

## CURRICULUM VITAE

Rennolds S Ostrom, Ph.D.

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### EDUCATION

- 1986 to 1990 **Dartmouth College**, Hanover, NH 03755.  
BA, Biology, 1990.
- 1993 to 1998 **University of California, Irvine**, Irvine, CA 92697.  
Ph.D., Pharmacology and Toxicology, 1998.

### PROFESSIONAL

- 2016 to present **Professor**. Chapman University School of Pharmacy, Department of Biomedical and Pharmaceutical Sciences.
- 2009 to 2016 **Associate Professor**. University of Tennessee Health Science Center, Department of Pharmacology.
- 2011 to 2016 **Program Director**, Integrated Biological Sciences Graduate Program. University of Tennessee Health Science Center.
- 2003 to 2009 **Assistant Professor**. University of Tennessee Health Science Center, Department of Pharmacology.
- 2006 to 2016 **Associate Graduate Faculty**. The University of Memphis, Department of Biomedical Engineering.
- 2001 to 2003 **Assistant Project Pharmacologist** (research track faculty), University of California, San Diego, Department of Pharmacology.
- 1998 to 2001 **Postdoctoral fellow**, laboratory of *Paul A. Insel, M.D.* University of California, San Diego, Dept. of Pharmacology. Molecular pharmacology and signal transduction of G protein-coupled receptors (adrenergic and purinergic receptors).
- 1993 to 1998 **Graduate Student**, laboratory of *Frederick J. Ehlert, Ph.D.* University of California, Irvine, Dept. of Pharmacology. Investigation of muscarinic receptor subtypes and their biochemical signaling pathways and responses in airway and gastrointestinal smooth muscle.
- 1991 to 1993 **Research Associate**, Behavioral Pharmacology Group. CoCensys, Inc., Irvine, CA. *In vivo* screening of novel compounds for anticonvulsant, anxiolytic and sedative-hypnotic activity. Behavioral, toxicological and pharmacokinetic studies for the filing of two IND applications.
- 1990 to 1991 **Research Technician**, laboratory of *Kelvin W. Gee, Ph.D.* University of Southern California, School of Pharmacy. *In vitro* binding and *in vivo* behavioral studies investigating neurosteroids that modulate the GABA<sub>A</sub> receptor complex.

### HONORS/AWARDS

- IUPHAR Young Scientist Award, 2002.
- Young Scientist Travel Award, International Symposium on Vascular Neuroeffector Mechanisms, 2002
- American Heart Assoc. Louis and Arnold Katz Basic Science Research Prize finalist, 2001.
- International Society Of Hypertension Young Investigator Travel Award, 2000.
- American Society For Biochemistry And Molecular Biology Travel Award, 2000.
- American Physiological Society's Caroline Tum Suden/Frances Hellebrandt Award, 2000.
- American Society For Pharmacology and Experimental Therapeutics Travel Award, 1999.
- Henry J. Elliott Award for Outstanding Pharmacology Graduate Student, 1996-1997.

### PROFESSIONAL ASSOCIATIONS

- American Society for Pharmacology and Experimental Therapeutics, since 1998.
- International Union of Pharmacology (IUPHAR), since 1998.

American Heart Association, Basic Cardiovascular Science Council, since 1999.  
American Physiological Society, since 2000.  
Alliance for Cell Signaling, since 2001.  
American Society for Biochemistry and Molecular Biology, 2004-2009.

## **FUNDING**

### **Current:**

Molecular signal transduction of cAMP compartments.  
NIH (R01 GM107094) \$280,994/yr 1/1/2015-12/31/2018  
Role: PI

Major Goals: This project will define the cAMP signaling compartments in a model cell based on unique response of different pools centered on AC isoforms. Overexpression of individual AC's define these compartments. The AKAP and PDE isoforms involved in maintaining these compartments will be characterized via knockdown approaches.

Defining cAMP signaling compartmentation.

American Heart Association (14GRNT20380762) \$75,000/yr 7/1/2014-6/30/2016  
Role: PI

Major Goals: This project will define the cAMP signaling compartments in a model cell using quantitative phosphoproteomics. By manipulating AC expression the signaling of these compartments can be altered such that the downstream signaling proteins responsive to each compartment can be defined.

### **Completed:**

Adenylyl cyclases in airway and GI smooth muscle.  
NIH (R01 HL079166) \$225,000 01/01/06-12/31/11  
Role: PI

Major Goals: This proposal studied the role of cAMP signaling microdomains in airway smooth muscle.  $\beta$ -adrenergic receptors appear capable of moving between different domains to initiate complex signaling events that can regulated distinct responses. These domains are established, in part, by lipid raft and non-raft localized adenylyl cyclase isoforms, which we show can regulate disparate cellular responses.

Adenylyl cyclase as a regulator of cardiac fibrosis.

NIH (R01 HL071781) \$150,000 09/01/03-08/31/08  
Role: PI

Major Goals: This project was designed to examine the signaling and compartmentation of adenylyl cyclase isoforms and G protein-coupled receptors in cardiac fibroblasts and to overexpress 3 different isoforms of adenylyl cyclase with a fibroblast-specific promoter to determine if increased cAMP generation will reduce cardiac fibrosis in an animal model of cardiac hypertrophy.

Localization and function of adenylyl cyclases in lipid rafts.

American Heart Association (0555291B) \$70,000 07/01/05-06/30/07  
Role: PI

Major Goals: This proposal sought to define the mechanism(s) by which adenylyl cyclase isoforms target to lipid rafts by creating chimeric proteins from a lipid raft localized isoform, AC6, and a non-raft localized isoform, AC4 then to express a non-raft version of AC6 in cardiac myocytes.

