

# ***CURRICULUM VITAE***

***Aleksey V. Zima, Ph.D.***

***Assistant Professor***

**Department of Molecular Biophysics and Physiology**

**Rush University**

**1750 West Harrison Street**

**Chicago, Illinois 60612**

**Phone: (312) 942-6454**

**Fax: (312) 942-8711**

**Aleksey\_Zima@rush.edu**

**Date of Birth:** April 18, 1969

**Citizenship:** Ukraine

## **Education**

**1986 - 1993** Master of Science with Honors in Biophysics, Biological Faculty, Kiev State University, Kiev, Ukraine. Supervisor: Prof. M.F. Shuba

**1993 - 1996** Ph.D, Biophysics, Bogomoletz Institute of Physiology, Kiev, Ukraine. Thesis: "The mechanism of nitric oxide action on calcium and potassium channels in the membrane of smooth muscle cells." Supervisor: Prof. M.F. Shuba

## **Previous Appointments**

**1996 - 98/  
2000 - 01** Research Associate, Dept. of Nerve-Muscle Physiology, Bogomoletz Institute of Physiology, Kiev, Ukraine

**1996** Visiting Scientist, Dept. of Physiology, Charring Cross & Westminster Medical School, London, UK

**1997** Visiting Scientist, Dept. of Psychology, University of California, Davis, CA, USA

**1998 - 2000** Postdoctoral Associate, Dept. of Anesthesiology, University of Florida, Gainesville, FL, USA

**2001- 2003** Research Associate, Dept. of Physiology, Loyola University Chicago, Maywood, IL, USA

**2003 - 2008** Research Assistant Professor, Dept. of Physiology, Loyola University Chicago, Maywood, IL, USA

**2008-present** Assistant Professor, Dept. Molecular Biophysics and Physiology, Rush University, Chicago, IL, USA.

## Current Areas of Research

Study of spatio-temporal organization of sarcoplasmic reticulum  $\text{Ca}^{2+}$  release during excitation-contraction coupling in cardiac myocytes. Investigation of role of mitochondria, glycolysis, cytosolic redox potential in regulation  $\text{Ca}^{2+}$  homeostasis. Study of effects of free radicals on  $\text{Ca}^{2+}$  signaling in cardiac myocytes. Investigation of the regulation of ryanodine and inositol-1,4,5-triphosphate ( $\text{IP}_3$ )  $\text{Ca}^{2+}$  release channels. Study of  $\text{IP}_3$ -dependent signalling pathway in the modulation of excitation-contraction coupling in atrial tissue and the generation of arrhythmias.

## Relevant Skills

Electrophysiological measurements of ion channels and membrane transporters (whole-cell, cell-attached, inside- and outside- out configurations of the patch-clamp technique).

Measurements of single channel activity reconstructed into planar lipid bilayers.

Measurements of intracellular  $\text{Ca}^{2+}$ , pH, mitochondrial  $\text{Ca}^{2+}$  and mitochondrial membrane potential by fluorescence confocal microscopy.

Optical measurements of  $\text{Ca}^{2+}$  uptake and release by sarcoplasmic reticulum microsomes

## Fellowships and Awards

- 1992-1993** Bogomoletz Scholarship of Kiev State University in the field of physiology  
**1994** Travel Grant from Soros International Foundation  
**1995** International Travel Grant from Biophysical Society  
**1995-1997** Scholarship of Ukraine National Academy of Science for young scientist  
**1996** Personal grant from Soros International Program for support education (ISSEP)  
**1994-1996** Personal grant from The Physiological Society (UK) of the Support Scheme for Centers of Excellence in Eastern Europe

## Research Support

### Completed Research Support

The Research Funding Committee, Loyola University Chicago 7/12/2004 - 7/12/2005

The Potts Foundation (LU#107458)

“Regulation of sarcoplasmic reticulum  $\text{Ca}^{2+}$  release by cytosolic NADH/NAD<sup>+</sup> levels during cardiac e-c coupling”

Role: Principal Investigator

American Heart Association Midwest Affiliate 01/01/2005 - 12/31/2007

Scientist Development Grant (0530309Z)

