

CURRICULUM VITAE
Ruben M. Markosyan Ph.D.

Present address: Department of Molecular Biophysics and Physiology
Rush University Medical Center
1653 W. Congress Pkwy,
Chicago, IL, 60612
Tel: (312) 942-7011; Fax: (312) 942-8711
E-mail: Ruben_Markosyan@rush.edu

Citizenship: US citizen

Degrees:

<u>Major</u>	<u>Year</u>
Ph.D. in Physiology	1998

Ph.D. Thesis: “*Neuronal Mechanism of Regulation of Bulbar Vago- Salitary Neurons by Structures of Amigdaloid Nuclei*”

MS in Physics 1988

BS in Medical Engineering 1985

Professional Experience:

2001 – Present Research Assistant Professor, Department of Molecular Biophysics and Physiology, Rush University Medical Center, Chicago, IL

1999 – 2001 Instructor, Department of Molecular Biophysics and Physiology, Rush University Medical Center, Chicago, IL

1997 – 1999 Post Doctoral Fellow, Department of Molecular Biophysics and Physiology, Rush University Medical Center, Chicago, IL

1994 – 1997 Graduate student, Laboratory of Physiology of Autonomic Nervous System, Institute of Physiology, Acad. Sci. Armenia

1988 – 1994 Senior Engineer, Laboratory of Physiology of Autonomic Nervous System, Institute of Physiology, Acad. Sci. Armenia

Current research activities and interests:

Viral entry into cells. Receptor-mediated fusion of virus to membranes. Retroviral fusion, particularly HIV and other retroviruses. Formation and evolution of fusion pores. Mechanisms of insertion of proteins into membranes. Mechanism for pH dependence of membrane protein activity. Potential across endosomal membrane for Class II and Class III fusion proteins.

Procedural Expertise:

- imaging single virus-cell fusion in real time;
- confocal microscopy, fluorescence video-microscopy, image processing;
- electrophysiology: time-resolved admittance measurements of cell-cell fusion in whole-cell patch clamp configuration;
- extensive experience in cell labeling and designing functional cell fusion experiments;
- flow cytometry, cell-cell fusion assay, viral-cell fusion assay, infectivity assay and generation of pseudotyped viruses.
- immunofluorescence; immunostaining
- microelectrophysiology; neuronal activity recording (response of single neuron from central, corticomedial and baso-lateral amigdala to stimulation of vagal, and sciatic nerves)
- microiontophoresis; application of neurotransmitters to elucidate the activity of functionally identified single neurons.
- analysis of neuronal activity after physiological experiments
- experience in measuring cardiovascular parameters in cats (heart rate and arterial pressure)
- cell culture, protein expression and analysis;
- DNA preparation and purification;
- extensive experience in animals surgery (efficacy and safety studies)
- assembly, calibration and maintenance of electrophysiological setups.

Memberships:

American Biophysical Society, Armenian Physiological Society,

Presentation:

22 Presentation on conferences

- Recent topics:
- "Voltage across the target cell membrane is a strong regulator of fusion of virus containing Class II or Class III proteins." (2010)
 - "Stability of the HIV-1 gp41 6-helix bundle affects formation and enlargement of fusion pores." (2009)

Grants, fellowships:

UCR grant in 2001 "Membrane fusion catalyzed by a retroviral envelope protein."