Molecular Physiology of Heart Failure – Project 4: Adenylyl cyclase regulation and heart failure.

NIH (P50 HL53773,) \$74,015 07/01/02-06/30/03

Role: Project Leader, project PI Kenneth Chien (University of California, San Diego)

Major goals: In this SCORE, the lab studies the role of adenylyl cyclase type IV as a possible treatment for experimental heart failure primarily using animal models and studies with rat cardiac myocytes. Co-investigator on this project was Dr. H. Kirk Hammond.

The mechanism of 11-178 activation of adenylyl cyclase activity.

Dynavax, Inc. \$29,000 04/01/02-12/31/02

Role: PI

Major Goals: This industry contract was directed at determining the signaling mechanism through which a proprietary lead compound, 11-178, increased cAMP levels in specific cell types.

## PUBLICATIONS

### Original Manuscripts

1. Bin Wang, Yu Liu, Lianyan Huang, Ruishan Wang, Jing Jing Li, Young-Don Kwak, Shiyong Diao, Yupin Chen, Jianjun Chen, Eunhee Kim, Carles Justicia, Dehna M. Fong, Deborah Young, Kazuko Sakata, Hao Chen, Anna Planas, Rennolds S Ostrom, Wei Li, Guang Yang, William E. Armstrong, Michael P. McDonald, Ruihong Chen, Detlef Heck & Francesca-Fang Liao. A CNS-permeable Hsp90 inhibitor rescues synaptic dysfunction and memory loss in Alzheimer's mice via an HSF1-mediated mechanism. *Molecular Psychiatry*, in press.
2. Rennolds S Ostrom. A two pronged weapon in the fight against fibrosis, Focus on "Inhibition of Wnt/ $\beta$ -Catenin Signaling Promotes Epithelial Differentiation of Mesenchymal Stem Cells and Repairs Bleomycin-induced Lung Injury." *Am J Physiol, Cell Physiol*, 307(3):C232-3, 2014.
3. Rennolds S Ostrom. A new molecular target for blunting organ fibrosis Focus on "Secreted Frizzled-related protein 2 (sFRP2) as a target in anti-fibrotic therapeutic intervention." *Am J Physiol, Cell Physiol*, 306(6):C527-8, 2014.
4. Amy S. Bogard, Anna V. Birg and Rennolds S Ostrom. Non-raft AC2 defines a cAMP signaling compartment that selectively regulates IL-6 expression in airway smooth muscle cells. *Naunyn-Schmiedeberg's Arch Pharmacol*, 387(4):329-39, 2014.
5. Wei Cai, Kuan Feng, Min Jin, Xiaonan Zhao, Liu Qian, Rennolds S. Ostrom and Congfeng Xu. Adenylyl cyclase 6 activation negatively regulates TLR4 signaling through lipid raft-mediated endocytosis. *J Immunology*, 191(12):6093-100, 2013.
6. Jason M. Conley, Cameron S. Brand, Amy S. Bogard, Evan P. S. Pratt, Ruqiang Xu, Gregory H. Hockerman, Rennolds S. Ostrom, Carmen W. Dessauer and Val J. Watts. Development of a high-throughput screening paradigm for the discovery of small molecule modulators of adenylyl cyclase: Identification of an adenylyl cyclase 2 inhibitor. *J Pharmacol Exp Thera*, 347(2):276-87, 2013.
7. Amy S. Bogard, Piyatilake Adris and Rennolds S Ostrom. Adenylyl cyclase 2 (AC2) selectively couples to EP<sub>2</sub> receptors while adenylyl cyclase 3 (AC3) is not receptor regulated in airway smooth muscle. *J Pharmacol Exp Thera*, 342(2):586-95, 2012.
8. Radomir M. Slominski, Russel J. Reiter, Natalia Schlabritz-Loutsevitch, Rennolds S Ostrom and Andrzej T. Slominski. Melatonin Membrane Receptors in Peripheral Tissues: Distribution and Functions. *Mol Cell Endocrin*, 351:152-166, 2012.
9. Rennolds S Ostrom, Amy S. Bogard, Robert Gros and Ross D. Feldman. Choreographing the adenylyl cyclase signalosome: sorting out the partners and the steps. *Naunyn-Schmiedeberg's Arch Pharmacol*, 385(1):5-12, 2012.
10. Amy S. Bogard, Congfeng Xu and Rennolds S Ostrom. Human bronchial smooth muscle cells express adenylyl cyclase isoforms 2, 4 and 6 in distinct membrane microdomains. *J Pharmacol Exp Thera*, 337(1):209-17, 2011.
11. Kirk J. Pak, Rennolds S Ostrom, Minoru Matsui and Frederick J Ehlert. The M<sub>2</sub> muscarinic receptor inhibits the development of streptozotocin-induced neuropathy of mouse urinary bladder. *J Pharmacol Exp Thera*, 335(1):239-2489, 2010.