“Regulation of sarcoplasmic reticulum  $\text{Ca}^{2+}$  release by cytosolic NADH/NAD<sup>+</sup> levels during cardiac e-c coupling”

Role: Principal Investigator

### Ongoing Research Support

NIH/NHLBI (Principal Investigator L. A. Blatter) 09/01/2003 - 8/31/2008

RO1-HL62231

“E-C Coupling and  $\text{Ca}^{2+}$  Regulation in atrial myocytes”

Role: Investigator

NIH/NHLBI (Principal Investigator D. M. Bers) 12/01/2005 - 11/30/2010

Program Project

“CaMKII and  $\text{IP}_3$ -Mediated Signaling in Cardiac Myocytes”

Role: Investigator

## Societies and Memberships

- Biophysical Society, USA
- Ukrainian Biophysical Society

## Invited seminars and symposium talks

Sector of General Physiology of Nervous Activity, Bogomoletz Institute of Physiology, Kiev, Ukraine, March 1993.  
Department of Pharmacology & Clinical Pharmacology, St. George's Hospital Medical School, London, UK, July 1995.  
Sector of General Physiology of Nervous Activity, Bogomoletz Institute of Physiology, Kiev, Ukraine, March 1996.  
Department of Anesthesiology, University of Florida, Gainesville, FL, USA, April 2000.  
Department of Physiology, Loyola University Chicago, Maywood, IL, USA, June 2003.  
Second Kiev Symposium "Smooth Muscle Physiology and Biophysics", Kiev, Ukraine, October 2003  
50-th Annual Meeting of Biophysical Society, Salt Lake City, UT, USA, February 2006  
51-th Annual Meeting of Biophysical Society, Baltimore, MD, USA, February 2007  
Department of Molecular Biophysics and Physiology, Rush University, Chicago, IL, USA, September 2007

## Teaching experience

- 1995-1996** Laboratory courses in Biophysics, Department of Biophysics, Biological Faculty, Kiev State University, Kiev, Ukraine.
- 2004** Laboratory rotation of graduate students, Dept. of Physiology, Loyola University of Chicago
- 2005-2007** Cellular and Molecular Neuroscience Course, Loyola University Chicago
- 2007** Membrane Protein Structure and Function, Loyola University Chicago

## Dissertation committees

- 2000** Tsintsadze T. Sh. (Ph.D. in biophysics, Bogomoletz Institute of Physiology, Kiev)

## List of Publications

1. Domeier TL, **Zima AV**, Maxwell JT, Huke S, Mignery GA, Blatter LA. IP3 receptor-dependent Ca<sup>2+</sup> release modulates excitation-contraction coupling in rabbit ventricular myocytes. *Am J Physiol Heart Circ Physiol.* 2008; 294(2):H596-604
2. **Zima AV**, Picht E, Bers DM and Blatter LA. Partial inhibition of sarcoplasmic reticulum Ca release evokes long-lasting Ca release events in ventricular myocytes: role of luminal Ca in termination of Ca release *Biophys. J.* 2008; 94(5):1867-79
3. **Zima AV**, Bare DJ, Mignery GA, Blatter LA. IP3-dependent nuclear Ca<sup>2+</sup> signalling in the mammalian heart. *J Physiol.* 2007;584:601-11
4. Picht E, **Zima AV**, Blatter LA, Bers DM. SparkMaster - Automated Calcium Spark Analysis with ImageJ. *Am J Physiol Cell Physiol.* 2007; 293(3):C1073-81

