

CURRICULUM VITAE

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Education:

- 1971 B.S. (Biochemistry, with honors) Oklahoma State University,
Stillwater, Oklahoma
1980 Ph.D. (Neurobiology, minor in immunology) Cornell University, Ithaca, New York

Teaching experience:

- 1975-76 Teaching Assistant, Cornell University, Ithaca, New York
1977-78 Instructor, Duke University Electron Microscope Institute, Duke University
Marine Laboratory (summer sessions), Beaufort, North Carolina
1985-88 Instructor, Department of Pharmacology, Harvard University Medical School;
Lecturer, Graduate Course in Neuropharmacology
1988 Lecturer, Graduate Seminar Series on Nicotinic Receptors, SUNY, Stony Brook,
New York
1989- Lecturer, Bouvé College of Pharmacy and Health Sciences, Northeastern University

Awards and Honors:

- 1983-84 The David Mahoney Fellowship of the National Amyotrophic Lateral
Sclerosis Foundation
1985-88 Recipient, New Investigator Research Award, NIH
1988-90 Recipient, FIRST Award, NIH

Professional Societies memberships:

Society for Neuroscience
American Society for Neurochemistry
American Society of Pharmacology and Experimental Therapeutics
American Association for the Advancement of Science
Coordinator of Boston Area Neuroscience Group (1991-2007)--the Boston chapter
of the Society for Neuroscience.

The Histochemical Society

Postdoctoral Experience:

1980-84 Fellow, Department of Pharmacology, Harvard University Medical School (R.E. Zigmond)

Professional Experience:

1984-89 Instructor, Department of Biological Chemistry and Molecular Pharmacology, Harvard University Medical School

1989-92 Clinical Associate Professor, Department of Pharmaceutical Sciences, Northeastern University, Boston, MA

1989-96 Lecturer of Neurology, Harvard Medical School at Children's Hospital, Boston, MA

1989-96 Associate of the Program in Neuroscience, Harvard University Medical School, Boston, MA

Student Advising:

Served on graduate thesis committees (not my students at the time):

Julie Stickney, NU Toxicology Ph.D. Student
Tenin Aburto, NU Pharmacology Ph.D. Student
Wang Ni Tian, NU Pharmacology Ph.D. Student
Kamelia Behnia, NU Pharmaceutics Ph.D. Student
Arti Jinsi, NU Pharmacology Ph.D. Student
Gabriela Greif, NU Pharmacology Ph.D. Student
Yong Jian Lin, NU Pharmacology Ph.D. Student
Edward Reverdy, NU Toxicology Ph.D. Student
Christine Weitasch, Harvard University Dept. Neurobiology Ph.D. Student
Sujata Vaidyanthan, NU Pharmaceutics Ph.D. Student
Dana Pedersen, NU Toxicology Ph.D. Student
Maria Carles, NU Interdisciplinary Ph.D. Student
Beom-Young Choi, Harvard University Dept. Neurobiology Ph.D. Student
Megan Pratt, Harvard University Dept. Neurobiology Ph.D. Student
Ruin Moaddel, NU Medicinal Chemistry Ph.D. student
Filbert Hui-Pek Hong, Harvard University Dept. Neurobiology Ph.D. Student
Goldi Kaul, NU Pharmaceutics Ph.D. student
Qinghuan Xiao, NU Pharmacology Ph.D. student
Eunice Stagliola, NU Toxicology Ph.D. student
Sushma Kommareddy, NU Pharmaceutics Ph.D. Student
Jennifer Weissert, NU Toxicology Ph.D. student
Matt Dickerson, NU Pharmacology Ph.D. student
Myank Bhavsar, NU Pharmaceutics Ph.D. Student
Lipa Shah, NU Pharmaceutics MS student