12. Xiaoqiu Liu, Fengying Li, Shu Qiang Sun, Muthusamy Thangavel, Joseph Kaminsky, Louisa Balazs and Rennolds S Ostrom. Fibroblast specific expression of AC6 enhances  $\beta$ -adrenergic and prostacyclin signaling and blunts bleomycin-induced pulmonary fibrosis. *Am J Physiol, Lung Cell Mol Physiol*, 298(6):L819-29, 2010.
13. Kirk J. Pak, Rennolds S Ostrom, Minoru Matsui and Frederick J Ehlert. Impaired M<sub>3</sub> and enhanced M<sub>w</sub> muscarinic receptor contractile function in a streptozotocin model of mouse diabetic urinary bladder. *Naunyn-Schmiedebergs Arch Pharmacol*, 381(5):441-54, 2010.
14. Michael T. Griffin, Minoru Matsui, Rennolds S Ostrom and Frederick J. Ehlert. The guinea pig ileum lacks the direct, high-potency, M<sub>2</sub>-muscarinic, contractile mechanism of the mouse ileum. *Naunyn-Schmiedebergs Arch Pharmacol*, 380(4):327-35, 2009
15. Congfeng Xu, Yanhui H. Zhang, Muthusamy Thangavel, Mekel Richardson, Li Liu, Bin Zhou, Yi Zheng, Rennolds S Ostrom and Xin A. Zhang. CD82 endocytosis reveals cholesterol-dependent reorganization of tetraspanin-enriched microdomains and lipid rafts. *FASEB J*, 23(10):3273-88, 2009.
16. Muthusamy Thangavel, Xiaoqiu Liu, Shu Qiang Sun, Joseph Kaminsky and Rennolds S Ostrom. The C1 and C2 domains target human type 6 adenylyl cyclase to lipid rafts and caveolae. *Cellular Signalling*, 21(2):301-8, 2009.
17. Hemal Patel and Rennolds S Ostrom. An orphan GPCR finds a home in the heart. Focus on “Myocardial expression, signaling and function of GPR22; a protective role for an orphan G protein-coupled receptor” *Am J Physiol, Heart Circ Physiol*, 295(2):H479-81, 2008.
18. Xiaoqiu Liu, Muthusamy Thangavel, Shu Qiang Sun, Joseph Kaminsky, Penden Mahautmr, Jeremiah Stitham, John Hwa and Rennolds S Ostrom. Adenylyl cyclase type 6 overexpression selectively enhances  $\beta$ -adrenergic and prostacyclin receptor mediated inhibition of rat cardiac fibroblast function due to co-localization in lipid rafts. *Naunyn-Schmiedebergs Arch Pharmacol*, 377(4-6):359-69, 2008.
19. Rennolds S Ostrom and Xiaoqiu Liu. Detergent and detergent-free methods to define lipid rafts and caveolae. *Methods Mol Biol*, 400:459-68, 2007.
20. Rennolds S Ostrom. Caveolin-2. *Alliance for Cell Signaling - Nature Molecule Pages*, DOI:10.1038/mp.a000521.01, 2006.
21. Xiaoqiu Liu, Shu Qiang Sun, Aviv Hassid and Rennolds S Ostrom. cAMP inhibits TGF- $\beta$ -stimulated collagen synthesis via inhibition of ERK1/2 and Smad signaling in rat cardiac fibroblasts. *Mol Pharmacol*, 70:1992-2003, 2006.
22. Rennolds S. Ostrom and Paul A. Insel. Methods for the study of signaling molecules in membrane lipid rafts and caveolae. *Methods Mol Biol*, 332:181-91, 2006.
23. Xiaoqiu Liu, Shu Qiang Sun and Rennolds S Ostrom. Fibrotic lung fibroblasts show blunted inhibition by cAMP due to deficient cAMP response element-binding protein phosphorylation.. *J Pharmacol Exp Thera*, 315(2):678-87, 2005.
24. Paul A. Insel, Brian P. Head, Rennolds S Ostrom, Hemal H. Patel, James S. Swaney, Chih-Min Tang and David M. Roth. Caveolae and lipid rafts: G protein-coupled receptor signaling microdomains in cardiac myocytes. *Ann N Y Acad Sci*, 1047:166-172, 2005.
25. Rennolds S Ostrom. Caveolins muscle their way into the regulation of cell differentiation, development and function. Focus on “Muscle-specific interaction of caveolin isoforms (Cav-1, Cav-2 and Cav-3): Differential complex formation between caveolins in fibroblastic versus muscle cells.” *Am J Physiol, Cell Physiol*, 288(3):C507-9, 2005.
26. Rennolds S Ostrom and Paul A. Insel. The evolving role of lipid rafts and caveolae in G protein-coupled receptor signaling: Implications for molecular pharmacology. *Brit J Pharmacol*, 143:235-245, 2004.

