

Miguel Martin-Caraballo, PhD

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ACADEMIC POSITIONS

Assistant Professor **September 2003-present**
UNIVERSITY OF VERMONT, BURLINGTON, VERMONT

Alberta Heritage Foundation Postdoctoral Fellow **June 2000-July 2003**
Advisor: **Dr. SE Dryer**
UNIVERSITY OF HOUSTON, HOUSTON, TEXAS

EDUCATION AND TRAINING

Ph.D / Physiology **1995-2000**
UNIVERSITY OF ALBERTA, EDMONTON, AB, CANADA
“Functional maturation of phrenic motoneuron electrical properties and diaphragm contractile properties during perinatal development in the rat”
Advisors: **Dr. JJ Greer, Dr. PA Smith, Dr. DJ Bennett**

M.Sc / Pharmacology **1993-1995**
MEMORIAL UNIVERSITY OF NEWFOUNDLAND, ST. JOHN'S, NF, CANADA
“Investigation of the photosensitizing activity of 1,4-dihydropyridine compounds in rat smooth muscle” Advisors: **Dr. D Bieger, Dr. R Newman, Dr. P Moody-Corbett**

B.Sc (Hon.) / Biophysics **1986-1991**
MOSCOW STATE UNIVERSITY, MOSCOW, RUSSIA
"A study of the effect of low-intensity He-Ne laser radiation on the functional activity and intracellular pH of peritoneal macrophages in mice"
Advisors: **Dr. VB Turovetsky and Dr. SI Pogosyan**

AWARDS

2000-2003 **Alberta Heritage Foundation** for Medical Research Postdoctoral Fellowship
2000 **PhD with Distinction**, University of Alberta
2000 **Andrew Stewart Memorial** Graduate Prize, University of Alberta
1999-2000 **Neuroscience Canada Foundation** Scholarship
2000 **G.H. Wood Award**, University of Alberta
2000 **Alberta Lung Association** Studentship
1998 **Dr. EW Gauk Scholarship** in Pediatric Neurology Research
1997-1999 **Alberta Heritage Foundation** for Medical Research Studentship
1997, 1999 Perinatal Research Center Travel Award, University of Alberta
1997 J. Gordin Kaplan Graduate Student Award, University of Alberta
1986 **Diploma with Distinction**, Moscow State University

FUNDING

Extramural funding

7/1/2006-6/30/2011 **NIH/NCRR** (PI R. Parsons)
Center of Biomedical Research Excellence (COBRE) in Neuroscience
“Expression of the AMPA receptor subunit GluR2 in chick lumbar motoneurons”
(Director Project 2, M. Martin-Caraballo) \$888,063 (project 2 total direct cost/5 years)

7/1/2004-6/30/06 **NIH/NCRR** (PI R. Parsons)
Center of Biomedical Research Excellence (COBRE) in Neuroscience
“Expression of the AMPA receptor subunit GluR2 in chick lumbar motoneurons”
(Director Project 2, M. Martin-Caraballo) \$120,00 (total direct cost/2 years)

Intramural funding

7/1/2008-6/30/09 **Vermont Genetic Network**
Graduate Student Assistantship (to Yone J. Yoon, Advisor: M. Martin-Caraballo)- \$30,000
“Calcium-permeable AMPA receptors and motoneuron survival”

7/1/2005-6/30/07 **Vermont Genetic Network**
Graduate Student Assistantship (to Judith Pachuau, Advisor: M. Martin-Caraballo)- \$45,000
"Developmental regulation of voltage-gated Ca²⁺ channels in chick nodose ganglion neurons"

09/1/2003-5/31/05 **NIH/NCRR** (PI J. Van Houten)
Vermont Genetic Network, New Investigator support- \$150,000

11/1/2003-6/30/04 **NIH/NCRR** (PI J. Van Houten)
Vermont Genetic Network Mini-Grant - \$2,000

RESEARCH INTEREST

Project 1: Regulation of T-type calcium channel expression in nodose sensory neurons. Ca²⁺ influx through voltage-gated Ca²⁺ channels regulates various developmental and physiological processes in neurons. Although the physiological role of voltage-gated Ca²⁺ channels is well established in many systems, we have very little understanding about the regulation of Ca²⁺ channel expression during neuronal differentiation. Using the chicken nodose neurons as a model, we are investigating the molecular and cellular mechanisms that regulate the functional expression of T-type calcium channels in developing neurons.

