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Institute of Molecular Physiology and Genetics  
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**Qualification, awards:**

- 1976 *Ing*, Faculty of Chemical technology, STU, Bratislava.
- 1982 *PhD*, Faculty of Chemical technology, STU, Bratislava.
- 1989-91 *Postdoctoral Fellow*, Department of Physiology and Biophysics, UTMB, Galveston, TX, USA
- 1993,1996 Prize of the Slovak Physiological Society for best publication
- 1994-96 *Visiting Scientist*, Department of Physiology and Endocrinology, MCG, Augusta, GA, USA
- 1995- *Visiting Scientist*, Department of Physiology, TTU HSC, Lubbock, TX, present USA
- 1995,2001 *Howard Hughes Medical Institute International Research Scholar*
- 1996 *Fulbright Scholar*

**Support:** Howard Hughes Medical Institute; Grants Agency for Science of the Slovak Republic (VEGA); NIH Fogarty International Research Collaboration Award (with Sándor Györke)

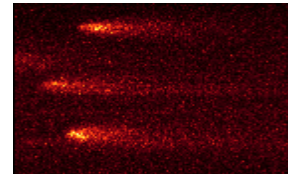
**Techniques:** whole-cell patch clamp, planar lipid bilayers, confocal microscopy, flash photolysis, advanced data analysis, mathematical modeling and simulation

**Calcium signaling during excitation–contraction coupling in cardiac myocytes**



*Ryanodine receptor*

Contraction of cardiac muscle results from an increase in  $Ca^{2+}$  concentration within the cytoplasm of muscle cells upon electrical excitation. Coupling of excitation to contraction is mediated by  $Ca^{2+}$  influx through surface membrane DHPR calcium channels that activate the ryanodine receptors (RyRs) in the sarcoplasmic reticulum (SR). Activated RyRs provide a channel for  $Ca^{2+}$  ions to pass



*Spontaneous calcium sparks*

from the SR to the cytosol in a sufficient amount to initiate contraction. Understanding of these calcium signaling mechanisms is important for understanding how cardiac contraction is regulated in health and how it is impaired in disease, e.g., cardiac ischaemia, hypertrophy, and heart failure. Our experiments on reconstituted RyR channels and in whole cells suggest that rapid binding of multiple  $Ca^{2+}$  ions to the RyR, and competition between  $Ca^{2+}$  and  $Mg^{2+}$  ions at the RyR activation sites, together provide the molecular basis for powerful local control of calcium release.



*Ion current through a single RyR*

**Selected publications:**

1. Zahradníková A, Dura M, Györke I, Escobar AL, Zahradník I, Györke S (2003): Regulation of dynamic behavior of cardiac ryanodine receptor by  $Mg^{2+}$  under simulated physiological conditions. *Am J Physiol Cell Physiol* 285: C1059–C1070.
2. Zahradníková A, Kubalová A, Pavelková J, Györke S, Zahradník I (2003): Activation of calcium release assessed by calcium release-induced inactivation of calcium current in rat cardiac myocytes. *Am J Physiol Cell Physiol* DOI: 10.1152/ajpcell.00272.2003
3. Fill M, Zahradníková A, Villalba-Galea CA, Zahradník I, Escobar AL, Györke S (2000): Ryanodine receptor adaptation. *J Gen Physiol* 116: 873-882.
4. Zahradníková A, Zahradník I, Györke I, Györke S (1999): Rapid activation of the cardiac ryanodine receptor by submillisecond calcium stimuli. *J Gen Physiol* 114: 787-798
5. Zahradníková A, Zahradník I (1999): Analysis of calcium-induced calcium release in cardiac sarcoplasmic reticulum vesicles using models derived from single channel data. *Biochim Biophys Acta* 1418: 268-284
6. Mészáros LG, Zahradníková A, Volpe P (1998): Kinetic basis of quantal calcium release from intracellular calcium stores. *Cell Calcium* 23: 43-52.
7. Zahradníková A, Mészáros LG (1998): Voltage change-induced gating transitions of the rabbit skeletal muscle  $Ca^{2+}$  release channel. *J Physiol* 509: 29-38
8. Mészáros LG, Minarovič I, Zahradníková A (1996): Inhibition of the skeletal muscle ryanodine receptor calcium release channel by nitric oxide. *FEBS Lett* 380: 49-52
9. Zahradníková A, Zahradník I (1996): A minimal gating model for the cardiac calcium release channel. *Biophys J* 71: 2996-3012
10. Zahradníková A, Zahradník I (1995): Description of modal gating of the cardiac calcium release channel in planar lipid membranes. *Biophys J* 69: 1780-1788



**Katedry biochémie a genetiky**  
Prírodovedeckej fakulty Univerzity Komenského

Vás pozývajú na **40.** prednášku v rámci Kuželových seminárov:

**Dr. Alexandra Zahradníková**

**Institute of Molecular Physiology and Genetics**  
**Slovak Academy of Sciences, Bratislava**

***Calcium signaling during excitation - contraction  
coupling in cardiac myocytes***

ktorá sa uskutoční

**27.11. 2003** (štvrtok)  
o **14:00** v miestnosti B1-501 PriF UK

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