Teaching:

- * **Lectures:** Advanced Physiology I (PHY551) - Renal Physiology / Rush University, Chicago IL
- * **Workshops:** on Renal Physiology (Physiology #441)/ Rush University Medical College, Chicago, IL

List of Publications:

1. **Markosyan R.M.**, Cohen F.S. Potential across endosomal membrane may control fusion for Class II and Class III proteins. *Molecular biology of the cell*, 2010, 21(12), p.2001-2012, USA
2. **Ruben M. Markosyan**, Michael Y.K. Leung, Frederic S. Cohen. The 6-helix bundle of human immunodeficiency virus Env controls pore formation and enlargement and is initiated at residues proximal to the hairpin turn. *Journal of Virology*, 2009, V83(19), p10048-57, USA
3. **Markosyan R.M.**, Kielian M., Cohen F.S. Fusion induced by a class II viral fusion protein, Semliki forest virus E1, is dependent on the voltage of the target cell. *Journal of Virology*, 2007, V81(20), p11218-25, USA
4. **Markosyan, R.M.**, F.S. Cohen and G.B. Malayan. Time- resolved imaging of HIV-1 Env-mediated lipid and content mixing between a single vesicle and cell membrane. *Molecular Biology of the Cell*, 2005, v.16, p.5502-5513, USA.
5. Mkrtchyan S.R, **Markosyan R.M**, Eadon M.T, Moore J.T, Melikyan G.B, Cohen F.S. Ternary complex formation of human immunodeficiency virus type 1 Env, CD4, and chemokine receptor captured as an intermediate of membrane fusion. *Journal of Virology*, 2005, v79 (17), p.11161-11169, USA.
6. Melikyan G.B, Barnard R.J, **Markosyan R.M**, Young J.A, Cohen F.S. Low pH is required for avian sarcoma and leucosis virus Env-induced hemifusion and fusion pore formation but not for pore growth. *Journal of Virology*, 2004, v.78, N7,p.3753-3762, USA.
7. **R.M. Markosyan** , P. Bates, F.S. Cohen and G.B. Melikyan. Avian Sarcoma and Leucosis Virus Env can fold into a six-helix bundle prior to membrane merger. *Biophysical Journal*, 2004, Nov. 87(5),p.3291-3298,USA.
8. **Markosyan R.M.**, Cohen F.S., Melikyan G.B. HIV-1 envelope proteins complete their folding into six-helix bundles immediately after fusion pore formation. *Molecular Biology of the Cell*, 2003, v.14, p.926-938,USA.
9. Abrahamyan L.G., **Markosyan R.M.**, Moore J.P., Cohen F.S., Melikyan G.B. HIV-1 Env with an intersubunit disulfide bond engages coreceptors, but requires bond reduction after engagement to induce fusion. *Journal of Virology*, 2003, v.77, N10, p.5829-5836, USA.
10. E.Borrego-Diaz, M.E. Peeples, **R.M. Markosyan**, G.B. Melikyan, and F.S. Cohen. Completion of trimeric hairpin formation of influenza virus hemagglutinin promotes fusion pore opening and enlargement. *Virology*, 2003, v.316, issue2, p234-244, USA.

