

BIOGRAPHICAL SKETCH

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NAME Edwards, Robert H.		POSITION TITLE Professor of Neurology and Physiology	
eRA COMMONS USER NAME RHEDWARDS			
EDUCATION/TRAINING <i>(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)</i>			
INSTITUTION AND LOCATION	DEGREE <i>(if applicable)</i>	YEAR(s)	FIELD OF STUDY
Yale College	B.A.	1976	Biology
Johns Hopkins School of Medicine	M.D.	1980	Medicine

A. Positions

1980-81, Intern in Medicine, Johns Hopkins Hospital; 1981-84, Resident in Neurology, UCSF; 1984-90, Postdoctoral Fellow William J. Rutter, UCSF; 1990-93, Assistant Professor, Neurology, UCLA; 1993-94, Associate Professor, Neurology and Biological Chemistry, UCLA; 1995-97, Associate Professor, Neurology and Physiology, UCSF; 1997-, Professor, Neurology and Physiology, UCSF

Honors

1990-92, March of Dimes Basil O'Connor Award; 1990-93, Alzheimer's Foundation Faculty Scholar Award; 1993, Established Investigator Award, NARSAD; 1999, Smith Lectureship, National Psychobiology Inst., Israel; 2005, Distinguished Investigator Award, NARSAD; 2007, FC MacIntosh Lectureship, McGill

Other Experience and Professional Memberships

1993-96, Advisory Board, Hereditary Disease Foundation; 1993-96, Editorial Board, *Neuron*; 1995-99, Neuropharmacology and Neurochemistry Review Section, NIMH; 1995-, Member, American Neurological Association; 1996-99, Scientific Advisory Board, Tourette's Foundation; 1997-, Member, American Society for Clinical Investigation; 1997-2003, Editorial Board, *Journal of Neuroscience*; 1998-, Scientific Advisory Board, National Parkinson's Foundation; 1999-2003, MDCN-5 Review Section, NIH; 2000-, Member, Dana Foundation; 2001-, Co-Director, UCSF Cell Biology Program

B. Selected peer-reviewed publications

19. Liu, Y., Peter, D., Roghani, A., Schuldiner, S., Prive, G.G., Eisenberg, D., Brecha, N., Edwards, R.H. 1992. A cDNA that suppresses MPP⁺ toxicity encodes a vesicular amine transporter. *Cell* 70, 539-551. (PMID 1505023)
20. Feany, M.B., Lee, S., Edwards, R.H. and Buckley, K.M. 1992. The synaptic vesicle protein SV2 is a novel type of transmembrane transporter. *Cell* 70, 861-867. (PMID 1355409)
26. Evans, C.J., Keith, D.E. Jr., Morrison, H., Magendzo, K. and Edwards, R.H. 1992. Cloning of a delta opioid receptor by functional expression. *Science* 258, 1952-1955. (PMID 1335167)
32. Roghani, A., Feldman, J., Kohan, S.A., Shirzadi, A., Gundersen, C.B., Brecha, N. and R.H. Edwards. 1994. Molecular cloning of a vesicular transporter for acetylcholine. *Proc. Natl. Acad. Sci.* 91, 10620-10624. (PMID 7938002)
53. McIntire, S.L., Reimer, R.J., Schuske, K., Edwards, R.H., Jorgensen, E.M. 1997. Identification and characterization of the vesicular GABA transporter. *Nature* 389, 870-876. (PMID 9349821)
54. Fon, E.A., Sun, B.-C., Pothos, E., Killeen, N., Sulzer, D., Edwards, R.H. 1997. Vesicular transport regulates monoamine storage and release but is not essential for amphetamine action. *Neuron* 19, 1271-1283. (PMID 9427250)
64. Pothos, E.N., Larsen, K.E., Krantz, D.E., Liu, Y., Edwards, R.H., Sulzer, D. 2000. Synaptic vesicle transporter expression regulates vesicle phenotype and quantal size. *J. Neurosci.* 20, 7297-7306. (PMID 11007887)
65. Chaudhry, F.A., Reimer, R.J., Krizaj, D., Barber, D., Storm-Mathisen, J., Copenhagen, D.R., Edwards, R.H. 1999. Analysis of an orphan neurotransmitter transporter identifies novel physiological roles for classical amino acid transport System N in nitrogen metabolism and synaptic transmission. *Cell* 99, 769-780. (PMID 10619430)