5. Aromolaran AA, **Zima AV**, Blatter LA. Role of glycolytically generated ATP for CaMKII-mediated regulation of intracellular Ca<sup>2+</sup> signaling in bovine vascular endothelial cells. *Am J Physiol Cell Physiol*. 2007 Jul;293(1):C106-18
6. Copello JA, **Zima AV**, Diaz-Sylvester PL, Fill M, Blatter LA. Ca<sup>2+</sup> entry-independent effects of L-type Ca<sup>2+</sup> channel modulators on Ca<sup>2+</sup> sparks in ventricular myocytes. *Am J Physiol Cell Physiol*. 2007; 292(6):C2129-40
7. **Zima AV**, Kockskämper J and Blatter LA The cytosolic energy reserves determines the effect of glycolytic sugar phosphates on sarcoplasmic reticulum Ca<sup>2+</sup> release in cat ventricular myocytes. *J Physiol*. 2006 Aug 31; 577(Pt 1):281-93
8. C. Jung, **A. V. Zima**, P. Szentesi, I. Jona, L. Blatter, E. Niggli Ca<sup>2+</sup> Release from the Sarcoplasmic Reticulum Activated by the Low Affinity Ca<sup>2+</sup> Chelator TPEN in Ventricular Myocytes *Cell Calcium* 2007 Feb;41(2):187-94
9. **Zima AV** & Blatter LA Redox regulation of cardiac calcium channels and transporters. *Cardiovasc Res* (2006) 71, 310-21
10. Sheehan KA, **Zima AV** and Blatter LA Regional differences in spontaneous Ca<sup>2+</sup> spark activity and regulation in cat atrial myocytes. *J Physiol* (2006) 572, 799-809
11. Remus T, **Zima AV**, Bossuyt J, Bare DJ, Martin JL, Blatter LA, Bers DM, Mignery GA Biosensors to Measure InsP<sub>3</sub> Concentration in Living Cells with Spatio-temporal Resolution. *J Biol Chem* (2006) 281, 608-616
12. Blatter L.A, Kockskämper J & **Zima AV** Glycolysis has many ways to regulate cardiac function. *Physiol News* (2005) 61, 36-37
13. X. Li, **A.V. Zima**, F. Sheikh, L.A. Blatter, J. Chen Endothelin-1-induced arrhythmogenic Ca<sup>2+</sup> signaling is abolished in atrial myocytes of inositol-1,4,5-trisphosphate (IP<sub>3</sub>)-receptor type 2-deficient mice *Circ Res* (2005) 96, 1274-81
14. Kockskämper J, **Zima AV** & Blatter LA Modulation of sarcoplasmic reticulum Ca<sup>2+</sup> release by glycolysis in cat atrial myocytes. *J Physiol* (2005) 564, 697-714
15. Kockskämper J, Ahmmed GU, **Zima AV**, Sheehan KA, Glitsch HG & Blatter LA. Palytoxin disrupts cardiac excitation-contraction coupling through interactions with P-type ion pumps. *Am J Physiol Cell Physiol* (2004) 287, C527-38
16. **Zima AV**, Copello JA & Blatter LA Effects of cytosolic NADH/NAD<sup>+</sup> levels on sarcoplasmic reticulum Ca<sup>2+</sup> release in permeabilized rat ventricular myocytes. *J Physiol* (2004) 555, 727-741
17. **Zima AV** & Blatter LA Inositol-1,4,5-trisphosphate-dependent Ca<sup>2+</sup> signalling in cat atrial excitation-contraction coupling and arrhythmias. *J Physiol* (2004) 555, 607-615
18. Cherednichenko G, **Zima AV**, Feng W, Schaefer S, Blatter LA & Pessah IN. NADH Oxidase activity of rat cardiac sarcoplasmic reticulum regulates calcium-induced calcium release. *Circ Res* (2004) 94, 478-486
19. **Zima AV**, Copello JA & Blatter LA. Differential modulation of cardiac and skeletal muscle ryanodine receptors by NADH. *FEBS Lett* (2003) 547, 32-36
20. **Zima AV**, Kockskämper J, Mejia-Alvarez R & Blatter LA. Pyruvate modulates cardiac sarcoplasmic reticulum Ca<sup>2+</sup> release via mitochondria-dependent and -independent mechanisms. *J Physiol*. (2003) 550, 765-783
21. Blatter LA, Kockskämper J, Sheehan KA, **Zima AV**, Hüser J & Lipsius SL. Local calcium gradients during excitation-contraction coupling and alternans in atrial myocytes. *J Physiol* (2003) 546, 19-31
22. Martynyuk AE, Seubert CN, **Zima A**, Morey TE, Belardinelli L, Lin G, Cucchiara RF & Dennis DM. Contribution of I(K,ADO) to the negative dromotropic effect of adenosine. *Basic Res Cardiol* (2002) 97, 286-94