Lillian VanVlerken, NU Pharmaceutics Ph.D. Student
Luis Brito, NU Pharmaceutics Ph.D. Student
Ritu Kaushik, NU Pharmaceutics MS student
Sindhura Ganga, NU Pharmaceutics MS student
Christina Muratore, NU Pharmacology Ph.D. student
Sheba Goklany, NU Chemical Engineering PhD student
Bo Ying, NU Pharmaceutics Ph.D. student
Madhura Deshpande, NU Pharmaceutics MS student
Sean Kokur, NU Pharm. Sci. Interdisciplinary, Ph.D. Student
Shardool Jain, NU Pharmaceutics, Ph.D. student
Brendan Harmon, NU Pharmacology, Ph.D. student
Yiting Li, NU Pharmacology, Ph.D. student
Thom Barchett, NU Interdisciplinary, Ph.D. student

Advised graduate students doing laboratory rotations:

Rahul Sharma, MS Student, Pharmacology
Xiaogang Zhang, Ph.D./MS student, Pharmacology
Aviva Blajchman, MS student, Pharmacology
Rashad El-Badrawi, M.S. student, Pharmacology
Alok Sharma, Ph.D. student, Pharmacology
Pi-Shan Hsu, MS student, Pharmacology
Kristen Pavelok, Ph.D. student, Pharmacology
Yu-Yian Wu, MS student, Pharmacology
Tracey Hall, MS student, Pharmacology
Tabassum Husseini, MS student, Pharmacology
Wenbo Tan, Ph.D. student, Pharmacology
Yen-Hua Tang, MS student, Pharmacology
Thanh Tran, Ph.D. student, Pharmacology
Hong Gao, Ph.D. student, Pharmacology
Waleed Swelieh, Ph.D. Student, Pharmacology
Prashanti Modadugu, M.S. Student, Pharmacology
Lavesh Gwalani, M.S. Student, Pharmacology
Negin Behazin, Ph.D. Student, Pharmacology
Scott Leppanen, MS student, Pharmacology
Visalakshi Visalakshi, MS student, Pharmacology
Vishnu Hosur, MS/Ph.D. student, Pharmacology
Onkar Vase, MS student, Pharmaceutics
Hari Chikyala, MS student, Biotechnology
Geeta Gwalani, MS student, Pharmacology
Gaurav Gogri, MS student, Pharmacology
Emily Thomas, MS student, Pharmacology
Priyanka Anandajawali, MS student, Pharmacology
Brijesh Garg, MS student, Pharmacology
Thomas Koperniak, PhD. Student, Pharmacology
Vartika Mishra, MS student, Pharmacology
Nehul Shah, MS student, Pharmacology

Hiral Patel, MS student, Pharmacology
Ketan Deotale, MS Biotechnology
Rohit Vyasamneni, MS Biotechnology
Sangram Yadav, MS Biotechnology
Sharah Rangunathan, MS Biotechnology
Bharti Patel, MS Biotechnology
Vatsal Oza, MS Biotechnology
Salonee Parikh, MS Pharmacology
Pragalath Sundararajan, MS Biotechnology
Abishek Chandrashekar, MS Biotechnology
Sharath Chandra Madasu, MS Pharmacology
Nikhil Soni, MS Biotechnology
Namrata Prasad, MS Biotechnology
Jessica Jimenez, MS Pharmaceutical Science
Guarang Patel, MS Pharmacology
Anagha Sawant, MS Pharmacology
LingLing Guo, MS Pharmaceutics
Dhaval Oza, MS Pharmacology
Ngoc Ha, MS Pharmacology
Michelle Pires, MS Pharmacology
Prerana Malwadkar, MS Pharmaceutics
Tapan Dave, MS Pharmacology,
Ting Wu, MS Pharmacology,
Yichen Chen, MS Pharmaceutics,
Yong Szeto, MS Pharmacology,
Ravi Challa, MS Pharmaceutics,
Yi Xu, MS Pharmaceutics,
Vinita Chaudhari, MS Pharmacology,
Jason Wickman, MS Pharmacology,
Grishma Pawar, MS Pharmacology,
Kiran Deshpande, MS Pharmaceutics
Hangqing Lin, MS Pharmacology
Pavithra Krishnaswami, MS Pharmaceutics
Tam Nguyen, MS Medicinal Chemistry
Trung Nguyen, MS Pharmaceutical Sciences
Vinita Doshi, MS Pharmaceutical Sciences
Shivani Krovvidi, MS Biotechnology
Rucha Adhav, MS Biotechnology
Alexandra Rezvaya, MS Pharmacology
Bhargav Tilak, MS Biotechnology
Bhakti Kadav, MS Biotechnology
Ankita Bhattathiripad, MS Pharmaceutical Sciences
Delong Zhou, MS Pharmaceutical Sciences
Sneha Sukumaran, MS Pharmacology
Sweta Swaminathan, MS Pharmacology
Aditya Ansodaria, MS Biotechnology
Anurag Wadhavkar, MS Pharmacology