Project 2: Regulation of spinal motoneuron development by calcium-permeable AMPA receptors. Ca²⁺ influx through ionotropic glutamate receptors constitutes one main source of Ca²⁺ entry required for activity-dependent regulation of early embryonic development. In the CNS, NMDA receptors were originally thought to be the sole source of Ca²⁺ influx through glutamate receptors; however, AMPA receptors also allow a significant influx of Ca²⁺ ions. The Ca²⁺ permeability of AMPA receptors is regulated by the insertion of one or more edited GluR2 subunits, which significantly reduces the permeability of Ca²⁺ through the channel. Using the

chicken spinal motoneurons as a model we are investigating the role of transiently expressed Ca^{2+} -permeable AMPA receptors in promoting early neuronal differentiation.

PUBLICATIONS (Peer-Reviewed)

- Ni X, **Martin-Caraballo M**. Differential effect of glutamate receptor activation on the maturation of dendritic morphology in lumbar motoneurons. **J. Comp. Neurol.** (Submitted)
- Trimarchi T, Pachua J, Shepherd A, Dey D, **Martin-Caraballo M** (2009) CNTF-evoked activation of JAK and ERK mediates the functional expression of T-type Ca^{2+} channels in chicken nodose neurons. **J. Neurochem.** 108(1): 246-59.
- Yoon YJ, Kominami H, Trimarchi T, **Martin-Caraballo M** (2008) Inhibition of electrical activity by retroviral infection of chicken spinal cord with Kir2.1 transgenes disrupts electrical differentiation of motoneurons. **PloS ONE** 3(8): e2971
(<http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0002971>)
- Pachua J, **Martin-Caraballo M** (2007) Developmental regulation of T-type Ca^{2+} channels in chick nodose ganglion cells. **Dev. Neurobiol.** 67(14): 1915-31.
- Pachua J, **Martin-Caraballo M** (2007) Extrinsic regulation of T-type Ca^{2+} channel expression in chick nodose ganglion neurons **Dev. Neurobiol.** 67(14): 1901-14.
- Ni X, Sullivan G, **Martin-Caraballo M** (2007) Developmental characteristics of AMPA receptors in chick lumbar motoneurons. **Dev. Neurobiol.** 67(11): 1419-32.
- Chae KS, **Martin-Caraballo M**, Anderson M, Dryer SE (2005) Akt activation is necessary for growth-factor-induced trafficking of functional K_{Ca} channels in developing parasympathetic neurons. **J. Neurophys.** 93(3): 1174-1182.
- Dryer SE, Lhuillier L, Cameron JS, **Martin-Caraballo M** (2003) Expression of K(Ca) channels in identified populations of developing vertebrate neurons: role of neurotrophic factors and activity. **J. Physiol.** (Paris) 97(1): 49-58.
- Martin-Caraballo M**, Dryer SE (2002) GDNF- and target-dependent regulation of large-conductance calcium-activated potassium channels in developing chick lumbar motoneurons. **J. Neurosci.** 22(23): 10201-10208.
- Martin-Caraballo M**, Dryer SE (2002) Activity- and target-dependent expression of large-conductance calcium-activated potassium channels in developing chick lumbar motoneurons. **J. Neurosci.** 22(1): 73-81.
- Martin-Caraballo M**, Greer JJ (2001) Voltage-sensitive calcium currents and their role in regulating phrenic motoneuron electrical excitability during the perinatal period. **J. Neurobiol.** 46(4): 231-248.
- Martin-Caraballo M**, Greer JJ (2000) Development of potassium conductances in perinatal rat phrenic motoneurons. **J. Neurophysiol.** 83(6): 3497-3508.
- Martin-Caraballo M**, Campagnaro PA, Gao Y, Greer JJ (2000) Contractile and fatigue properties of rat diaphragm musculature during the perinatal period. **J. Appl. Physiol.** 88: 573-579.
- Martin-Caraballo M**, Greer JJ (1999) Electrophysiological properties of rat phrenic motoneuron

during perinatal development. **J. Neurophysiol.** 81: 1365-1378.

