Cardiac **B**ioelectricity & **A**rrhythmia **C**enter
Washington University in St. Louis

Handbook

Linking molecule to bedside to
study & treat rhythm disorders of the heart

cbac.wustl.edu

Cardiac Biolectricity & Arrhythmia Center (CBAC)

Handbook

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CBAC HANDBOOK

Our Mission

The Cardiac Bioelectricity and Arrhythmia Center (CBAC) is an interdisciplinary center whose goals are to study the mechanisms of rhythm disorders of the heart (cardiac arrhythmias) and to develop new tools for their diagnosis and treatment.

Cardiac arrhythmias are a major cause of death (over 300,000 deaths annually in the US alone; estimated 7 million worldwide) and disability, yet mechanisms are poorly understood and treatment is mostly empirical. Through an interdisciplinary effort, CBAC investigators apply molecular biology, ion-channel and cell electrophysiology, optical mapping of membrane potential and cell calcium, multi-electrode cardiac electrophysiological mapping, Electrocardiographic Imaging (ECGI) and other noninvasive imaging modalities, and computational biology (mathematical modeling) to study mechanisms of arrhythmias at all levels of the cardiac system.

Our mission is to battle cardiac arrhythmias and sudden cardiac death through scientific discovery and its application in the development of mechanism-based therapy.

PROJECTS

- Molecular structure and electrophysiological function of cardiac ion channels
- Development of mathematical models of cardiac ion channels, cells and tissues
- Regulatory pathways in cardiac cells
- Mechanisms of hereditary cardiac arrhythmias
- Arrhythmias in myocardial ischemia and infarction
- Cell-to-cell communication and action potential propagation in the diseased heart
- Ion-channel structure - function based drug design
- Mechanisms of cardiac (ventricular and atrial) tachyarrhythmias and fibrillation
- Development and application of a novel imaging modality for cardiac arrhythmias
- Mechanisms of cardiac arryhthmias and resynchronization therapy in heart failure

EDUCATION & TRAINING

An important goal of the CBAC is to enhance and promote education and training in biomedical engineering, life sciences, and clinical medicine.

The cross-disciplinary structure of the CBAC facilitates a synergistic relationship between training, research and clinical medicine. The educational component of CBAC builds on graduate programs in the Department of Biomedical Engineering and the Medical School. Through the CBAC, graduate students and scientists in engineering and life sciences can participate in clinical lectures, seminars, case presentations and clinical procedures such as diagnosis and treatment of arrhythmias in the catheterization laboratory.

Similarly, post-MD clinical fellows can participate in lectures and seminars in the basic science departments and in research projects in the basic science laboratories. The CBAC hosts seminars each semester, where world renowned clinicians and researchers are invited to lecture. These seminars are attended by engineering, physics and medical school faculty and graduate students, as well as professionals from outside the university.

The seminars are open to the general public.

SUPPORT

Research is supported through grants to affiliated faculty. Funding agencies include:

- National Institues of Health (NIH)
- American Heart Association (AHA)
- Fondation LeDucq
- National Science Foundation (NSF)
- Burroughs Wellcome Fund

FACILITIES

Located within five areas across Washington University (the James McKelvey School of Engineering, School of Medicine, Center for Clinical Studies, St. Louis Children's Hospital and the Mallinckrodt Institute of Radiology), our facilities include state-of-the-art laboratories for:

- genetics;
- molecular biology;
- cellular and subcellular electrophysiology;
- optical mapping of action potentials and cell calcium;
- multi-electrode mapping of cardiac electrical activity;
- mathematical modeling and computer simulations using supercomputing.

Studies can also be conducted in clinical facilities for MRI, CT and Ultrasound imaging, and for electrophysiology studies and arrhythmia treatment during cardiac catheterization and surgery.

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School of Medicine

Center for Clinical Studies

St. Louis Children's Hospital

Mallinckrodt Institute of Radiology

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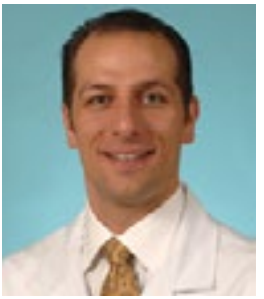

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