Babu Ram Prasad Saravanan, MS Biotechnology
Gauri Mahimkar, MS Pharmaceutical Sciences
Jaya Prakash Thummapudi, MS Biotechnology
Sushma Krishnamurthy, MS Biotechnology
Swetha Iyer, MS Biotechnology
Vijay Ramesh, MS Biotechnology
Zhiyuan Wang, MS Pharmaceutical Sciences
Yaamini Subramanian, MS Biotechnology
Kritika Mukherjee, MS Biotechnology
Xinbo Luo, MS Pharmacology

Major advisor to students completing graduate degrees with theses:

Yu Xie, Ph.D. (Degree received in 1993)
Yamin Dou, MS (Degree received in 1993)
Ruin Moaddel, NU Medicinal Chemistry Ph.D. (with Robert Hanson, Degree received in 1999)
Waleed Sweileh, Ph.D. (Degree received in 2000)
Hee Kyung Lee, MS (Degree received in 2002)
Adham Abutaha, Ph.D. (Degree received in 2003)
Vishnu Hosur, Ph.D. (Degree received in 2010)
Thomas Koperniak, Ph.D., American Foundation for Pharmaceutical Education fellow 2009 (Degree received in 2012)
Hiral Patel, Ph.D. (Degree received in 2017)
Bijesh Garg, Ph.D. (Degree received in 2017)

Advisor to five undergraduates from the University of Bath (UK) or University College London doing external training research projects towards a B.Sc. in Biochemistry

Ashley Pike, March -September, 1991. Mr. Pike received the Glaxo Placement Award at Bath University in 1992, partly based on work in this laboratory
Christine Rossant, March -September, 1992
Mark Cragg, March -September, 1993
Judith McKay, March-September, 1994 and June-September, 1995
Assad Khan, March-August, 2004, Univ. London

Advisor to undergraduates from Northeastern University doing laboratory rotations:

Abdullah Baaj. 1993-1995. Mr. Baaj was co-winner of the NU Dean's Research Award based on work in this laboratory
Fouzia Abisourour. 1993-1994
Erica Waugh Summer 1997 (Co-advising with Dr. James Stellar during a joint NU RSDF project)
Kristen Danischewski Fall 1997-1999 (Co-advising with Dr. James Stellar during a joint NU RSDF project)
Sean Sherman 2004-2005 (Provost Undergraduate Research Grant)
Jennifer Tarnaki, Spring 2009 (Provost Undergraduate Research Grant)

Joe Musacchia, Summer 2009-Spring 2011 (Matz Co-op Fellowship)
Elizabeth Kyer, Spring 2012
Kyu Won Kim, Summer 2012
Yong Szeto, Fall 2012-13, Mr. Szeto became a MS student in the lab (Provost Undergraduate Research Grant)
Kaci Coveleski, Fall 2013, (Provost Undergraduate Research Grant)
Amro Alhelawe, Spring 2013-14
David Wu, BS Pharm.Sci. Fall 2015-Spring 2016.
Michelle Nguyen, BS Pharm. Sci. Spring 2016
Halldor Arnarson, BS Pharm. Sci. Fall 2016-Spring 2017
Grant Tucker, BS Biology Fall 2019

Supervised lab volunteers: Jay Boltax, Sheba Goklany

Current MS students:

