic reticulum  $Ca^{2+}$  in the ...

Optical mapping is an imaging technique that measures fluorescence signals across a cardiac preparation with high spatiotemporal resolution. Optical mapping of transmembrane voltage and intracellular calcium is a powerful tool for investigating cardiac physiology and pathophysiology. ... a frame grabber and an excitation light to simultaneously ...

BitFlow frame grabber eliminates data bottlenecks in new ...

More information: Alexander M. Zolotarev et al. Optical Mapping-Validated Machine Learning Improves Atrial Fibrillation Driver Detection by Multi-Electrode Mapping, Circulation: Arrhythmia and ...

Machine learning helps pinpoint sources of the most common ...

WOBURN, MA, OCTOBER 19, 2020 — Optical mapping is an imaging technique that measures fluorescence signals across a cardiac preparation with high spatiotemporal resolution. Optical mapping of transmembrane voltage and intracellular calcium is a powerful tool for investigating cardiac physiology and pathophysiology.

BitFlow Frame Grabber Eliminates Data Bottlenecks in New ...

Multi-electrode mapping (MEM) is a technique that can be applied during an operation, in which an array of electrodes is pressed against tissue to measure electrical activity. But AF drivers have proved difficult to locate with sufficient accuracy using this technique – as the remedy is to stop the AF driver by burning it away from within the heart tissue – called targeted ablation.

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