Greer JJ, Allan DW, **Martin-Caraballo M**, Lemke RP (1999) Invited review: An overview of phrenic nerve and diaphragm muscle development in the perinatal rat. **J. Appl. Physiol.** 86: 779-786.

Martin-Caraballo M, Triggle CR, Bieger D (1995) Photosensitization of rat oesophageal smooth muscle by 3'-NO₂-1,4-dihydropyridines: evidence for two cGMP-dependent effector pathways. **Br. J. Pharmacol.** 116: 3293-3301.

Turovetsky VB, Pogosyan SI, Zolotilin SA, **Martin-Caraballo M** (1992) Effect of the He-Ne laser irradiation on the functional activity and intracellular pH of mouse peritoneal phagocytes. **Biologicheskie Membrani (rus.)** 9, n.10-11: 1172-1174.

ABSTRACTS AND PRESENTATIONS

Ni X, **Martin-Caraballo M** (2009) Differential effect of glutamate receptor blockade on dendritic outgrowth in developing chicken lumbar motoneurons. **Abstr. Experimental Biol.** D317

Yoon YJ, Ni X, **Martin-Caraballo M** (2008) Age-dependent changes in motoneurons survival and dendritic outgrowth caused by pharmacological blockade of synaptic activity in the chicken spinal cord. **Abstr. Soc. Neurosc.** 29.21.D3

Martin-Caraballo M, Pachua J (2008) Posttranslational regulation of T-type Ca²⁺ channels by cytokines in sensory neurons. **Advanced Workshop: T-type Calcium Channels.** Kiev, Ukraine

Pachua J, **Martin-Caraballo M** (2007) Posttranslational regulation of T-type Ca²⁺ channel expression in chick nodose ganglion neurons. **Abstr. Soc. Neurosc.** 563.19/D15

Pachua J, **Martin-Caraballo M** (2006) Regulation of low-voltage-activated calcium channels by cell-cell interactions and trophic factors in chick nodose ganglion neurons. **Abstr. Soc. Neurosc.** 29.4/B12

Yoon YJ, Kominami H, **Martin-Caraballo M** (2006) Silencing of chick spinal cord electrical activity by replication-competent retroviral vectors. **Abstr. Soc. Neurosc.** 716.13/B38

Pachua J, **Martin-Caraballo M**, Delay R (2005) GDNF-evoked expression of large-conductance K_{Ca} channels requires membrane-bound GFR α receptors and functional lipid rafts. **Abstr. Soc. Neurosc. #267.1**

Martin-Caraballo M, Sullivan G (2005) Developmental expression of AMPA GluR2 receptor subunit in chick lumbar spinal cord. **Abstr. Soc. Neurosc. #602.13**

Chae K, **Martin-Caraballo M**, Dryer SE (2003) Neuregulin actions in developing ciliary ganglion neurons: role of ERK and PI3 kinase. **Abstr. Soc. Neurosc. #367.4**

Martin-Caraballo M, Dryer SE (2002) GDNF- and target-dependent regulation of large-conductance calcium-activated potassium channels in developing chick lumbar motoneurons. **Abstr. Soc. Neurosc.**

Dryer SE, Lhuillier L, Cameron J, **Martin-Caraballo M (2002)** Developmental changes in neuronal repetitive spike discharge: role of cell-cell interactions in regulation of calcium-activated potassium (KCa) channels. 2002 Ladislav Tauc Conference in Neurobiology, Gif Sur Yvette, France.

