



Paul Buckmaster, DVM, PhD

Professor of Comparative Medicine and of Neurology

Bio

ACADEMIC APPOINTMENTS

- Professor, Comparative Medicine
- Professor, Neurology & Neurological Sciences
- Member, Bio-X
- Member, Stanford Neurosciences Institute

ADMINISTRATIVE APPOINTMENTS

- Career Award in the Medical Sciences Advisory Committee, Burroughs Wellcome Fund, (2014- present)
- Comparative Medicine Review Committee (RIRG-C) Study Section, NCRR, NIH, (2008-2012)
- Clinical Neuroplasticity and Neurotransmitter Study Section, NIH Center for Scientific Review, (2004-2008)
- Research Council of the Professional Advisory Board, Epilepsy Foundation, (2003-2014)

HONORS AND AWARDS

- Career Award in the Biomedical Sciences, Burroughs Wellcome Fund (1996-2000)

PROFESSIONAL EDUCATION

- DVM, University of California, Davis , Veterinary Medicine (1988)
- PhD, University of Washington , Physiology (1992)

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

Temporal lobe epilepsy is common, frequently refractory to treatment, and devastating to those affected. Our long-term goal is to better understand the pathophysiological mechanisms of this disease so that rational and effective therapies can be developed. We use electrophysiological, molecular, and anatomical techniques to evaluate neuronal circuitry in normal and in epileptic brains.

Teaching

COURSES

2017-18

- Comparative Brain Evolution: COMPMED 107, COMPMED 207 (Aut)

2014-15

- Comparative Brain Evolution: COMPMED 107, COMPMED 207 (Aut)

GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Neurosciences (Phd Program)

Publications

PUBLICATIONS

- **Seizure frequency correlates with loss of dentate gyrus GABAergic neurons in a mouse model of temporal lobe epilepsy.** *journal of comparative neurology*
Buckmaster, P. S., Abrams, E., Wen, X.
2017; 525 (11): 2592-2610
- **More Docked Vesicles and Larger Active Zones at Basket Cell-to-Granule Cell Synapses in a Rat Model of Temporal Lobe Epilepsy.** *journal of neuroscience*
Buckmaster, P. S., Yamawaki, R., Thind, K.
2016; 36 (11): 3295-3308
- **Unit Activity of Hippocampal Interneurons before Spontaneous Seizures in an Animal Model of Temporal Lobe Epilepsy** *JOURNAL OF NEUROSCIENCE*
Toyoda, I., Fujita, S., Thamattoor, A. K., Buckmaster, P. S.
2015; 35 (16): 6600-6618
- **Preictal Activity of Subicular, CA1, and Dentate Gyrus Principal Neurons in the Dorsal Hippocampus before Spontaneous Seizures in a Rat Model of Temporal Lobe Epilepsy** *JOURNAL OF NEUROSCIENCE*
Fujita, S., Toyoda, I., Thamattoor, A. K., Buckmaster, P. S.
2014; 34 (50): 16671-16687
- **Early Activation of Ventral Hippocampus and Subiculum during Spontaneous Seizures in a Rat Model of Temporal Lobe Epilepsy** *JOURNAL OF NEUROSCIENCE*
Toyoda, I., Bower, M. R., Leyva, F., Buckmaster, P. S.
2013; 33 (27): 11100-11115
- **Increased Excitatory Synaptic Input to Granule Cells from Hilar and CA3 Regions in a Rat Model of Temporal Lobe Epilepsy** *JOURNAL OF NEUROSCIENCE*
Zhang, W., Huguenard, J. R., Buckmaster, P. S.
2012; 32 (4): 1183-1196
- **Rapamycin Suppresses Mossy Fiber Sprouting But Not Seizure Frequency in a Mouse Model of Temporal Lobe Epilepsy** *JOURNAL OF NEUROSCIENCE*
Buckmaster, P. S., Lew, F. H.
2011; 31 (6): 2337-2347
- **A single subconvulsant dose of domoic acid at mid-gestation does not cause temporal lobe epilepsy in mice** *NEUROTOXICOLOGY*
Demars, F., Clark, K., Wyeth, M. S., Abrams, E., Buckmaster, P. S.
2018; 66: 128-37
- **Hilar somatostatin interneuron loss reduces dentate gyrus inhibition in a mouse model of temporal lobe epilepsy** *EPILEPSIA*
Hofmann, G., Balgooyen, L., Mattis, J., Deisseroth, K., Buckmaster, P. S.
2016; 57 (6): 977-983
- **Surviving Mossy Cells Enlarge and Receive More Excitatory Synaptic Input in a Mouse Model of Temporal Lobe Epilepsy** *HIPPOCAMPUS*
Zhang, W., Thamattoor, A. K., LeRoy, C., Buckmaster, P. S.
2015; 25 (5): 594-604
- **Blockade of Excitatory Synaptogenesis With Proximal Dendrites of Dentate Granule Cells Following Rapamycin Treatment in a Mouse Model of Temporal Lobe Epilepsy** *JOURNAL OF COMPARATIVE NEUROLOGY*
Yamawaki, R., Thind, K., Buckmaster, P. S.
2015; 523 (2): 281-297
- **Hippocampal Neuropathology of Domoic Acid-Induced Epilepsy in California Sea Lions (*Zalophus californianus*)** *JOURNAL OF COMPARATIVE NEUROLOGY*