23. Martynyuk AE, **Zima A**, Seubert CN, Morey TE, Belardinelli L & Dennis DM. Potentiation of the negative dromotropic effect of adenosine by rapid heart rates: possible ionic mechanism. *Basic Res Cardiol* (2002) 97, 295-304
24. **Zima A**, Martynyuk AE, Seubert ChN, Morey TE, Sumners C, Cucchiara RF, Dennis DM. Antagonism of the positive dromotropic effect of isoproterenol by adenosine: Role of nitric oxide, cGMP-dependent cAMP-phosphodiesterase and protein kinase G. *J Mol Cell Cardiol* (2000) 32, 1609-1619
25. Povstyan AV, **Zima AV**, Harhun MI & Shuba MF. Properties of the apamin-sensitive component of Ca<sup>2+</sup>-dependent K<sup>+</sup> current in smooth muscle cells of the guinea-pig taenia coli. *Neurophysiology* (2000) 32, 63-69
26. Belevych AE, **Zima AV**, Vladimirova IA, Hirata H, Jurkiewicz A, Jurkiewicz NH & Shuba MF. TTX-sensitive Na<sup>+</sup> and nifedipine-sensitive Ca<sup>2+</sup> channels in rat vas deferens smooth muscle cells. *BBA* (1999) 1419, 343-352
27. Belevich A, **Zima A**, Harhun M & Shuba M. Role of cAMP, cGMP and protein kinase C in regulation of calcium current through the L-type calcium channels in the electroexcitable membrane of smooth muscle cells. *Neurophysiology* (1998) 30, 63-71
28. Povstyan AV, **Zima AV**, Reznikov BL, Tsytsura YaD & Shuba MF. The components of depolarization induced transmembrane ionic current in isolated smooth muscle cells of the guinea-pig taenia coli. *Neurophysiology* (1997) 29, 340-350
29. Korchev YE, Bashford CL, Alder GM, Apel PY, Edmondson DT, Lev AA, Nandi K, **Zima AV** & Pasternak CA. A novel explanation for fluctuations of ion current through narrow pores. *FASEB J* (1997) 11, 600-608
30. **Zima AV**, Belevich AE, Povstyan AV, Harhun MI, Tsytsura YaD & Shuba MF. Mechanism of action of nitric oxide donors on voltage-activated calcium channels in vascular muscle cells. *Neurophysiology* (1996) 28, 232-239
31. **Zima AV**, Belevich AE, Tsugorka AM & Shuba MF. Depressing action of nitroglycerin on voltage-activated calcium current in isolated smooth muscle cells of the guinea pig gut. *Neurophysiology* (1994) 26, 182-185
32. Zagorodnyuk VP, **Zima AV**, Vladimirova IA & Shuba MF. Mechanism of action of NO as a non-adrenergic inhibitory transmitter in smooth muscle cells of the guinea-pig gastrointestinal tract. *Neurophysiology* (1994) 26, 86-91

### Abstracts

1. **Zima AV**, Belevich AE & Shuba MF Modulatory action of glyceryl trinitrate and sodium nitroprusside on potential-operated calcium channels in smooth muscle cells. XII-th International Congress of Pharmacology, Montreal, Canada, 1994 - published in *Can J Physiol Pharmacol* (1994) 72, 580
2. **Zima AV**, Belevich AE & Shuba MF Dual action of nitric oxide on Ca<sup>2+</sup> current in isolated taenia coli smooth muscle cells. The Physiological Society Annual Meeting, Oxford, UK, 1995 – published in *J Physiol* (1995) 487, 198P
3. Belevich AE, **Zima AV** & Shuba MF Augmentation of potential-activated Ca<sup>2+</sup> current by GTPγS-activated G proteins in isolated taenia coli smooth muscle cells. The Physiological Society Annual Meeting, Oxford, UK, 1995 – published in *J Physiol* (1995) 487, 198P
4. **Zima AV** & Shuba MF Action of nitric oxide on calcium current in non-vascular smooth muscle cells. 40-th Annual Meeting of Biophysical Society, Baltimore, US, 1996 - published in *Biophys J* (1996) 70, A323
5. Shuba M, Belevich A, Harhun M, **Zima A** Protein kinase regulation of calcium channels in gastrointestinal smooth muscle cells. The Romanian-Hungarian Physiology Joint-Meeting, Szeged, Hungary, Timosoara, Romania, 1996 – published in *Physiology* (1996) 6, 77