Martin-Caraballo M, Dryer SE (2001) Activity- and target-dependent expression of calcium-activated potassium channels in developing chick lumbar motoneurons. **Abstr. Soc. Neurosc.**

Martin-Caraballo M (2000) Functional maturation of phrenic motoneuron electrical properties and diaphragm contractile properties during perinatal development in the rat. *Physiology Canada* 31(1): 22-23.

Martin-Caraballo M, Greer JJ (1999) Role of calcium-dependent conductances in developing phrenic motoneurons. **Abstr. Soc. Neurosc.** 378.

Martin-Caraballo M, Greer JJ (1998) Phrenic motoneuron electrophysiological and diaphragm contractile properties in perinatal rat. **Abstr. Soc. Neurosc.** 937.

Martin-Caraballo M, Greer JJ (1997) Ionic mechanisms underlying changes in discharge properties of phrenic motoneurons during fetal development. **Abstr. Soc. Neurosc.** 625.

Martin-Caraballo M, Greer JJ (1997) Electrophysiological properties of phrenic motoneurons during fetal development. **XXXIII Congress of the International Union of Physiological Sciences**, St. Petersburg, Russia.

Martin-Caraballo M, Bieger D, Triggle CR (1994) Photosensitization by nitro-substituted 1,4-dihydropyridines (DHPs) in oesophageal smooth muscle. **Can. J. Physiol. Pharmacol.** 72 (suppl. 1), 478.

Bieger D, **Martin-Caraballo M, Triggle CR (1994)** Photocontraction in rat aortic smooth muscle requires nitric oxide production. **Can. J. Physiol. Pharmacol.** 72 (suppl. 4), 38.

Lovren F, O'Neill SK, **Martin-Caraballo M, Bieger D, Triggle CR (1994)** Role of cytochrome P450 in photorelaxation of vascular smooth muscle by Bay K 8644. **Can. J. Physiol. Pharmacol.** 72 (suppl. 4), 37.

Bieger D, **Martin-Caraballo M, Triggle CR (1993)** Photosensitization by 1,4-dihydropyridines in non-vascular smooth muscle: modulation by calcium. **XXXII Congress of the International Union of Physiological Sciences**, Glasgow, UK.

INVITED PRESENTATIONS

University of Vermont, Burlington, Vermont. 2005, 2008

University of Alberta, Edmonton, Canada. 2004

Florida Atlantic University, Boca Raton, Florida. 2003

Marshall University, Huntington, West Virginia. 2003

Gladstone Institute of Neurological Disease, San Francisco, California. 2003

University of Wyoming, Laramie, Wyoming. 2003

TEACHING EXPERIENCE

Comparative Physiology (BIOL 255): 4-credit course consisting of lectures and laboratory sections, designed for advanced undergraduate biology and graduate students.
University of Vermont, Burlington, VT, every fall semester from 2003 to 2008

Developmental Neurobiology (BIOL 296): 3-credit course that explores current topics in developmental neurobiology through lectures and discussions of current literature. This course is designed for advanced undergraduate and graduate students.
University of Vermont, Burlington, VT, every spring semester from 2005 to 2009

Neurobiology Techniques (BIOL 292): 4-credit course for advanced undergraduate and graduate students who received hands-on-experience on various laboratory techniques common in present-day neuroscience research including neuronal labeling, oocyte recordings and gene expression.
University of Vermont, Burlington, VT, Spring 2007

Graduate Colloquium “Regulation of ion channel function”. 3-credit graduate colloquium regarding the regulation of ion channel expression and function.
University of Vermont, Burlington, VT, Spring 2009

Graduate Colloquium “Ion channels: from structure to function”. 3-credit graduate colloquium regarding the structure and function of ion channels.
University of Vermont, Burlington, VT, Spring 2007

Graduate Colloquium “Role of neurotrophic factors in development”. 3-credit graduate colloquium discussing the role of neurotrophic factors in neurodevelopment.
University of Vermont, Burlington, VT, Spring 2005/2006

Human Anatomy & Physiology I (BIOL 2401): 4-credit course required for pre-nursing students consisting of 3 hrs-lecture and 3 hrs-laboratory sections (weekly).
North Harris Community College, Houston, TX, 2001/2002