-
- Buckmaster, P. S., Wen, X., Toyoda, I., Gulland, F. M., Van Bonn, W.
2014; 522 (7): 1691-1706
- **Does Mossy Fiber Sprouting Give Rise to the Epileptic State?** *Workshop on Issues in Clinical Epileptology - A View from the Bench held in honor of Phil Buckmaster, P. S.*
SPRINGER.2014: 161-168
 - **High-dose rapamycin blocks mossy fiber sprouting but not seizures in a mouse model of temporal lobe epilepsy.** *Epilepsia*
Heng, K., Haney, M. M., Buckmaster, P. S.
2013; 54 (9): 1535-1541
 - **Short-term treatment with the GABAA receptor antagonist pentylentetrazole produces a sustained pro-cognitive benefit in a mouse model of Down's syndrome.** *British journal of pharmacology*
Colas, D., Chuluun, B., Warriar, D., Blank, M., Wetmore, D. Z., Buckmaster, P., Garner, C. C., Heller, H. C.
2013; 169 (5): 963-973
 - **Factors affecting outcomes of pilocarpine treatment in a mouse model of temporal lobe epilepsy** *EPILEPSY RESEARCH*
Buckmaster, P. S., Haney, M. M.
2012; 102 (3): 153-159
 - **Mossy cell dendritic structure quantified and compared with other hippocampal neurons labeled in rats in vivo** *EPILEPSIA*
Buckmaster, P. S.
2012; 53: 9-17
 - **Distinct Neuronal Coding Schemes in Memory Revealed by Selective Erasure of Fast Synchronous Synaptic Transmission** *NEURON*
Xu, W., Morishita, W., Buckmaster, P. S., Pang, Z. P., Malenka, R. C., Suedhof, T. C.
2012; 73 (5): 990-1001
 - **Identification of new epilepsy treatments: Issues in preclinical methodology** *EPILEPSIA*
Galanopoulou, A. S., Buckmaster, P. S., Staley, K. J., Moshe, S. L., Perucca, E., Engel, J., Loescher, W., Noebels, J. L., Pitkanen, A., Stables, J., White, H. S., O'Brien, T. J., Simonato, et al
2012; 53 (3): 571-582
 - **Is there a critical period for mossy fiber sprouting in a mouse model of temporal lobe epilepsy?** *EPILEPSIA*
Lew, F. H., Buckmaster, P. S.
2011; 52 (12): 2326-2332
 - **Rapamycin suppresses axon sprouting by somatostatin interneurons in a mouse model of temporal lobe epilepsy** *EPILEPSIA*
Buckmaster, P. S., Wen, X.
2011; 52 (11): 2057-2064
 - **Seizure-induced basal dendrites on granule cells** *EPILEPSIA*
Ribak, C. E., Shapiro, L. A., Yan, X., Dashtipour, K., Nadler, J. V., Obenaus, A., Spigelman, I., Buckmaster, P. S.
2010; 51: 43-43
 - **Mossy fiber sprouting in the dentate gyrus** *EPILEPSIA*
Buckmaster, P. S.
2010; 51: 39-39
 - **Excitatory Input Onto Hilar Somatostatin Interneurons Is Increased in a Chronic Model of Epilepsy** *JOURNAL OF NEUROPHYSIOLOGY*
Halabisky, B., Parada, I., Buckmaster, P. S., Prince, D. A.
2010; 104 (4): 2214-2223
 - **Stress coping stimulates hippocampal neurogenesis in adult monkeys** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
Lyons, D. M., Buckmaster, P. S., Lee, A. G., Wu, C., Mitra, R., Duffey, L. M., Buckmaster, C. L., Her, S., Patel, P. D., Schatzberg, A. F.
2010; 107 (33): 14823-14827
 - **Initial Loss but Later Excess of GABAergic Synapses with Dentate Granule Cells in a Rat Model of Temporal Lobe Epilepsy** *JOURNAL OF COMPARATIVE NEUROLOGY*
Thind, K. K., Yamawaki, R., Phanwar, I., Zhang, G., Wen, X., Buckmaster, P. S.