27. Rennolds S Ostrom, Richard A. Bunday and Paul A. Insel. Nitric oxide inhibition of adenylyl cyclase type 6 activity is dependent upon lipid rafts and caveolin signaling complexes. *J Biol Chem*, 279(19): 19846-53, 2004.
28. Xiaoqiu Liu, Rennolds S Ostrom and Paul A. Insel. Cyclic AMP-elevating agents and adenylyl cyclase overexpression promote an anti-fibrotic phenotype in pulmonary fibroblasts. *Am J Physiol, Cell Physiol*, 86(5):C1089-99, 2004.
29. Rennolds S Ostrom, Jennifer E. Naugle, Miki Hase, Caroline Gregorian, James S. Swaney, Paul A. Insel, Laurence L. Brunton and J. Gary Meszaros. Angiotensin II enhances adenylyl cyclase signaling via Ca<sup>2+</sup>/calmodulin. Gq-Gs cross-talk regulates collagen production in cardiac fibroblasts. *J Biol Chem*, 278(27):24461-8, 2003.
30. William H. Loomis, Sachiko Namiki, Rennolds S Ostrom, Paul A. Insel, Wolfgang G. Junger. Hypertonic stress co-stimulates T cell IL-2 expression through a feedback mechanism involving ATP release and P<sub>2</sub> receptor activation of p38 MAP kinase. *J Biol Chem*, 278(7):4590-6, 2003.
31. Paul A. Insel and Rennolds S Ostrom. Forskolin as a tool for examining adenylyl cyclase expression, regulation and G protein signaling. *Cell Mol Neurobiol*, 23(3):305-14, 2003.
32. Rennolds S Ostrom, Brinda K. Rana and Paul A. Insel. Stoichiometry of G Protein-coupled Receptor Signaling: Implications in the Genomic Era. *Pharmaceutical News*, 9:295-303, 2003.
33. Rennolds S Ostrom, Xiaoqiu Liu, Brian P. Head, Caroline Gregorian, Tammy M. Seasholtz and Paul A. Insel. Localization of adenylyl cyclase isoforms and G protein-coupled receptors in vascular smooth muscle cells: expression in caveolin-rich and non-caveolin domains. *Mol Pharmacol*, 62(4):983-92, 2002.
34. Rennolds S Ostrom. New determinants of receptor-effector coupling: trafficking and compartmentation in membrane microdomains. *Mol Pharmacol*, 61(3):473-6, 2002.
35. Rennolds S Ostrom, Caroline Gregorian, Ryan M. Drenan, Yang Xiang, John W. Regan and Paul A. Insel. Receptor number and caveolar co-localization determine receptor coupling efficiency to adenylyl cyclase. *J Biol Chem*, 276:42063-9, 2001.
36. Bin Zheng, Yong-Chao Ma, Rennolds S Ostrom, Christine Lavoie, Gordon N. Gill, Paul A. Insel, Xin-Yun Huang and Marilyn G. Farquhar. RGS-PX1, GAP for G<sub>αs</sub> and a sorting nexin in vesicular trafficking. *Science*, 294:1939-42, 2001.
37. Rennolds S Ostrom, Caroline Gregorian, Ryan M. Drenan, Kathryn Gabot, Brinda K. Rana and Paul A. Insel. Key role for constitutive cyclooxygenase type 2 of MDCK cells in basal signaling and response to released ATP. *Am J Physiol Cell Physiol*, 281:C524-31, 2001.
38. Rennolds S Ostrom and Paul A. Insel. Adenylyl cyclase type 3. Nature - Alliance for Cell Signaling molecule page (peer reviewed), 2001. <http://www.signaling-gateway.org>
39. Rennolds S Ostrom. Caveolin-2. Nature - Alliance for Cell Signaling molecule page (peer reviewed), 2001. <http://www.signaling-gateway.org>
40. Paul A. Insel, Rennolds S Ostrom, Martin C. Michel and Rainer Büscher. α<sub>1</sub>-adrenergic receptors of MDCK-D<sub>1</sub> cells utilize multiple signaling components. *Proceedings of the Ninth International Catecholamine Society*, 2001.
41. Paul A. Insel, Rennolds S Ostrom, Alexander C. Zambon, Richard J. Hughes, Maria A. Balboa, Darakhshanda Shehnaz, Caroline Gregorian, Brian Torres, Bonnie Firestein, Mingzhao Xing, Steven Post. P<sub>2</sub>Y receptors in MDCK cells: epithelial cell regulation by extracellular nucleotides. *Clin Exp Pharmacol Physiol*, 28: 351-4, 2001.
42. Rennolds S Ostrom, Caroline Gregorian and Paul A. Insel. Cellular release of and response to ATP as key determinants of the set-point of signal transduction pathways. *J Biol Chem*, 275 (16):11735-739, 2000.

43. Rennolds S Ostrom, Jon Violin, Scott Coleman and Paul A. Insel. Selective enhancement of  $\beta$ -adrenergic receptor signaling by overexpression of adenylyl cyclase 6: co-localization of receptor and adenylyl cyclase in caveolae of cardiac myocytes. *Mol Pharmacol*, 57:1075-1079, 2000.
44. Rennolds S Ostrom, Steven R. Post and Paul A. Insel. Stoichiometry and compartmentation in G protein-coupled receptor signaling: implications for therapeutic interventions involving Gs. *J Pharmacol Exp Thera*, 294:407-412, 2000.
45. Rennolds S Ostrom and Paul A. Insel. Compartmentation of signal transduction pathways in caveolae. *Science and Medicine*, February/March:44-54, 2000.
46. Steven R. Post, Rennolds S Ostrom and Paul A. Insel. Biochemical methods for detection and measurement of cyclic AMP and adenylyl cyclase activity. *Methods in Molecular Biology*, 126:363-74, 2000.
47. Mingzhao Xing, Steven R. Post, Rennolds S Ostrom, Michael Samardzija and Paul A. Insel. Inhibition of cPLA<sub>2</sub>-mediated arachidonic acid release by cyclic AMP defines a negative feedback loop for P2Y-receptor activation in MDCK-D<sub>1</sub> cells. *J Biol Chem*, 274:10035-10038, 1999.
48. Rennolds S Ostrom and Paul A. Insel. Editorial. Caveolar microdomains of the sarcolemma: compartmentation of signaling molecules comes of age. *Circ Res*, 84:110-112, 1999.
49. Rennolds S Ostrom and Frederick J. Ehlert. Differential roles of the M<sub>2</sub> and M<sub>3</sub> muscarinic receptors in the functional antagonism of isoproterenol in guinea pig ileum and trachea. *J Pharmacol Exp Thera*, 288:969-976, 1999.
50. Rennolds S Ostrom and Frederick J. Ehlert. M<sub>2</sub> muscarinic receptors inhibit forskolin- but not isoproterenol-mediated relaxation in bovine trachea. *J Pharmacol Exp Thera*, 286:234-242, 1998.
51. Frederick J. Ehlert, Rennolds S Ostrom and Gregory W. Sawyer. Subtypes of the muscarinic receptor in smooth muscle. *Life Sciences*, 61(18): 1729-1740, 1997.
52. Rennolds S Ostrom and Frederick J. Ehlert. M<sub>2</sub> muscarinic receptor inhibition of agonist-induced cyclic adenosine monophosphate accumulation and relaxation in the guinea pig ileum. *J Pharmacol Exp Thera*, 280:189-199, 1997.