6. Shuba MF, Belevich AE, **Zima AV** Membrane and intracellular mechanisms of nitric oxide relaxing action of vascular smooth muscle. - published in *J Vasc Res* (1996) 33, 46
7. Belevich A, **Zima A** & Shuba M A regulation of L-type calcium channels in intestinal smooth muscle cells by protein kinases. The Molecular and Cellular Physiology Conference, Liverpool, UK, 1997 – published in *J Physiol* (1997) 501, 118P
8. Belevich A, **Zima A** & Shuba M Neurokinin A changes voltage-dependent characteristics of L-type calcium channels in taenia coli smooth muscle cells. 41-st Annual Meeting of Biophysical Society, New Orleans, US, 1997 - published in *Biophys J* (1997) 72, A356
9. Wang GY, Liets LC, **Zima A**, Chalupa LM Nitric oxide modulates discharge patterns of retinal ganglion cells via cGMP. 28-th Annual Meeting of Soc. for Neuroscience, Los Angeles, US, 1998
10. Shuba MF, Belevich AE, Harhun MI, **Zima AV** A regulation of L-type calcium channel activity in smooth muscle cells. - published in *Pflügers Arch* (1997) 433, R49
11. Belevych A E, **Zima AV**, Vladimirova IA, Hirata H, Jurkiewicz A, Jurkiewicz NH, Shuba MF Tetrodotoxin-sensitive Na<sup>+</sup> current in single smooth muscle cells isolated from rat vas deferens. 43-th Annual Meeting of Biophysical Society, Baltimore, US, 1999 - published in *Biophys J* (1999) 76, A296
12. **Zima AV**, Kockskämper J & Blatter LA Pyruvate-mediated effects on cardiac Ca<sup>2+</sup> signaling. 46-th Annual Meeting of Biophysical Society, San Francisco, US, 2002 - published in *Biophys J* (2002) 82, 71a
13. Kockskämper J, **Zima AV** & Blatter LA Modulation of cardiac excitation-contraction coupling by glycolysis. 46-th Annual Meeting of Biophysical Society, San Francisco, US, 2002 - published in *Biophys J* (2002) 82, 68a
14. **Zima AV** & Blatter LA IP<sub>3</sub>-dependent Ca<sup>2+</sup> signaling in atrial myocytes. 47-th Annual Meeting of Biophysical Society, San Antonio, US, 2003 – published in *Biophys J* (2003), 84, 201a
15. **Zima AV**, Copello J & Blatter LA Cytosolic NADH inhibits sarcoplasmic reticulum Ca<sup>2+</sup> release in cardiac myocytes. 47-th Annual Meeting of Biophysical Society, San Antonio, US, 2003 – published in *Biophys J* (2003), 84, 201a
16. Kockskämper J, **Zima AV** & Blatter LA Complex modulation of cardiac e-c coupling by glycolysis. 82-nd Annual Meeting of German Physiological Society, Bochum, Germany, 2003 – published in *Pflügers Arch* (2003), 445, S68
17. **Zima AV** & Blatter LA Effects of cytosolic NADH/NAD<sup>+</sup> levels on sarcoplasmic reticulum Ca<sup>2+</sup> release in permeabilized rat ventricular myocytes. Second Kiev Symposium “Smooth Muscle Physiology and Biophysics”, Kiev, Ukraine, 2003 – published in *Neurophysiology* (2003)
18. **Zima AV**, Copello JA & Blatter LA Direct and indirect effects of cytosolic NADH on sarcoplasmic reticulum Ca<sup>2+</sup> release in rat ventricular myocytes. 48-th Annual Meeting of Biophysical Society, Baltimore, USA, 2004 – published in *Biophys J* (2004), 86, 111a
19. Cherednichenko G, **Zima AV**, Schaefer S, Blatter LA, Casida JE & Pessah IN NADH Oxidase Activity of Rat Cardiac Sarcoplasmic Reticulum Regulates Calcium-Induced Calcium Release. 48-th Annual Meeting of Biophysical Society, Baltimore, USA, 2004 – published in *Biophys J* (2004), 86, 241a
20. **Zima AV** & Blatter LA Local control of sarcoplasmic reticulum Ca<sup>2+</sup> release by glycolysis in cat ventricular myocytes. 49-th Annual Meeting of Biophysical Society, Long Beach, CA, USA, 2005 – published in *Biophys J* (2005), 88
21. **Zima AV**, Bare DJ, Mignery GA, Blatter LA InsP<sub>3</sub>-dependent nuclear Ca signaling in the heart. 49-th Annual Meeting of Biophysical Society, Long Beach, CA, USA, 2005 – published in *Biophys J* (2005), 88