2010; 518 (5): 647-667

- **Surviving Hilar Somatostatin Interneurons Enlarge, Sprout Axons, and Form New Synapses with Granule Cells in a Mouse Model of Temporal Lobe Epilepsy** *JOURNAL OF NEUROSCIENCE*
Zhang, W., Yamawaki, R., Wen, X., Uhl, J., Diaz, J., Prince, D. A., Buckmaster, P. S.
2009; 29 (45): 14247-14256
- **Inhibition of the Mammalian Target of Rapamycin Signaling Pathway Suppresses Dentate Granule Cell Axon Sprouting in a Rodent Model of Temporal Lobe Epilepsy** *JOURNAL OF NEUROSCIENCE*
Buckmaster, P. S., Ingram, E. A., Wen, X.
2009; 29 (25): 8259-8269
- **Dysfunction of the Dentate Basket Cell Circuit in a Rat Model of Temporal Lobe Epilepsy** *JOURNAL OF NEUROSCIENCE*
Zhang, W., Buckmaster, P. S.
2009; 29 (24): 7846-7856
- **Prolonged infusion of inhibitors of calcineurin or L-type calcium channels does not block mossy fiber sprouting in a model of temporal lobe epilepsy** *EPILEPSIA*
Ingram, E. A., Toyoda, I., Wen, X., Buckmaster, P. S.
2009; 50 (1): 56-64
- **Synaptic input to dentate granule cell basal dendrites in a rat model of temporal lobe epilepsy** *JOURNAL OF COMPARATIVE NEUROLOGY*
Thind, K. K., Ribak, C. E., Buckmaster, P. S.
2008; 509 (2): 190-202
- **Changes in granule cell firing rates precede locally recorded spontaneous seizures by minutes in an animal model of temporal lobe epilepsy** *JOURNAL OF NEUROPHYSIOLOGY*
Bower, M. R., Buckmaster, P. S.
2008; 99 (5): 2431-2442
- **Neuron-specific nuclear antigen NeuN is not detectable in gerbil substantia nigra pars reticulata** *BRAIN RESEARCH*
Kumar, S. S., Buckmaster, P. S.
2007; 1142: 54-60
- **Recurrent circuits in layer II of medial entorhinal cortex in a model of temporal lobe epilepsy** *JOURNAL OF NEUROSCIENCE*
Kumar, S. S., Jin, X., Buckmaster, P. S., Huguenard, J. R.
2007; 27 (6): 1239-1246
- **Hyperexcitability, interneurons, and loss of GABAergic synapses in entorhinal cortex in a model of temporal lobe epilepsy** *JOURNAL OF NEUROSCIENCE*
Kumar, S. S., Buckmaster, P. S.
2006; 26 (17): 4613-4623
- **GABA(A) receptor-mediated IPSCs and alpha 1 subunit expression are not reduced in the substantia nigra pars reticulata of gerbils with inherited epilepsy** *JOURNAL OF NEUROPHYSIOLOGY*
Kumar, S. S., Wen, X. L., Yang, Y. F., Buckmaster, P. S.
2006; 95 (4): 2446-2455
- **Stereological analysis of forebrain regions in kainate-treated epileptic rats** *BRAIN RESEARCH*
Chen, S. Y., Buckmaster, P. S.
2005; 1057 (1-2): 141-152
- **Prolonged infusion of cycloheximide does not block mossy fiber sprouting in a model of temporal lobe epilepsy** *EPILEPSIA*
Toyoda, I., Buckmaster, P. S.
2005; 46 (7): 1017-1020
- **Does a unique type of CA3 pyramidal cell in primates bypass the dentate gate?** *JOURNAL OF NEUROPHYSIOLOGY*
Buckmaster, P. S.
2005; 94 (1): 896-900
- **Laboratory animal models of temporal lobe epilepsy** *COMPARATIVE MEDICINE*