### **Dissertation**

Functional antagonism of relaxant effects by M<sub>2</sub> muscarinic acetylcholine receptors in smooth muscle. University of California, Irvine, 1998.

### **Published Abstracts (selected from more than 60)**

1. KM Hill, F Li, AS Bogard and RS Ostrom. The IBMX-insensitive PDE8A is expressed in human airway smooth muscle cells and selectively regulates signaling through AC6. *FASEB J*, 2016.
2. K Miyashiro, SR Agarwal, H Latt, RS Ostrom and RD Harvey. Compartmentalized cAMP response to EP2 receptor activation in human airway smooth muscle cells. *FASEB J*, 2016.
3. ML Toews, NA Schulte, RS Ostrom, SI Rennard. Specificity and Mechanisms for Induction of PDE4 Up-Regulation by PGE<sub>2</sub> and Related Agents in Lung Fibroblasts. *FASEB J*, 2016.
4. J Reedus, C Shelton, T Sweatman, RS Ostrom and S Phelps. Survey of Student Pharmacist Perceptions of an Interactive Pharmacology Simulation Session. *Am Col Clin Pharm*, 2015.
5. ML Toews, NA Schulte, Y Tu, JC. Meyer, JM Michalski, RS Ostrom, X Liu, and SI Rennard. PGE<sub>2</sub> Up-Regulates PDE4 Enzyme Activity to Induce a PGE-Selective Desensitization of cAMP Accumulation in Lung Fibroblasts. *Am Thoracic Soc*, 2015.
6. A Bogard and RS Ostrom. Non-raft AC2 defines a cAMP signaling compartment that selectively regulates IL-6 expression in airway smooth muscle cells. *FASEB J*, 2013.

7. A Bogard, JM Elam and RS Ostrom. Adenylyl cyclase 6 defines a distinct compartment that increases somaostatin expression by airway smooth muscle cells. *FASEB J*, 2012.
8. A Bogard and RS Ostrom.  $\beta$ -adrenergic receptors stimulate IL-6 production in human bronchial smooth muscle cells: enhancement by non-raft AC2 but not lipid raft AC6. *FASEB J*, 2011.
9. T Muthusamy, P Adris and RS Ostrom. Localization and coupling of adenylyl cyclase isoforms 2, 3 and 6 with G protein-coupled receptors in mouse bronchial smooth muscle cells. *FASEB J*, 2009.
10. X Liu, F Li and RS Ostrom. Fibroblast-specific expression of adenylyl cyclase 6 reduces myofibroblast differentiation and protects against bleomycin-induced pulmonary fibrosis. *FASEB J*, 2008.
11. M Thangavel, X Liu and RS Ostrom. Proteomic analysis detects cytoskeletal-related proteins that interact with the intracellular C1 domain of adenylyl cyclase 6. *FASEB J*, 2008.
12. M Thangavel, X Liu and RS Ostrom. The proximal segments of the cytosolic domain of adenylyl cyclase type 6 localize to plasma membrane lipid rafts and caveolae. *FASEB J*, 2007.
13. R Reece, X Liu, SQ Sun, FJ Ehlert and RS Ostrom. Expression and localization of adenylyl cyclases and G protein receptors in guinea pig ileum caveolae and lipid rafts. *FASEB J*, 2007.
14. X Liu, S Sun and RS Ostrom. TGF $\beta$  Signaling via ERK1/2 and Smad is Inhibited by cAMP-Elevating Agents in Rat Cardiac Fibroblasts. *FASEB J*, 2006.
15. X Liu, S Sun, T. Muthusamy and RS Ostrom. C1 and C2 Domains of Human Adenylyl Cyclase 6 are Targeted to Lipid Rafts and Caveolae. *FASEB J*, 2006.
16. X Liu, S Sun and RS Ostrom. Palmitoylation at Cys 1145 in the Carboxyl Terminus of Human Type 6 Adenylyl Cyclase is Not Required for Targeting to Lipid Rafts and Caveolae. *FASEB J*, 2006.
17. X Liu, S Sun and RS Ostrom. Fibrotic pulmonary fibroblasts show blunted inhibition by cAMP-elevating agents due to decreased CREB phosphorylation. *FASEB J*, 2005.
18. X Liu, S Sun and RS Ostrom. cAMP-elevating agents inhibit collagen synthesis and myofibroblast differentiation via inhibition of SMAD3/4- and STAT5/6-mediated transcription in rat cardiac fibroblasts. *FASEB J*, 2005.
19. X Liu, JE Naugle, S Sun, JG Meszaros and RS Ostrom. cAMP-elevating agents inhibit activation of mouse cardiac fibroblasts. *FASEB J*, 2005.
20. X Liu, PA Insel, RS Ostrom. Decreased sensitivity of fibroblasts cultured from human fibrotic lung to cAMP-mediated inhibition of cell proliferation and collagen synthesis. *FASEB J*, 18(5), 2004.
21. RS Ostrom, J Deckenback, M Hase, PA Insel. Nitric oxide inhibition of cyclic AMP formation is dependant upon lipid rafts and caveolin signaling complexes. *Circulation*, 108(17): IV-206, 2003.
22. RS Ostrom, M Hase, FJ Ehlert, C Gregorian. Overexpression of adenylyl cyclase 6 localizes in caveolae and selectively enhances  $\beta$ -adrenergic receptor relaxation in airway smooth muscle. *FASEB J*, 17(5): A36, 2003.
23. JS Swaney, DM Roth, M Hase, PA Insel and RS Ostrom. Overexpression of adenylyl cyclase attenuates extracellular matrix production by cardiac fibroblasts. *FASEB J*, 17(5): A1042, 2003.
24. X Liu, PA Insel and RS Ostrom. EP<sub>2</sub>, EP<sub>4</sub> and IP receptors are expressed in pulmonary fibroblasts and mediate inhibition of cell proliferation and collagen synthesis. *FASEB J*, 17(5): A90, 2003.
25. RS Ostrom, M Hase, PA Insel. Inhibition of adenylyl cyclase activity by nitric oxide in cardiac myocyte caveolae. *Circulation*, abstract ID#114982, 2002.
26. BP Head, RS Ostrom, AN Ander, DM Roth, PA Insel. Caveolar microdomains concentrate signal transduction of  $\beta_1$ -adrenergic receptors, but not  $\beta_2$ -adrenergic receptors in adult rat cardiac myocytes. *Circulation*, abstract ID#115796, 2002.