Madhave Upadhyay,
Aayush Pankaj Agarwal
Akshitha Rameshbabu
Anish Deshpande
Parnika Dalvi
Sarulatha Thulasi Raman
Shravani Godkar
Sreeharshini Oruganti
Tanya Shah
Remitha Vinayakamoorthy
Gayatri Patankar
Palak Shah
Meghana Bantwal
Shradda Kamath
Shivani Bhawsar
Gargi Ramdasi
Riya Chhowala
Pranjali Rumale
Nirzari Shah

Director, Northeastern University Graduate Program in Pharmacology (A subset of the Biomedical Science Graduate Program) 1994-2003.

Chair, Dept. Pharmaceutical Science Graduate Education Committee 2001-2010

Advisor, MS program in Pharmacology (a specialization of the Pharmaceutical Science Graduate Program) 2003-present

Invited Presentations:

Spring, 1989. Northeastern University Biomedical Science Colloquium Series, Dr. Mehdi Boroujerdi, host

November, 1989. Dept. Pharmacology, Cornell University, Ithaca NY “Nicotinic and NMDA receptors in chick retina”, Dr. Robert Oswald, host

June, 1990. Dept. Pharmacology, University College, London. Dr. David Colquhoun, host.

June, 1990. Dept. Biochemistry, University of Bath, Bath, England. Dr. Susan Wonnacott, host

July 23, 1990. European Society for Neurochemistry, Leipzig, German Democratic Republic

August, 1990. Dept. of Physiology, University of Geneva, Geneva Switzerland. Dr. Daniel Bertrand, host

August, 1990. Dept. of Molecular Neurobiology, Pasteur Institute, Paris, France. Dr. Michele Roa, host

Fall 1990, Dept. of Neuroscience, Pfizer Central Research, Groton, Conn. Dr. W.Frost White, host

Spring 1991, Dept. Physiology, University of Pittsburgh, Pittsburgh, PA. Dr. Elias Aizenman, host

Spring 1991, Massachusetts College of Pharmacy, Boston, MA. Dr. Timothy Maher, host

March 22, 1992 Cambridge NeuroScience

May 19, 1992. Dept. of Neurology, Children’s Hospital, Boston MA. Dr. Stewart Lipton, host

May 26, 1992 Mailman Research Laboratories, McLean Hospital, Belmont MA. Dr. Sherry Bursztajn, host

March 9, 1994 “Arsenic & old worms; Old reagents as new probes for nicotinic receptors”, Biology Dept., Northeastern University, Dr. Sue Powers-Lee, host.

May 9, 1994 Rho Chi Speaker, Northeastern University

November 13, 1995. “Epibatidine, a promising ligand for neuronal nicotinic receptors”, Raddison Hotel, San Diego, CA. Sponsored by Research Biochemicals, International and Amersham International.

March 19, 1997. “Roles of Disulfide Bonds in Regulating Ligand Gated Receptor Channel Function.” Pharmacology Dept., B.U. School of Medicine, Dr. Susan Leeman, host

November 3, 2000. Invited speaker “Evidence against $\alpha 4\beta 2$ nicotinic receptor stabilization during nicotine-induced up-regulation: Studies with cycloheximide and brefeldin A.” *10th Neuropharmacology Conference*, 2000, New Orleans, LA

March 2, 2012. "Investigating Novel Nicotinic Receptor Chaperones and Signaling Systems". Dept. of Pharmacology, University of Florida, Gainesville, FL, Dr. Roger Papke, host.

April 13, 2018. “ $\alpha 7$ Nicotinic Receptor Chaperones and Unconventional Signaling.” Department of Biochemistry, Oklahoma State University, Stillwater OK, Dr. John Gustafson, host.

Present Position:

1998-Present Associate Professor, Department of Pharmaceutical Sciences, Northeastern University, Boston, MA

Grant History for Ralph Loring

External Funding:

National Institute of Neurological Disorders and Stroke, NS22472, "Characterization of Neuronal Nicotinic Receptors"

\$54,377 first year direct cost (2/1/89-8/31/89), \$30,346 indirect.