-
- Buckmaster, P. S.
2004; 54 (5): 473-485
- **Recurrent excitation of granule cells with basal dendrites and low interneuron density and inhibitory postsynaptic current frequency in the dentate gyrus of macaque monkeys** *JOURNAL OF COMPARATIVE NEUROLOGY*
Austin, J. E., Buckmaster, P. S.
2004; 476 (3): 205-218
 - **Prolonged infusion of tetrodotoxin does not block mossy fiber sprouting in pilocarpine-treated rats** *EPILEPSIA*
Buckmaster, P. S.
2004; 45 (5): 452-458
 - **Dendritic morphology, local circuitry, and intrinsic electrophysiology of principal neurons in the entorhinal cortex of macaque monkeys** *JOURNAL OF COMPARATIVE NEUROLOGY*
Buckmaster, P. S., Alonso, A., Canfield, D. R., AMARAL, D. G.
2004; 470 (3): 317-329
 - **Reduced inhibition and increased output of layer II neurons in the medial entorhinal cortex in a model of temporal lobe epilepsy** *JOURNAL OF NEUROSCIENCE*
Kobayashi, M., Wen, X. L., Buckmaster, P. S.
2003; 23 (24): 8471-8479
 - **Reduced inhibition of dentate granule cells in a model of temporal lobe epilepsy** *JOURNAL OF NEUROSCIENCE*
Kobayashi, M., Buckmaster, P. S.
2003; 23 (6): 2440-2452
 - **Axon sprouting in a model of temporal lobe epilepsy creates a predominantly excitatory feedback circuit** *JOURNAL OF NEUROSCIENCE*
Buckmaster, P. S., Zhang, G. F., Yamawaki, R.
2002; 22 (15): 6650-6658
 - **Evoked responses of the dentate gyrus during seizures in developing gerbils with inherited epilepsy** *JOURNAL OF NEUROPHYSIOLOGY*
Buckmaster, P. S., Wong, E. H.
2002; 88 (2): 783-793
 - **Axon arbors and synaptic connections of a vulnerable population of interneurons in the dentate gyrus in vivo** *JOURNAL OF COMPARATIVE NEUROLOGY*
Buckmaster, P. S., Yamawaki, R., Zhang, G. F.
2002; 445 (4): 360-373
 - **BDNF overexpression increases dendrite complexity in hippocampal dentate gyrus** *NEUROSCIENCE*
Tolwani, R. J., Buckmaster, P. S., Varma, S., Cosgaya, J. M., Wu, Y., Suri, C., Shooter, E. M.
2002; 114 (3): 795-805
 - **Heightened seizure severity in somatostatin knockout mice** *EPILEPSY RESEARCH*
Buckmaster, P. S., Otero-Corchon, V., Rubinstein, M., Low, M. J.
2002; 48 (1-2): 43-56
 - **Absence of temporal lobe epilepsy pathology in dogs with medically intractable epilepsy** *JOURNAL OF VETERINARY INTERNAL MEDICINE*
Buckmaster, P. S., Smith, M. O., Buckmaster, C. L., LeCouteur, R. A., Dudek, F. E.
2002; 16 (1): 95-99
 - **Intracellular recording and labeling of mossy cells and proximal CA3 pyramidal cells in macaque monkeys** *JOURNAL OF COMPARATIVE NEUROLOGY*
Buckmaster, P. S., Amaral, D. G.
2001; 430 (2): 264-281
 - **Somatostatin-immunoreactive interneurons contribute to lateral inhibitory circuits in the dentate gyrus of control and epileptic rats** *HIPPOCAMPUS*
Boyett, J. M., Buckmaster, P. S.
2001; 11 (4): 418-422
 - **Testing the disinhibition hypothesis of epileptogenesis in vivo and during spontaneous seizures** *JOURNAL OF NEUROSCIENCE*
Buckmaster, P. S., Jongen-Relo, A. L., Davari, S. B., Wong, E. H.
2000; 20 (16): 6232-6240