68. Reimer, R.J., Chaudhry, F.A., Gray, A.T., Edwards, R.H. 2000. Amino acid transport system A resembles system N in sequence but differs in mechanism. *Proc. Natl. Acad. Sci. USA* 97, 7715-7720. (PMID 10859363)
69. Bellocchio, E. E., Reimer, R. J., Fremeau, R. T. J., and Edwards, R. H. 2000. Uptake of glutamate into synaptic vesicles by an inorganic phosphate transporter. *Science* 289, 957-960. (PMID 10938000)
70. Waites, C.L., Mehta, A., Tan, P.K., Friesen, E., Thomas, G., Edwards, R.H., Krantz, D.E. 2001. An acidic motif retains vesicular monoamine transporter 2 on large dense core vesicles. *J. Cell Biol.* 152, 1159-1168. (PMID 11257117)
73. Fremeau, R.T. Jr., Troyer, M.D., Pahner, I., Nygaard, G.O., Tran, C.H., Reimer, R.J., Bellocchio, E.E., Fortin, D., Storm-Mathisen, J., Edwards, R.H. 2001. The expression of vesicular glutamate transporters defines two classes of excitatory synapse. *Neuron* 32, 247-60. (PMID 11502256)
75. Chaudhry, F.A., Krizaj, D., Larsson, P., Reimer, R.J., Wreden, C., Storm-Mathisen, J., Copenhagen, D., Kavanaugh, M., Edwards, R.H. 2001. Coupled and uncoupled proton movement by amino acid transport system N. *EMBO J.* 20, 7041-7051. (PMID 11742981)
79. Fremeau, R.T. Jr., Burman, J., Qureshi, T., Tran, C.H., Proctor, J., Johnson, J., Zhang, H., Sulzer, D., Copenhagen, D.R., Storm-Mathisen, J., Reimer, R.J., Chaudhry, F.A., Edwards, R.H. 2002. The identification of vesicular glutamate transporter 3 suggests novel modes of signalling by glutamate. *Proc. Natl. Acad. Sci. USA* 99, 14488-14493. (PMID 12388773)
93. Fremeau, R.T. Jr., Kam, K., Qureshi, T., Johnson, J., Copenhagen, D.R., Storm-Mathisen, J., Chaudhry, F.A., Nicoll, R.A., Edwards, R.H. 2004. Vesicular glutamate transporters 1 and 2 target to functionally distinct synaptic release sites. *Science* 304, 815-819. (PMID 15118123)
94. Harkany, T. *et al.* 2004. Endocannabinoid-independent retrograde signaling at inhibitory synapses in layer 2/3 of neocortex: involvement of vesicular glutamate transporter 3. *J. Neurosci.* 24, 4978-4988. (PMID 15163690)
95. Fortin, D.L., Troyer, M.D., Nakamura, K., Kubo, S.I., Anthony, M.D. and Edwards, R.H. 2004. Lipid rafts mediate the synaptic localization of α -synuclein. *J. Neurosci.* 24, 6715-6723. (PMID 15282274)
99. Kubo, S.I., Nemani, V.M., Chalkley, R.J., Anthony, M.D., Hattori, N., Mizuno, Y., Edwards, R.H., Fortin, D.L. 2005. A combinatorial code for the interaction of α -synuclein with membranes. *J. Biol. Chem.* 280, 31664-31672. (PMID 16020543)
100. Li, H., Waites, C.L., Park, J., Dobryy, Y. and Edwards, R.H. 2005. Vesicular monoamine transporter 2 targets directly to large dense core vesicles during biosynthesis and defines a novel regulated secretory pathway in neurons. *Neuron* 48, 619-33. (PMID 16301178)
101. Fortin, D.L., Nemani, V.M., Voglmaier, S.M., Anthony, M.D., Ryan, T.A., Edwards, R.H. 2005. Neural activity controls the synaptic accumulation of α -synuclein. *J. Neurosci.* 25, 10913-10921. (PMID 16306404)
106. Voglmaier, S.M., Kam, K., Yang, H., Fortin, D.L., Hua, Z., Nicoll, R.A., Edwards, R.H. 2006. Distinct endocytic pathways control the rate and extent of synaptic vesicle recycling. *Neuron* 51, 71-84. (PMID 16815333)
107. Morimoto, R., Uehara, S., Yatsushiro, S., Juge, N., Hua, Z., Senoh, S., Echigo, N., Hayashi, M., Mizoguchi, T., Ninomiya, T., Udagawa, N., Omote, H., Yamamoto, A., Edwards, R. H., and Moriyama, Y. 2006. Secretion of L-glutamate from osteoclasts through transcytosis. *EMBO J.* 25, 4175-4186. (PMID 16957773)
111. Larsen, K. E., Schmitz, Y., Troyer, M. D., Mosharov, E., Dietrich, P., Quazi, A. Z., Savalle, M., Nemani, V., Chaudhry, F. A., Edwards, R. H., Stefanis, L., Sulzer, D. 2006. Alpha-synuclein overexpression in PC12 and chromaffin cells impairs catecholamine release by interfering with a late step in exocytosis. *J. Neurosci.* 26, 11915-11922. (PMID 17108165)
112. Mosharov, E. V., Staal, R. G., Bove, J., Prou, D., Hananiya, A., Markov, D., Poulsen, N., Larsen, K. E., Moore, C. M., Troyer, M. D., Edwards, R.H., Przedborski, S., Sulzer, D. 2006. Alpha-synuclein overexpression increases cytosolic catecholamine concentration. *J. Neurosci.* 26, 9304-9311. (PMID 17108165)
113. Johnson, J., Fremeau, R. T., Jr., Duncan, J. L., Renteria, R. C., Yang, H., Hua, Z., Liu, X., LaVail, M. M., Edwards, R. H., and Copenhagen, D. R. 2007. Vesicular glutamate transporter 1 is required for photoreceptor synaptic signaling but not for intrinsic visual functions. *J. Neurosci.* 27, 7245-7255. (PMID 17611277)
114. Sned, A. N., Santos, M. S., Seal, R. P., Miyakawa, M., Edwards, R. H., and Scanlan, T. S. 2007. Thyronamines inhibit plasma membrane and vesicular monoamine transport. *ACS Chem Biol* 2, 390-398. (PMID 17530732)