\$82,387 second year direct cost (9/1/89-8/31/90), and \$49,964 indirect.

This was a FIRST award brought from Harvard University Medical School to study the effects of neuronal bungarotoxin on neuronal nicotinic receptors.

Pfizer Central Research, "Novel excitatory amino acid agents",

\$35,327 for 1 year direct costs (1/1/91-12/31/91). \$4,416 indirect.

This was a contract to study the effects of a potential drug that blocks glutamate receptors.

National Institute of Neurological Disorders and Stroke, NS22472, "Characterization of Neuronal Nicotinic Receptors",

\$877,419 over 5 years (9/1/90-8/31/95).

First year (9/1/90-8/31/91), \$120,675 direct, \$63,049 indirect.

Second year (9/1/91-8/31/92) \$109,708 direct, \$62,501 indirect.

Third year (9/1/92-8/31/93) \$109,001 direct, \$60,714 indirect.

Fourth year: (9/1/93-8/31/94) \$114,404 direct, \$61,134 indirect.

Fifth year: (9/1/94-8/31/95) \$111,540 direct, \$64,693 indirect.

This R01 was a competing renewal of the FIRST award to study the effects of reducing and oxidizing reagents on neuronal nicotinic receptors.

Smokeless Tobacco Research Council, Inc. #0273, "Novel Probes for Nicotine Binding Sites" over 3 years (1/1/91-12/31/93).

First year \$27,000 direct, 3,375 indirect.

Second year, \$28,629 direct, \$3579 indirect.

Third year, \$30,347 direct, \$3,794 indirect.

This grant was to design novel drugs to block the function of neuronal nicotinic receptors. Dr. Gerald S. Jones Jr. was a collaborator on this grant to synthesize novel organochemicals.

Advanced Tobacco Products (ATP), Inc., unspecified and unsolicited grant,

\$10,000 with unrestricted dates.

This grant was a technology transfer agreement with ATP Inc., to have a right of first refusal on any patents that might have been discovered during the time of NIH grant NS22472 (9/1/90-8/31/95).

Claims on future discoveries have now lapsed.

Research Biochemicals Incorporated (1994) contract for \$1,000 to test various batches of the snake toxin α -bungarotoxin for pharmacological activity.

Smokeless Tobacco Research Council, "*Heterobifunctional Ligands for labeling neuronal nicotinic receptors*" (1/1/94 to 12/31/96).

Dr. Gerald S. Jones, Jr. started as the PI on this grant but after Dr. Jones left Northeastern for the Mass. College of Pharmacy, and then left the Mass. College of Pharmacy, I ended up supervising both his student Ruin Moaddel and the research. This grant was to continue drug design for blocking neuronal nicotinic receptors based on the results of the previous Smokeless Tobacco Research Council grant (1/1/91-12/31/93).

National Institute of Neurological Disorders and Stroke, NS22472, "*Characterization of Neuronal Nicotinic Receptors*",

\$567,835 over 3 years (1/1/97-12/31/99).

No cost extension completed in 2000.

Internal Funding:

BRSB Instrument Grant (With Jonathan Freedman): \$5,195 direct only (1992)

RSDF (Northeastern University Research and Scholarship Development Fund) proposal funded with Dr. James Stellar: "*Nicotine Intracranial Self-Administration (ICSA)*" for \$9,999 July 1, 1997-June 30, 1998. The object is to determine if rats will work to self-inject nicotine into various brain sites to test theories of how nicotine acts as an addictive drug.

Bouve Faculty Bridge Award "*A Biological Switch for Amplifying and Retaining Transcription Factor Signaling*" for \$3400, 6/1/11-6/30/12

Since 2000, I have funded my laboratory research with honoraria obtained as a consultant evaluating grant applications for a foundation that wishes to remain anonymous. Currently, this amounts to \$34,000/year.

Service

1992-2003 Coordinator, Boston Area Neuroscience Group (BANG), the Boston chapter of the Society for Neuroscience and co-organizer (With Dr. James Stellar, NU Psychology) of the Boston Area Neuroscience Group (BANG) meetings for 1992, 1993, and 1996.