22. Copello JA, **Zima AV**, Diaz-Sylvester PL, Fill M, Blatter LA Nifedipine inhibits Ca sparks in permeabilized myocytes. 49-th Annual Meeting of Biophysical Society, Long Beach, CA, USA, 2005 – published in *Biophys J* (2005), 88
23. **Zima AV** & Blatter LA Sarcoplasmic reticulum Ca<sup>2+</sup> load controls duration and termination of Ca<sup>2+</sup> sparks in cardiac myocyte. 50-th Annual Meeting of Biophysical Society, Salt Lake City, UT, USA, February 2006 – published in *Biophys J* (2006)
24. **Zima AV** & Blatter LA Role of mitochondrial ATP production in regulation Ca<sup>2+</sup> signaling in cat atrial myocytes. 50-th Annual Meeting of Biophysical Society, Salt Lake City, UT, USA, February 2006 – published in *Biophys J* (2006)
25. Remus T, **Zima AV**, Bossuyt J, Bare DJ, Martin JL, Blatter LA, Bers DM, Mignery GA Biosensors to Measure InsP<sub>3</sub> Concentration in Living Cells with Spatio-temporal Resolution. 50-th Annual Meeting of Biophysical Society, Salt Lake City, UT, USA, February 2006 – published in *Biophys J* (2006)
26. Remus T, **Zima AV**, Bossuyt J, Bare DJ, Martin JL, Blatter LA, Bers DM, Mignery GA Novel FRET-based InsP<sub>3</sub> sensor and spatiotemporal measurement of agonist-induced [InsP<sub>3</sub>] in ventricular myocytes. published in *Circulation* 112, II-123
27. **Zima AV**, Qin J, Fill M, Blatter LA Effects of amitriptyline on sarcoplasmic reticulum Ca<sup>2+</sup> regulation in ventricular myocytes. 51-th Annual Meeting of Biophysical Society, Baltimore, USA, February 2007 – published in *Biophys J* (2007) 77a
28. Shkryl VM, **Zima AV**, Blatter LA Mechanisms of mitochondrial Ca extrusion in intact atrial myocytes. 51-th Annual Meeting of Biophysical Society, Baltimore, USA, February 2007 – published in *Biophys J* (2007) 137a
29. **Zima AV**, Picht E, Bers DM, Blatter LA Sarcoplasmic reticulum Ca<sup>2+</sup> depletion contributes to termination of cardiac myocyte Ca<sup>2+</sup> sparks. 51-th Annual Meeting of Biophysical Society, Baltimore, USA, February 2007 – published in *Biophys J* (2007) 343a
30. Domeier TL, **Zima AV**, Florea SM, Blatter LA IP<sub>3</sub>-dependent calcium signaling in rabbit ventricular myocytes. 51-th Annual Meeting of Biophysical Society, Baltimore, USA, February 2007 – published in *Biophys J* (2007) 446a
31. **Zima A.V.** and Blatter L.A. The Role Of Mitochondria In Generation Of Spontaneous Ca<sup>2+</sup> Waves In Cat Atrial Myocytes. *Biophys. J.* 2008 94: 496
32. **Zima A.V.**, Picht E., Bers D.M. and Blatter L.A. Spark and non-Spark mediated SR Calcium Leak in Rabbit Ventricular Myocytes. *Biophys. J.* 2008 94: 497

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