PROFESSIONAL SERVICES

PROFESSIONAL AFFILIATION

Society for Neuroscience
International Brain Organization
International Society for Developmental Neuroscience
The Physiological Society
Society for Advancement of Chicanos and Native Americans in Science (SACNA)

ACADEMIC SERVICE

Ad hoc reviewer: J. Neurochemistry, Neuroscience, Brain Research, Neuropharmacology
Ad hoc reviewer: CAREER grant program, National Science Foundation

DEPARTMENTAL/UNIVERSITY SERVICE

Admissions Committee (College of Arts & Sciences, elected member, 2008-2011)

VT Chapter Society for Neuroscience, Faculty Representative (elected, 2008-2010)
Neuroscience Graduate Program, Advertising & Diversity Committee (2007-present)
Organizer, Departmental seminars (Biology Dept. Spring & Fall semesters 2004-2005)
Organizer, Cell Lunch seminars (Biology Dept. Spring semester 2008-2009)
Transfer Advisor and Coordinator (Biology Dept. 2005-2007)
Advisory Council Member (Biology Dept. 2006-2007, 2008-2009)
Faculty Search Committee (Biology Dept. 2004, 2005)
VT Chapter Society for Neuroscience, Executive Committee member (2004-2005)
Departmental representative to Visit Days and Orientation (every year, 2004-present)
Undergraduate student advising (~50 students/semester, Spring semester 2004-present)

GRADUATE STUDENTS (* graduated)

Judith Panchua, PhD (2003-2008)*
Xianglian Ni (2004-expected to graduate in June 2009)
Yone Jung Yoon (2005- expected to graduate by the spring of 2010)
Deblina Dey (rotation student, 2007-2009)
Carol Taylor-Burds (rotation student, 2004)

GRADUATE COMMITTEES (* graduated)

Wenling Zhang, Biol. Dept., PhD*
Vivek K. Vishnudas, Biol. Dept., PhD*
Peng Zhang, Biol. Dept., PhD*
Carol Taylor-Burds, Biol. Dept., PhD
Koela Ray, Biol. Dept., PhD*
Chun Yang, Biol. Dept., PhD
Sukanya Majumder, Biol. Dept., PhD
Mujeeburahiman Cheerathodi, Biol. Dept., PhD
Madhurima Saha, Biol. Dept., PhD
Annette LaBauve, Dept. Microbiol. & Mol. Genetics, PhD

UNDERGRADUATE RESEARCH

Valerie C. Kunzi (BIOL 191, Spring 2004)
Daniel D. Kovacs (BIOL 191, Spring 2004)
Grace Sullivan (Honors student, 2004-2005, Helix Summer internship 2004)
Michele Lareau (Honors student, 2004-2005)
Amy Wallingford (BIOL 191 Spring 2005, Helix Summer internship 2005)
Jesse Bernstein (BIOL 191, Spring 2005)
Michele Waste (BIOL 191, Spring 2005)
Cora Lozinschi (Spring 2005)
Alexander Torres (Fall 2005-Spring 2006)
Lauren Costello (BIOL 191, Spring 2006)
Mikaela Fein (BIOL 191, Fall 2007, Spring 2008)
Christopher Murphy (BIOL 191, Spring 2008)
Holly Stradecki (Helix Summer Internship 2008)
Brett Van Etten (BIOL 191, Fall 2008, BIOL 192, Spring 2009)

HONORS COMMITTEES

Andrea Ostrander (Biology Dept., 2005)

Melissa Catenassi (Dept. Animal Sci., 2005)
Tomas Trimarchi (Biology Dept., 2006)
Susan Vargas (Biology Dept., 2007)
Raymond Lee (Biology Dept., 2009)

SUMMER STUDENTS

Grace Sullivan (Helix Summer Internship 2004)
Amy Wallingford (Helix Summer Internship 2005)
Holly Stradecki (Helix Summer Internship 2008)