27. RS Ostrom, C Gregorian, RM Drenan, A Gustafsson, LL Brunton, MP Printz, PA Insel. Cardiac fibroblasts express seven isoforms of adenylyl cyclase but only AC3 and AC5/6 localize in caveolin-rich membrane fractions. *FASEB J*, 16(5):A1160, 2002.
28. RS Ostrom, X Liu, C Gregorian, RM Drenan TM Seasholtz, PA Insel. Cell-specific compartmentation of adenylyl cyclase regulation in cardiomyocytes and vascular smooth muscle cells. *Circulation*, 104(17) II-7, 2001.
29. RS Ostrom, C Gregorian, SS McDaniel, JX Yuan, PA Insel. Adenylyl cyclase isoform expression and receptor coupling in human pulmonary artery smooth muscle cells. *Circulation*, 104(17) II-144, 2001.
30. RS Ostrom, RM Drenan, C Gregorian and PA Insel. P2Y<sub>2</sub> receptor-mediated activation of cytosolic PLA<sub>2</sub> at the nuclear membrane: signaling into then out of caveolae. *FASEB J*, 15(4): A218, 2001.
31. RS Ostrom, BK Rana, C Gregorian, JG Meszaros, LL Brunton, MP Printz and PA Insel. Adenylyl cyclase in cardiac fibroblasts: activation of adenylyl cyclase-6 by  $\beta$ -adrenergic receptors. *Circulation*, 102(18) II-116, 2000.
32. RS Ostrom, C Gregorian and PA Insel. ATP release as an autocrine/paracrine regulator of renal epithelial cell function. *J Hypertension*, suppl. 2000.
33. RS Ostrom, K Gabot and PA Insel. Overexpression of adenylyl cyclase type VI enhances  $\beta$ -adrenergic cAMP production in cardiac myocytes without blunting inhibition by carbachol and endothelin. *Circulation*, 100(18):I-488, 1999.
34. RS Ostrom and PA Insel. Selective effects of overexpression of adenylyl cyclase type VI in cardiac myocytes and fibroblasts. *J Mol Cell Cardiol*, 31(5):A16, 1999.
35. RS Ostrom and PA Insel. Nucleotides and cyclooxygenase products as determinants of basal and Ca<sup>+2</sup>-stimulating agonist-induced cyclic AMP formation in Madin Darby canine kidney D<sub>1</sub> (MDCK-D<sub>1</sub>) cells. *FASEB J*, 13(5 pt 2):A789, 1999.

## ACADEMIC ACTIVITIES

### Teaching

- |                |   |
|----------------|---|
| 2014 - present | Co-Course Director, Dental Pharmacology, 2 <sup>nd</sup> year dental students, UTHSC.                     |
| 2014 - present | Hypertension TBL Leader, 2 <sup>nd</sup> year pharmacy students, UTHSC.                                   |
| 2013 - present | Lecturer, Cellular Signaling, MSCI861, graduate students, UTHSC.  |
| 2012 - present | Course Director, IBS Students Seminars, IP810, graduate students, UTHSC.                                  |
| 2012 - present | Lecturer and TBL Leader, Cardiovascular System Organ Block, 1 <sup>st</sup> year medical students, UTHSC. |
| 2012 - present | Autonomics TBL Leader, Pharmacy Pharmacology, 1 <sup>st</sup> year pharmacy students, UTHSC.              |
| 2009 - 2011    | Course Director, Foundations in Pharmacology I, MS students, UTHSC.                                       |
| 2013 - present | Lecturer, Foundations in Pharmacology I, MS students, UTHSC.  |
| 2009 - present | Lecturer, Foundations in Pharmacology II, MS students, UTHSC.   |
| 2009 - present | Lecturer, Special Topics in Pharmacology, MS students, UTHSC.   |
| 2009 - present | Lecturer, Pharmacological Research Techniques, MS students, UTHSC.  |
| 2008 - present | Lecturer, Essentials of Cell Biology IP841, graduate students, UTHSC.                                     |
| 2006 - 2011    | Lecturer, Medical Pharmacology, 2 <sup>nd</sup> year medical students, UTHSC.                             |
| 2005 - present | Lecturer, Dental Pharmacology, 2 <sup>nd</sup> year dental students, UTHSC.                               |
| 2004 - present | Lecturer, Pharmacy Pharmacology, 1 <sup>st</sup> year pharmacy students, UTHSC.                           |
| 2005 - 2008    | Lecturer, Nursing 816, Graduate Nursing Pharmacology, UTHSC.  |
| 2005 - 2007    | Lecturer, Tennessee Institute for Pre-professionals, UTHSC.   |
| 2004 - 2007    | Lecturer, Systems Biology IP842, graduate students, UTHSC.  |
| 2003 - 2004    | Lecturer, Pharmacology 822. Principles of Drug Action, graduate students, UTHSC.                          |
| 2002 - 2003    | Course coordinator, Signal Transduction Journal Club (Pharm 294), U.C. San Diego.                         |
| 2001 - 2003    | Cardiovascular lab instructor, Principles of Pharmacology, medical and graduate students,                 |