Manuscript Reviewer, Journal of Neuroscience, Journal of Neurochemistry, Journal of Physiology, Synapse, Biochemical Pharmacology, Journal of Neuroinflammation

Consultant with Research Biochemicals, International. Produced the Nicotinic Receptor page for the RBI Handbook of Receptor Classifications 1st & 2nd editions.

Consultant with Partidge Films, Ltd., of Bristol, UK for a documentary film on Cobras prepared for the Discovery Channel.

Ad Hoc Reviewer for National Institutes of Health, Israeli Science Foundation, and the National Science Foundation, as well as Reviewer, Research and Scholarship Development Fund for Division of Research Management, Northeastern University

1997-1999 Member, Northeastern University Faculty Senate

1989-2003 Chairman, Dept. of Pharmaceutical Sciences Seminar Committee

1994-Present Program Director, Pharmacology Graduate Program.

1994-Present Member, Pharmaceutical Sciences Graduate Education Committee.

1994-Present Member, University Graduate Council

1998-1999 Member, University Graduate Council Executive Committee

1995-2002 Member, University Graduate Council committee on New Programs

1989-Present Delegate for the Bouvé College of Pharmacy and Health Sciences, Northeastern University Radiation Safety Committee.

1995-1999 Member of Pharmacy Affairs Committee.

1996-1997 Member, Pharmacy Program Academic Standing Appeals Committee

1997-1999 Member, Bouvé College Academic Standing Appeals Committee

1996-1997 Member, Non-traditional Pharm. D. task group

1996 Member, Pharmacy Program Progression Requirements subcommittee

- 1997-1998 Member, (with Jonathan Freedman and Barbara Waszczak) Special Graduate Program self-study report committee
- 1997-1999 Member of Neuroscience Task Force to develop a Ph.D. program in Neuroscience at Northeastern University.
- 1998-2000 Member, (with Barbara Waszczak and Bob Schatz), Pharmaceutical Sciences Graduate Task Force.
- 2000-2003 Organizer of the Biomedical Science Colloquium Series
- 2003 Chair of the Pharmacology Core Teaching Initiative Committee
- 2002-2005 Chair of the Bouve Graduate Curriculum Committee (Responsible for semester conversion oversight of all Bouve Graduate programs in 2003)
- 2003-2006 Chair or member, Department merit committee
- 2003-2004 Member, School of Pharmacy Academic Recruiting and Transfer committee
- 2003-2004 Chair, University Graduate Council Evaluation of the Pharmacy program
- 2000-2006 Member, University Graduate Council New Programs Committee (Chair, 2004-2006)
- 2005 Graduate Council Ad Hoc Committee for evaluating graduate programs
- 2005-2010 Chair, Bouve Graduate Academic Affairs Committee
- 2007 Chair of ad hoc committee for evaluating Pharmaceutical Science Graduate Curriculum
- 2008 Chair of ad hoc committee for establishing a Graduate Pharmaceutical Science Laboratory Course.
- 2009 Member of School of Nursing Dean's Search Committee
- 2010 Member, Dept. Pharmaceutical Science Medicinal Chemistry faculty Search
- 2005-2010 Member, University Graduate Council
- 2010-Present Member, Bouve Graduate Curriculum Committee
- 2009-Present Member, School of Pharmacy Honors and Awards Committee
- 2009 Member, Provost's ad hoc committee for PhD Thesis Completion awards
- 2011 Member, Senate Academic Unit Review Committee
- 2012-2017 Member, School of Pharmacy Academic Affairs Committee

2012-Present Chair, Bouve College Graduate Curriculum Committee

2012-Present Chair, Northeastern University Institutional Biosafety Committee

2012-Present Member, Northeastern University Laboratory Safety Committee

Bibliography:

Mitchell, E.D., Riquetti, P., Loring, R.H., and Carraway, K.L. Quaternary structure of *B. subtilis* α -amylase: Anomalous behavior in SDS. *Biochimica et Biophysica Acta* **295**:314-322 (1973).