- **Highly specific neuron loss preserves lateral inhibitory circuits in the dentate gyrus of kainate-induced epileptic rats** *JOURNAL OF NEUROSCIENCE*
Buckmaster, P. S., Jongen-Reelo, A. L.
1999; 19 (21): 9519-9529
- **Neuron loss and axon reorganization in the dentate gyrus of cats infected with the feline immunodeficiency virus** *JOURNAL OF COMPARATIVE NEUROLOGY*
Mitchell, T. W., Buckmaster, P. S., Hoover, E. A., Whalen, L. R., Dudek, F. E.
1999; 411 (4): 563-577
- **In vivo intracellular analysis of granule cell axon reorganization in epileptic rats** *JOURNAL OF NEUROPHYSIOLOGY*
Buckmaster, P. S., Dudek, F. E.
1999; 81 (2): 712-721
- **Recurrent spontaneous motor seizures after repeated low-dose systemic treatment with kainate: assessment of a rat model of temporal lobe epilepsy** *EPILEPSY RESEARCH*
Hellier, J. L., Patrylo, P. R., Buckmaster, P. S., Dudek, F. E.
1998; 31 (1): 73-84
- **Axonal sprouting in hippocampus of cats infected with feline immunodeficiency virus (FIV)** *JOURNAL OF ACQUIRED IMMUNE DEFICIENCY SYNDROMES*
Mitchell, T. W., Buckmaster, P. S., Hoover, E. A., Whalen, L. R., Dudek, F. E.
1998; 17 (1): 1-8
- **Neuron loss, granule cell axon reorganization, and functional changes in the dentate gyrus of epileptic kainate-treated rats** *JOURNAL OF COMPARATIVE NEUROLOGY*
Buckmaster, P. S., Dudek, F. E.
1997; 385 (3): 385-404
- **Network properties of the dentate gyrus in epileptic rats with hilar neuron loss and granule cell axon reorganization** *JOURNAL OF NEUROPHYSIOLOGY*
Buckmaster, P. S., Dudek, F. E.
1997; 77 (5): 2685-2696
- **Ultrastructural localization of neurotransmitter immunoreactivity in mossy cell axons and their synaptic targets in the rat dentate gyrus** *HIPPOCAMPUS*
Wenzel, H. J., Buckmaster, P. S., Anderson, N. L., Wenzel, M. E., Schwartzkroin, P. A.
1997; 7 (5): 559-570
- **Electrophysiological correlates of seizure sensitivity in the dentate gyrus of epileptic juvenile and adult gerbils** *JOURNAL OF NEUROPHYSIOLOGY*
Buckmaster, P. S., Tam, E., Schwartzkroin, P. A.
1996; 76 (4): 2169-2180
- **Axon arbors and synaptic connections of hippocampal mossy cells in the rat in vivo** *JOURNAL OF COMPARATIVE NEUROLOGY*
Buckmaster, P. S., Wenzel, H. J., Kunkel, D. D., Schwartzkroin, P. A.
1996; 366 (2): 270-292
- **Possible mechanisms of seizure-related cell damage in the dentate hilus.** *Epilepsy research. Supplement*
Schwartzkroin, P. A., Buckmaster, P. S., Strowbridge, B. W., Kunkel, D. D., Owens, J., Pokorný, J.
1996; 12: 317-324
- **Neurobiology of hippocampal interneurons: A workshop review** *HIPPOCAMPUS*
Buckmaster, P. S., Soltesz, I.
1996; 6 (3): 330-339
- **Physiological and morphological heterogeneity of dentate gyrus-hilus interneurons in the gerbil hippocampus in vivo.** *European journal of neuroscience*
Buckmaster, P. S., Schwartzkroin, P. A.
1995; 7 (10): 1393-1402
- **PHYSIOLOGICAL AND MORPHOLOGICAL HETEROGENEITY OF DENTATE GYRUS-HILUS INTERNEURONS IN THE GERBIL HIPPOCAMPUS IN-VIVO** *EUROPEAN JOURNAL OF NEUROSCIENCE*
Buckmaster, P. S., Schwartzkroin, P. A.
1995; 7 (6): 1393-1402