- U.C. San Diego.
- 1999 - 2002 Lecturer, Principles of Pharmacology, undergraduates, U.C. San Diego.
- 1998 - 2003 Discussion groups, Principles of Pharmacology, medical students, U.C. San Diego.
- 1999 - 2002 Special Lecturer – Frontiers of Pharmacology, Medical Pharmacology, 2<sup>nd</sup> year medical and graduate students, U.C. Irvine.
- 1996 - 1997 Lecturer, Principles of Toxicology, 2<sup>nd</sup> year graduate students, U.C. Irvine.

### Peer Review

Associate Editor: Naunyn-Schmiedeberg's Archives of Pharmacology, 2015 - present.

Editorial Boards: American Journal of Physiology – Cell Physiology, 2012 - present.  
 Naunyn-Schmiedeberg's Archives of Pharmacology, 2008 - present.  
 IUPHAR committee on adenylyl cyclases, 2015 - present

Journal ad hoc review: Molecular Pharmacology, Journal of Biological Chemistry, American Journal of Physiology – Lung Cellular and Molecular Physiology, American Journal of Physiology – Heart and Circulatory Physiology, Journal of Pharmacology and Experimental Therapeutics, FASEB Journal, Circulation Research, American Journal of Hypertension, American Journal of Respiratory Cell and Molecular Biology, American Journal of Respiratory and Critical Care Medicine, Hypertension, British Journal of Pharmacology, Allergy, FEBS Letters, Trends in Pharmacological Sciences, Journal of Cellular and Molecular Medicine, Cardiovascular Research, Journal of Molecular and Cellular Cardiology, Journal of Cardiovascular Pharmacology, Current Medicinal Chemistry, Experimental Lung Research.

Grant peer review: NHLBI Program Project Review Panel, 2011-2012. Oak Ridge Associated Universities, performance review panel, 2010-2013. NIH Special Emphasis Panel, ad hoc reviewer, 2009. American Heart Association, National Center, Molecular Signaling, 2008-2009. American Heart Association, Region 2, Lipoproteins, Lipid Metabolism and Nutrition, 2008. American Heart Association, Southeast Affiliate, Molecular Signaling/Basic Cell and Molecular Biology, 2005-2007. American Heart Association, National Center, Vascular Biology/Blood Pressure Regulation, 2004-2005. National Science Foundation, ad hoc reviewer, 2006. The Medical Research Council, United Kingdom, ad hoc reviewer, 2006.

### Mentoring

- 2014 - 2015 Research training of Joseph Caron, IBS graduate student, UTHSC.
- 2009 - 2013 Research training of Amy Bogard, IBS graduate student, UTHSC.
- 2013 - Thesis committee member for Bin Wang, IBS graduate student, UTHSC.
- 2013 - 2014 Thesis committee member for Rachel Scheib, masters student, UTHSC/St. Jude.
- 2011 - 2014 Thesis committee member for Nayaab Khan, IPBS graduate student, UTHSC.
- 2011 - 2014 Thesis committee member for Xi Wang, IPBS graduate student, UTHSC/St. Jude.
- 2009 - 2012 Thesis committee member for Kristin Timmer, IPBS graduate student, UTHSC.
- 2011 - 2012 Thesis committee member for Andrew Lasiter, masters student, UTHSC/St. Jude.
- 2011 - 2012 Thesis committee member for Jin Cheng, masters student, UTHSC/St. Jude.
- 2009 - 2010 Thesis advisor for Radomir Slominsky, Pharmacology masters student, UTHSC.
- 2007 - 2010 Thesis committee member for Scott Latimer, masters student, UTHSC.
- 2007 - 2010 Thesis committee member for Damo Narayan, IPBS graduate student, UTHSC.
- 2005 - 2009 Research training of Thangavel Muthusamy, Ph.D., postdoctoral fellow. Dr. Muthusamy is investigating the mechanisms of adenylyl cyclase localization in lipid rafts.
- 2008 - 2009 Research training of Piyatilake Adris, Ph.D., postdoctoral fellow. Dr. Adris investigated cAMP signaling microdomains in airway smooth muscle.
- 2007 - 2008 Research training of Congfeng Xu, Ph.D., postdoctoral fellow. Dr. Xu investigated signaling and compartmentation of adenylyl cyclases in airway smooth muscle.
- 2004 - 2007 Thesis committee member for Michael Liu, IP graduate student, UTHSC.
- 2004 - 2006 Thesis committee member for Aleksandra Janik, Pharmacology graduate student, UTHSC.
- 2004 - 2006 Thesis committee member for Kawleen Oberoi, Biomedical Engineering graduate student, University of Memphis.