Loring, R.H. and Salpeter, M.M. Denervation increases turnover rate of junctional acetylcholine receptors. *Proc. Natl. Acad. Sci. USA* **77**:2293-2297 (1980).

Levitt, T.A., Loring, R.H. and Salpeter, M.M. Neuronal control of acetylcholine receptor turnover rate at a vertebrate neuromuscular junction. *Science* **210**:550-551 (1980).

Loring, R.H., Jones, S.W., Matthews-Bellinger, J. and Salpeter, M.M. ¹²⁵I- α -Bungarotoxin: Effects of radiodecomposition on specific activity. *J. Biol. Chem.* **257**:1418-1423 (1982).

Loring, R.H., Chiappinelli, V.A., Zigmond, R.E. and Cohen, J.B. Characterization of a snake venom neurotoxin which blocks nicotinic transmission in the avian ciliary ganglion. *Neuroscience* **11**:989-999 (1984).

Loring, R.H., Dahm, L.M. and Zigmond, R.E. Localization of α -bungarotoxin binding sites in the ciliary ganglion of the embryonic chick: An autoradiographic study at the electron microscopic level. *Neuroscience* **14**:645-660 (1985).

Loring, R.H. A method for recording agonist-induced depolarizations in small autonomic ganglia. *J. Neurosci. Methods* **12**:241-248 (1985).

Salpeter, M.M. and Loring, R.H. Nicotinic acetylcholine receptors in vertebrate muscle: Properties, distribution, and neuronal control. *Progress in Neurobiol.* **25**:297-325 (1986).

Loring, R.H., Andrews, D., Lane, W. and Zigmond, R.E. Amino acid sequence of toxin F, a snake venom toxin that blocks neuronal nicotinic receptors. *Brain Research* **385**:30-37 (1986).

Sah, D.W.Y., Loring, R.H. and Zigmond, R.E. Long-term blockade by toxin F of nicotinic synaptic potentials in cultured sympathetic neurons. *Neuroscience* **20**:867-874 (1987).

Loring, R.H. and Zigmond, R.E. Ultrastructural distribution of ¹²⁵I-toxin F binding sites on chick ciliary neurons: Synaptic localization of a toxin that blocks ganglionic nicotinic receptors. *J. Neurosci.* **7**:2153-2162 (1987).

Lipton, S.A., Aizenman, E. and Loring, R.H. Neural nicotinic acetylcholine responses in solitary mammalian retinal ganglion cells. *Pflugers Arch.*, **410**:37-43 (1987).

Loring, R.H. and Zigmond, R.E. Characterization of neuronal nicotinic receptors by snake venom neurotoxins. *Trends in Neurosci.*, **11**:73-78 (1988).

Loring, R.H., Sah, D.W.Y., Landis, S.C. and Zigmond, R.E. The ultrastructural distribution of putative nicotinic receptors on cultured neurons from the rat superior cervical ganglion. *Neuroscience*, **24**:1071-1080 (1988).

Zigmond, R.E. and Loring, R.H. Characterization and localization of ganglionic nicotinic receptors using neuronal bungarotoxin. In: *NATO advanced research workshop on Nicotinic Acetylcholine Receptors in the Nervous System*, F. Clementi, Editor. Springer Verlag, Berlin, 1988, pp. 31-39.

Aizenman, E., Lipton, S.A. and Loring, R.H. Selective Modulation of NMDA responses by reduction and oxidation. *Neuron*, **2**:1257-1263 (1989).

Loring, R.H., Aizenman, E., Lipton, S.E. and Zigmond, R.E. Characterization of nicotinic receptors in chick retina using a snake venom neurotoxin that blocks neuronal nicotinic receptor function. *J. Neurosci.* **9**:2423-2431 (1989).

Loring, R.H., Schulz, D.W. and Zigmond, R.E. Characterization of neuronal nicotinic receptors using neuronal bungarotoxin. *Progress in Brain Res.* **79**:109-116 (1989).

