Donald M. Bers, Ph.D.

Research/Academic Interests

Cellular and molecular factors involved in the control of cardiac muscle contraction.

Synopsis: Dr. Bers' research program focuses on cellular and molecular factors involved in the control of cardiac muscle contraction, particularly as modulated by intracellular [Ca]. Cellular Ca regulates contraction and is in a dynamic, yet delicate balance in cardiac muscle cells.

Variations in this Ca balance are crucial to physiological and pharmacological mechanisms that increase cardiac contraction (i.e., with inotropic agents such as digitalis). Disturbance of this balance also can be responsible for pathological states (e.g. incomplete relaxation between beats and the generation of cardiac arrhythmias). Thus, detailed study of cellular Ca regulation is central to understanding cardiac muscle contraction.

At each beat, Ca enters the cell via Ca channels (ICa) and via Na/Ca exchange. Some of the Ca that enters the cell triggers the release of additional Ca from the sarcoplasmic reticulum (SR). Ca from these sources binds to the myofilaments (MF) activating contraction.

During relaxation, Ca is removed from the cytoplasm by: (1) the SR Ca-ATPase (pumping Ca back into the SR), (2) the sarcolemmal Na/Ca exchange, (3) the sarcolemmal Ca-ATPase pump (pumping Ca back out of the cell), and (4) transport into mitochondria (where it modifies ATP production). Donald Bers' research involves the cellular Ca that regulates contraction and is in a dynamic, yet delicate balance in cardiac muscle cells.

It is the study of these Ca transport systems themselves and their interplay with each other that allows us to develop a fuller understanding of how the heart works and is regulated. For example, recent studies from the lab have clarified quantitatively how the four systems above compete to reduce [Ca]i during relaxation.

Study of these systems entails a number of modern physiological and biophysical approaches. Ca channels (and Na/Ca exchange)are studied with patch-clamp techniques in both the single channel and whole cell mode. Intracellular [Ca] is measured in single cells using new intracellular fluorescent Ca indicators and ion-selective microelectrodes; contraction is recorded using video edge detectors and transducers. Cells also are permeailized or fractionated to study transport systems or receptor sites in isolation.

Recent/Current Research Funding:

National Institutes of Health

Fondation Leducq

Graduate Group Affiliations:

Biochemistry, Molecular, Cellular and Developmental Biology

Molecular, Cellular and Integrative Physiology

Pharmacology and Toxicology

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Honors and Awards
AHA Distinguished Scientist Award, American Heart Association, 2012
UC Davis School of Medicine Research Award, 2012
NIH Center for Scientific Review, ESTA Study Section Chair (2009-2010), 2009
Distinguished Achievement Award, American Heart Association, Basic Science Council, 2009
Elected Fellow of the Biophysical Society, 2009
NIH/NHLBI MERIT Award Recipient for 2005-2015, 2008
Joseph Silva Endowed Chair for Cardiovascular Research at UC Davis (2008-present), 2008
President (elected) of International Society for Heart Research NAS (2006-2015), 2006
NIH/NHLBI Program Project Grant Principal Investigator (2005-2016), 2005
Founding Fellow, American Heart Association, 2000
Founding Fellow, International Society for Heart Research, 2000

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