11. Fredric S. Cohen, **Ruben M. Markosyan**, and Grigory B. Melikyan. The process of membrane fusion: Nipples, Hemifusion, Pores, and Pores Growth. *Current Topics in Membrane*, 2002, v.52, USA.
12. **Markosyan R.M.**, Ma X., Lu M., Cohen F.S., Melikyan G.B. The mechanism of inhibition of HIV-1 Env-mediated cell-cell fusion by recombinant cores of gp41 ectodomain. *Virology*, 2002, v.302, N1, p.174-184, USA.
13. **Markosyan R.M.**, Melikyan G.M., Cohen F.S. Evolution of intermediates of influenza virus hemagglutinin-mediated fusion revealed by kinetic measurements of pore formation. *Biophysical Journal*, 2001, v.80, p.812-821, USA.
14. Baclavajian O.G., Avetissian E.A., **Markosyan R.M.**, Adamian F.A., Petrossian A.A. Electrophysiological study of the mechanisms of corticofugal regulation of activity of vagal viscerosensorial neurons of solitar tract nuclei. *Neurophysiology*, 2000, v.32 p.10-16, Ukraine.
15. Melikyan G.M., **Markosyan R.M.**, Brener S.A., Rozenberg Y., Cohen F.S. Role of cytoplasmic tail of ecotropic moloney murine leukemia virus env protein in fusion pore formation. *Journal of Virology*, 2000, v.74, p.447-455, USA.
16. **Markosyan R.M.**, Cohen F.S., Melikyan G.M. The lipid-anchored ectodomain of influenza virus hemagglutinin is capable of inducing nonenlarging fusion pores. *Molecular Biology of the Cell*, 2000, v.11, p.1143-1152, USA.
17. Melikyan G.M., **Markosyan R.M.**, Hemmati H., Delmedico M.K, Lambert D.M., Cohen F.S. The transition of HIV-1 gp-41 into a six-helix bundle, not the bundle configuration, induces membrane fusion. *Journal of Cell Biology*, 2000, v. 151, N2, p.413-423, USA.
18. Avetissian E.A., Adamian F.A., Petrossian A.A., **Markosyan R.M.** Role of different structures in regulation of activity of bulbar vagosolitary viscerosensorial neurons of solitar tract nuclei. *Archives of Clinical and Experimental Medicine*, 2000, v9, N1, p.37-39, Ukraine.
19. Melikyan G.M., **Markosyan R.M.**, Roth M.G., Cohen F.S. A point mutation in transmembrane domain of the hemagglutinin of influenza virus stabilizes a hemi-fusion intermediate that can transit to fusion. *Molecular Biology of the Cell*, 2000, v.11, p.3765-3755, USA.
20. **Markosyan R.M.**, Melikyan G.M., Cohen F.S. Tension of membranes expressing the hemagglutinin of influenza virus inhibits fusion. *Biophysical Journal*, 1999, v.77, p.943-952, USA.
21. Baclavajian O.G., Avetissian E.A., Migaelian R.N., Adamian F.A., **Markosyan R.M.**, Petrosian A. Neuronal mechanisms of regulation of bulbar vagosalitary

- neurons activity by the structures of baso-lateral nuclei of amygdala. *Russian Journal of Physiology*, 1998, v.84, p.164-172, Russia.
22. Avetissian E.A., Adamian F.A., **Markosyan R.M.**, Petrossian A.A. Characteristics of influence of cortical structures on the activity of viscerosensory neurons of the vago-solitari complex. *Second Conf. Armenian IBRO Association*, 1998, p.19, Armenia.
 23. Avetissian E.A., Adamian F.A., Petrossian A.A., **Markosyan R.M.** The role of the frontal areas of the limbic cortex in regulation of activity of viscerosensory neurons of vagosolitary complex. *Fifth IBRO World Congr. of Neuroscience*, 1998, p.50, Israel.
 24. Nersessian L.B., Manoukian N.K., **Markosyan R.M.** Microelectrophysiological investigation of the reactions of bulbar respiratory center neurons on stimulation of frontal ventral thalamic nucleus. *Armenian Biological Journal*, 1996, v.46, N 2, p. 220-225, Armenia.
 25. Avetissian E.A., Adamian F.A., **Markosyan R.M.**, Petrosian A.A. Neuronal organization of amygdalo-visceral reflex. *Proceedings of the First Conference of Armenian International Brain Research Organization (IBRO) Association*, 1996, p.19, Armenia.
 26. Nersessian L.B., **Markosyan R.M.** Some cortical mechanisms of regulation of the activity of brain stem respiratory neurons. *Proceedings of the 50th Anniversary of the Orbeli Institute of Physiology*, 1993, p.75, Armenia.
 27. Krishian E.M., **Markosyan R.M.**, Sarukhanian R.V. Microsystem for the physiological experiment results analysis on the "Electronica D3-28" computer. *Proceedings of the 6th All-Union Conference on the Physiology of Autonomic Nervous System*, 1986, p.170, Armenia.
 28. **Markosyan R.M.** Microsystem for the automated analysis of neuronal activity. *Proceedings of the V Conference of Young Physiologists of UnderCaucasus*, 1986, p.62