Loring, R.H. Agmatine acts as an antagonist of neuronal nicotinic receptors. *Brit. J. Pharm.* **99**:207-211 (1990).

Aizenman, E., Loring, R.H., and Lipton, S.E. Blockade of nicotinic responses in rat retinal ganglion cells by neuronal bungarotoxin *Brain Res.* **517**:209-214 (1990).

Aizenman, E., White, W.F., Loring, R.H., and Rosenberg, P.A. A 3,4-dihydroxyphenylalanine oxidation product is a non-NMDA glutamatergic agonist. *Neurosci. Lett.* **116**:168-171 (1990).

Loring, R.H., and Zigmond, R.E. Pharmacological and biochemical properties of nicotinic receptors from chick retina. *Euro. J. Neurosci.* **2**:863-872 (1990).

Schulz, D.W., Loring, R.H., Aizenman, E. and Zigmond, R.E. Autoradiographic localization of putative nicotinic receptors in the rat brain using ¹²⁵I-neuronal bungarotoxin. *J. Neurosci.* **11**:287-297 (1991).

Oswald, R.E., Sutcliffe, M.J., Bamberger, M., Loring, R.H., Braswell, E., and Dobson, C.M. Solution structure of neuronal bungarotoxin determined by two-dimensional NMR spectroscopy: Sequence specific assignments, secondary structure, and dimer formation. *Biochemistry* **30**:4901-4909 (1991).

Rosenberg, P.A., Loring, R.H., Xie, Y., Zaleskas, V. and Aizenman, E. 2,4,5-Trihydroxyphenylalanine in aqueous solution forms a non-NMDA glutamatergic agonist and neurotoxin. *Proc. Natl. Acad. Sci. USA* **88**:4865-4869 (1991).

Smith, K.E., Wong, V., Kremer, N.E., Loring, R.H. and Kessler, J.A. Differential regulation of muscarinic and nicotinic cholinergic receptor and their mRNAs in cultured sympathetic neurons. *Mol. Brain Res.* **12**:121-129 (1992).

Xie, Y., Jones, G.S. Jr. and Loring, R.H. Effects of oxidizing and reducing analogs of acetylcholine on neuronal nicotinic receptors. *Mol. Pharmacol.* **42**:356-363 (1992).

Loring, R.H., Dou, Y.-M., Lane, W., Jones, G.S. Jr. and Stevenson, K.J. Aromatic trivalent arsenicals: Covalent yet reversible reagents for the agonist binding site of nicotinic receptors. *Mol. Brain Res.* **15**:113-120 (1992).

Pike, A. and Loring, R.H. Effects of p-aminophenyl dichloroarsine on reduced high-affinity [³H]nicotine binding sites from chick brain: A covalent, yet reversible, agent for neuronal nicotinic receptors. *Eur. J. Neurosci.* **4**:1362-1368 (1992).

Xie, Y., Lane, W. and Loring, R.H. Nereistoxin: A naturally occurring toxin with redox effects on neuronal nicotinic acetylcholine receptors in chick retina. *J. Pharmacol. Exper. Therap.* **264**:689-694 (1993).

Loring, R.H. and Schulz, D.W. Autoradiographic localization of putative neuronal nicotinic receptors using snake venom neurotoxins. *Methods Neurosci.* **12**:324-341 (1993).

Fisher, D.H., Xie, Y. and Loring, R.H. Analysis of nereistoxin using HPLC and electrochemical detection. *Analyt. Lett.* **26**:1051-1063 (1993).

Loring, R.H. The molecular basis of curaremimetic snake neurotoxin specificity for neuronal nicotinic receptor subtypes. *J. Toxicol. Toxin Rev.* **12**:105-153 (1993).

Rossant, C.J., Lindstrom, J. and Loring, R.H. Effects of redox reagents and arsenical compounds on [³H]-cytisine binding to $\alpha 4\beta 2$ nicotinic acetylcholine receptors immunisolated from chick brain. *J. Neurochem.* **62**:1368-1374 (1994).

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