- 2004 - 2007 Research training of Richard Reece, IPBS graduate student, UTHSC.
- 2004 - 2005 Thesis committee member for Yixin Liang, Pharmacology graduate student, UTHSC.
- 2001 - 2006 Research training of Xiaoqiu Liu, M.D., Ph.D., postdoctoral fellow. Dr. Liu investigated the signaling and compartmentation of G protein-coupled receptors and adenylyl cyclases in cardiac and pulmonary fibroblasts.
- 2001-2003 Supervised and directed the research efforts of Richard Bunday, Ph.D. and Hemal Patel, Ph.D. (postdoctoral fellows), James Swaney, Brian Head and Ross Corriden (graduate students) at U.C. San Diego.

Over 30 undergraduate researchers have trained directly under Dr. Ostrom as volunteer lab assistants or summer research fellows at UCSD and UTHSC.

### **Service**

- 2015 - present CGHS Strategic Implementation Team, Recruitment.
- 2015 CGHS Strategic Map Planning Committee.
- 2014 - present Communications Officer, Molecular Pharmacology Division, ASPET.
- 2013 UTHSC Strategic Planning: Student Access and Success Goal Committee, CGHS rep.
- 2012 CGHS Associate Dean of Student Affairs Search Committee.
- 2012 - 2015 SACS Student Policies and Procedures workgroup, CGHS representative.
- 2012 - 2015 Secretary/Treasurer, Molecular Pharmacology Division, ASPET.
- 2011 - present Director, Integrated Biological Sciences (IBS) graduate program.
- 2010 - 2011 Track Director, Molecular and Systems Pharmacology track, Integrated Biological Sciences (IBS) graduate program.
- 2009 - 2012 Ad Hoc member of Executive Committee, Molecular Pharmacology Division, ASPET.
- 2007 - 2014 Director, Pharmacology Summer Undergraduate Research Fellowship program (funded by ASPET from 2010-2014).
- 2008 - 2011 Federal Demonstration Partnership, inaugural faculty representative for UTHSC.
- 2007 - present Department of Pharmacology Graduate Education and Curriculum Committee.
- 2011 Medical curriculum redesign, Pharmacology Representative on the cardiovascular block committee.
- 2010 Hyde Chair of Excellence, Orthopedic Surgery Dept. Chair, Search Committee.
- 2008 CGHS Associate Dean of Health Careers search committee.
- 2008 IPBS Core Curriculum Design Committee.
- 2007 - 2011 Director, Molecular Therapeutics and Cell Signaling track, Integrated Program in Biological Sciences (IPBS) graduate program.
- 2007 - 2008 UTHSC Faculty Development Advisory Committee.
- 2007 UTHSC Faculty Senate Research Committee, subcommittee on animal per diems.
- 2006 Department of Pharmacology, faculty search committee.

### **Invited lectures and moderations**

- 2014 Visiting Professor, Department of Medicine, Thomas Jefferson University, regional.
- 2012 Visiting Professor, Dept. of Pharmacology and Experimental Neuroscience, University of Nebraska Medical Center, regional.
- 2012 Department of Biology seminar series, University of Memphis, invited lecture, local.
- 2012 Microbiology, Immunology and Biochemistry seminar series, UTHSC, local.
- 2011 Invited speaker, Experimental Biology 2011 symposium "Novel Regulation, Physiological Roles, and Pharmacological Intervention of G Protein Coupled Receptor – Adenylyl Cyclase Signaling Systems." Washington, DC, international.
- 2011 Invited Speaker, University of Memphis symposium "Understanding the Organization of the Intracellular Region." Memphis, TN, national.
- 2010 Visiting Professor, University of Nevada Dept. of Physiology & Cell Biology, regional.
- 2009 Invited speaker, Gordon Research Conference, Phosphorylation and G Protein Mediated Signaling Networks, international.

- 2008 School of Pharmacy Lecture Series, University of Mississippi, Oxford, MS, regional.
- 2007 Invited speaker, International Receptor Symposium, Shizuoka, Japan, international.
- 2007 Endocrinology Grand Rounds, UTHSC, local.
- 2007 Organizer and moderator, Experimental Biology symposium "Higher order organization of GPCR signaling components: lipid rafts and multimeric protein complexes." Washington DC, international.
- 2006 Cardiology Grand Rounds, UTHSC, local.
- 2006 Endocrinology Grand Rounds, UTHSC, local.
- 2005 Experimental Biology symposium on receptors and signaling pathways in lung, International.
- 2004 Visiting Professor, University of Cincinnati Dept. of Pharmacology and Cell Biophysics. regional.
- 2004 Visiting Professor, Northeastern Ohio Universities College of Medicine, regional.
- 2004 Research Seminar Series, Veterans Administration Hospital, Memphis, local.
- 2003 Invited speaker, Experimental Biology symposium on caveolae and lipid rafts, international.
- 2002 Pharmacology Lecture Series, University of California, Irvine, local.
- 2001 Pharmacology Lecture Series, University of California, Irvine, local.

**Consultant activities:**

- 2009-2013 Beta tester and consultant to LabArchives, Inc., Carlsbad, CA.
- 1998-present Beta tester for Graph Pad Software, San Diego, CA.
- 2001-2003 Consultant to Dynavax, Inc., Berkeley, CA
- 1999-2002 Consultant to Collateral Therapeutics, San Diego, CA.