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B.Sc. 1985 Electrical Engineering, Technion-IIT

M.D. 1986 Medicine, Technion-IIT

D.Sc. 1993 Biomedical Engineering, Technion-IIT

Field of research:

Excitation-Contraction Coupling.Molecular Cardiology

About:

Dr. Amir Landesberg was born in Israel in 1961. He held a post doctoral fellowship at the University of Calgary Health Science Center from 1997-8, and joined the Department of Biomedical Engineering at the Technion as a senior lecturer in 1998. Dr. Landesberg is the coordinator of the [Molecular Cardiology Laboratory](#), the [Laboratory for Isolated Cardiac Muscle Studies](#) and of the [In Situ Cardiovascular Research Laboratory](#).

Research interests:

- Control and modeling in biomedical systems.
- Intracellular control mechanisms
- Electro-mechanical coupling. (Excitation-Contraction Coupling)
- Electrophysiology. Electro-mechanical feedback.
- Molecular cardiology, Motility assays.
- Cardiac mechanics
- Regulation of energy conversion in muscles. Economy and Efficiency.
- Isolated cardiac fiber studies.
- Molecular motility assay. Image analysis.
- Heart failure.
- Cardiac assist devices.

Current Research Projects

- Regulation of power generation by the cardiac muscle (in situ, whole heart studies).
- Development of direct cardiac actuator - for the treatment of the failing heart. (In collaboration with the industry).
- Treatment of hypotension associated with spinal anesthesia. Testing new drug therapy.
- Regulation of cardiac muscle motor unit recruitment, in the normal and failing heart. The regulation of Frank Starling Law.
- Regulation of economy and efficiency of the normal and failing heart.
- Cardiac motor unit dynamics and energy conversion by the isolated cardiac motor unit (at the isolated molecules level)
- Mechano-electrical feedback - effect of cardiac mechanics on the electrical activity.
- Early detection of ischemia - development of new diagnostic tools

Research Focus

The excitation contraction coupling in the cardiac muscle. Understanding the intracellular control

of contraction and the cellular feedback mechanisms that regulate motor unit recruitment, energy consumption, power generation, the intracellular calcium transient and the effect of the loading condition on the membrane potential.

Heart failure. Understanding the regulation of the failing heart function at the cellular and whole heart level. Development of new diagnostic and therapeutic modalities. Development of cardiac assist devices.

Theory of muscle contraction. Understanding the biophysics of the muscle motor unit dynamics and energetics. The regulation of the sarcomere (The contractile apparatus) and of the isolated actomyosin cross-bridge (the muscle motor unit) dynamics.

Selected publications:

1. Landesberg A. End-systolic pressure-volume relation based on the intracellular control of contraction. *Am J Physiol* 270: H338-H349, 1996.
2. Landesberg A, Sideman S. Coupling calcium binding to troponin-C and crossbridge cycling in skinned cardiac cells. *Am J Physiol* 266:H1260-H1266, 1994.
3. Landesberg A, Markhasin VS, Beyar R, Sideman S. Effect of cellular inhomogeneity on cardiac tissue mechanics based on intracellular control mechanism. *Am J Physiol* 270: H1101-H1114, 1996.
4. Landesberg A, Sideman S. Regulation of energy consumption in the cardiac muscle: analysis of isometric contractions. *Am J Physiol* 276: H998-H1011, 1999.
5. Landesberg A, Sideman S. Force-Velocity Relationship and biochemical to mechanical energy conversion by the sarcomere. *Am J Physiol*, 278 (4) H1274-1284, 2000.
6. ter Keurs H. E.D.J, Dies N., Landesberg A., Guyen T.T., Livshitz L., tyvers B. and M.L. Zhang. Force, Sarcomere shortening velocity and ATPase Activity. *Molecular Mechanism of Muscle Contraction. Advance in Experimental Medicine and Biology*. 538, 586-602, 2003.
7. Levy C., Landesberg A. Hysteresis in the force-length relation in the ardiac muscle. *Am J. Physiol. Heart Circ. Physiol.* 286, H434-H441. 2004
8. Yaniv Y., Sivan R. and A. Landesberg. The force sarcomere length relation during sinusoidal oscillations, identification of the sarcomere control of contraction. *Am J. Physiol.* 288, H389-H399, 2005.
9. Tchaicheyan Oren and A. Landesberg, Regulation of Energy Liberation during Steady Sarcomere Shortening. *Am. J. Physiol.- Heart Circ Physiol*: 289: H2176–H2182, 2005.
10. ter Keurs, H.E.D.J., Wakayama Y., Miura ., Shinozaki T., Stuyvers B.D., Boyden P.A. and A. Landesberg. Arrhythmogenic Calcium release from cardiac myofilaments. *Progress in Biophysics and Molecular biology*. 90; 151–171, 2006.
11. Levy C., Landesberg A. Cross-bridge Dependent Cooperativity Determines the Cardiac Force-Length Relationship. *Journal of Molecular and Cellular Cardiology*. 40; 639–647, 2006.
12. Yaniv Y., R. Sivan, Landesberg A. Stability controllability and observability of the four state model: Model of the sarcomere control of contraction. *Annals of Biomedical Engineering*. 34 (5), 778–789, 2006.

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