115. Seal, R.P., Akil, O., Yi, E., Weber, C.M., Grant, L., Yoo, J., Clause, A., Kandler, K., Noebels, J.L., Glowatzki, E., Lustig, L.R., Edwards, R.H. 2008. Sensorineural deafness and seizures in mice lacking vesicular glutamate transporter 3. *Neuron* 57, 263-275. (PMID 18215263)
117. Nakamura, K., Nemani, V.M., Kaehlcke, K., Ott, M. and Edwards, R.H. 2008. Optical reporters for the conformation of α -synuclein reveal a specific interaction with mitochondria. *J. Neurosci.* 28, 12305-12317. (PMID 19020024)
119. Mosharov EV, Larsen KE, Phillips KA, Wilson K, Kanter E., Schmitz Y., Krantz D.E., Edwards R.H., Sulzer D. 2009. Interplay between cytosolic dopamine, calcium and alpha-synuclein causes selective death of substantia nigra neurons. *Neuron*, 62, 218-229. (PMID 19409267)
120. Gubernator, N.G., Zhang, H., Staal, R.G.W., Mosharov, E.V., Pereira, D., Yue, M., Balsanek, V., Vadola, P.A., Mukherjee, B., Edwards, R.H., Sulzer, D., Sames D. 2009. Activity-dependent heterogeneity of dopamine release at individual presynaptic terminals visualized with fluorescent false neurotransmitters. *Science*, 324, 1441-4. (PMID 19423778)
124. Seal, R.P., Wang, X., Guan, Y., Raja, S.N., Woodbury, C.J., Basbaum, A.I. and Edwards, R.H. 2009. Injury-induced mechanical hypersensitivity requires C-low threshold mechanoreceptors. *Nature* 462, 651-655. (PMID 19915548)
126. Nemani, V.M., Lu, W., Berge, V., Nakamura, K., Onoa, B., Lee, M.K., Chaudhry, F.A., Nicoll, R.A. and Edwards, R.H. 2010. Increased expression of alpha-synuclein reduces neurotransmitter release by inhibiting synaptic vesicle reclustering after endocytosis. *Neuron* 65, 66-79. (PMID 20152114)
127. Anantharam, A., Onoa, B., Edwards, R.H., Holz, R.W., Axelrod, D. 2010. Localized topological changes of the plasma membrane upon exocytosis visualized by polarized TIRFM. *J. Cell Biol.* 188, 415-428. (PMID 20142424)
128. Noh, J., Seal, R.P., Garver, J.A., Edwards, R.H., Kandler, K. 2010. Glutamate co-release at GABA/glycinergic synapses is crucial for the refinement of an inhibitory map. *Nat. Neurosci.* 13, 232-8. (PMID 20081852)
129. Hnasko, T.S., Chuhma, N., Zhang, H., Goh, G.A., Sulzer, D., Palmiter, R.D., Rayport, S. and Edwards, R.H. 2010. Vesicular glutamate transport promotes dopamine storage and glutamate corelease *in vivo*. *Neuron* 65, 643-656. (PMID 20223200)
130. Onoa, B., Li, H., Gagnon-Bartsch, J.A., Elias, L.A., and Edwards, R.H. (2010). Vesicular monoamine and glutamate transporters select distinct synaptic vesicle recycling pathways. *J. Neurosci.* 30, 7917-7927. (PMID 20534840)
131. Stuber, G.D., Hnasko, T.S., Britt, J.P., Edwards, R.H., and Bonci, A. (2010). Dopaminergic terminals in the nucleus accumbens but not the dorsal striatum corelease glutamate. *J. Neurosci.* 30, 8229-8233. (PMID 20554874)