- **INTERNEURONS AND INHIBITION IN THE DENTATE GYRUS OF THE RAT IN-VIVO** *JOURNAL OF NEUROSCIENCE*
Buckmaster, P. S., Schwartzkroin, P. A.
1995; 15 (1): 774-789
- **HIPPOCAMPAL MOSSY CELL-FUNCTION - A SPECULATIVE VIEW** *HIPPOCAMPUS*
Buckmaster, P. S., Schwartzkroin, P. A.
1994; 4 (4): 393-402
- **HYPEREXCITABILITY IN THE DENTATE GYRUS OF THE EPILEPTIC MONGOLIAN GERBIL** *EPILEPSY RESEARCH*
Buckmaster, P. S., Schwartzkroin, P. A.
1994; 18 (1): 23-28
- **SOMATOSTATIN-IMMUNOREACTIVITY IN THE HIPPOCAMPUS OF MOUSE, RAT, GUINEA-PIG, AND RABBIT** *HIPPOCAMPUS*
Buckmaster, P. S., Kunkel, D. D., Robbins, R. J., Schwartzkroin, P. A.
1994; 4 (2): 167-180
- **A COMPARISON OF RAT HIPPOCAMPAL MOSSY CELLS AND CA3C PYRAMIDAL CELLS** *JOURNAL OF NEUROPHYSIOLOGY*
Buckmaster, P. S., Strowbridge, B. W., Schwartzkroin, P. A.
1993; 70 (4): 1281-1299
- **BRAIN-STEM AUDITORY EVOKED-POTENTIAL INTERWAVE INTERVALS ARE PROLONGED IN VITAMIN-B6-DEFICIENT CATS** *JOURNAL OF NUTRITION*
Buckmaster, P. S., Holliday, T. A., Bai, S. C., Rogers, Q. R.
1993; 123 (1): 20-26
- **MOSSY CELL AXONAL PROJECTIONS TO THE DENTATE GYRUS MOLECULAR LAYER IN THE RAT HIPPOCAMPAL SLICE** *HIPPOCAMPUS*
Buckmaster, P. S., Strowbridge, B. W., Kunkel, D. D., SCHMIEGE, D. L., Schwartzkroin, P. A.
1992; 2 (4): 349-362
- **POTENTIATION OF SPONTANEOUS SYNAPTIC ACTIVITY IN RAT MOSSY CELLS** *NEUROSCIENCE LETTERS*
Strowbridge, B. W., Buckmaster, P. S., Schwartzkroin, P. A.
1992; 142 (2): 205-210
- **FASTIGIAL NUCLEUS ACTIVITY IN THE ALERT MONKEY DURING SLOW EYE AND HEAD MOVEMENTS** *JOURNAL OF NEUROPHYSIOLOGY*
Buttner, U., FUCHS, A. F., MARKERTSCHWAB, G., Buckmaster, P.
1991; 65 (6): 1360-1371