Siva Digavalli, Ph.D.

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Summary: A dedicated academic with a track record of industrial drug development in the areas of neuropsychiatric, pain and gastrointestinal motility disorders with a passion for developing EEG-based biomarkers for mental illness.

Current Position

Associate Professor of Pharmaceutical Sciences, Bill Gatton College of Pharmacy, East Tennessee State University, Johnson City; 8/2018- .

Previous Positions

Senior Manager, in vivo testing unit, Emergent Biosolutions, Gaithersburg, MD. Responsible for nonclinical development of novel antibacterial agents; 09/2017-07/2018.

Chief Scientist and co-founder, EPHYS-BIO, a specialty research company established at the University of Rhode Island campus, Kingston, RI. Responsible for EEG-based translational assays, experimental design, analysis and client liaison; 07/2017-12/2022.

Senior Director, Psychogenics Inc., Tarrytown, NY.

- Led a neurophysiology team of 5 scientists; was client liaison for discovery projects; wrote research proposals, ran discovery team meetings, oversaw data analysis and project reports; 01/2017-03/2017.

Principal Scientist, Bristol Myers Squibb Co., Wallingford, CT; 4/2014-1/2017.

- Led a translation team of 3-5 scientists for multiple discovery programs; delivered *in vivo* translational biomarkers for small fiber neuropathies with robust PK-PD relationship; established clinical biomarker path for an adaptor-associated kinase 1 inhibitor to combat neuropathic pain through rodent and primate proof of concept (POC) and PK-PD studies.
- Part of a clinical team that designed and directed a Phase I Pharmaco-EEG study for an investigational new drug (IND) for cognition.
- Wrote pharmacology sections for numerous FDA submissions.
- Worked with small molecules as well as biologicals
- Established and monitored contract research with several external partners for rodent and primate studies
- Invited speaker at regional and international symposia.

Senior Research Investigator II, Bristol Myers Squibb Co., Wallingford, CT; 2/2008-4/2014.

- Led a team of 3-4 scientists for biomarkers for treatment-resistant depression and schizophrenia; delivered an EEG-based tool box of translational biomarkers (e.g. Mismatch Negativity, 40 Hz auditory steady state response, sensory gating); established time-frequency analysis of single trial EEG data.
- Led a team that established a novel video-tracking based *in vivo* assay for predicting efficacy as well as toxicity liability; assay instrumental in delivering drug candidate in record time; evaluated in-licensing opportunities.
- Invited speaker at a National symposium on translational biomarkers.

Senior Research Investigator I, Bristol Myers Squibb Co., Wallingford, CT; 4/2003-2/2008.

- Established a polysomnography (sleep) lab; demonstrated differentiation from standard of care through lack of REM suppression; evaluated target liability by characterizing

HPA axis response to stressors including hemorrhagic shock with CRF antagonist on board.
- Persuaded the disease-working group to embrace partial agonism as a strategic choice for targeting nicotinic alpha7 receptors.
- Identified D1-induced hyperthermia as a potential liability for triple reuptake inhibitors.

Research Investigator II, Bristol Myers Squibb Co., Wallingford, CT; 4/2002-3/2003.
- Delivered preclinical POC data for a Maxi-K channel opener as potential treatment for the irritable bowel syndrome; these data were instrumental in out-licensing of the asset.

Research Investigator I, Bristol Myers Squibb Co., Wallingford, CT; 10/2000-4/2002.
- Developed visceral pain and colonic motility assays for studying gastrointestinal function and delivered data packages.

Postdoctoral Research Fellow, Center for Swallowing and Motility Disorders, Harvard Medical School and West Roxbury VA Medical Center, West Roxbury, MA; 10/1997-9/2000.
- Developed micronized manometry approach to study in vivo upper gastrointestinal motility in mutant mouse models
- Established neuronal nitric oxide synthase ($nNOS^{-/-}$) gene knockout mouse as a model for achalasia
- Using selected murine models, demonstrated that intramuscular interstitial cells of Cajal are not involved in mediating nitrergic relaxation of the smooth muscle
- Established $nNOS^{-/-}$ mouse as a model for gastroparesis and stasis akin to diabetes-induced dysmotility
- Trained several scientists in micro-manometry technique

Research and graduate assistant, Dept. of Pharmacology and Experimental Therapeutics, LSU Health Sciences Center, New Orleans, LA; 7/1993-7/1997.
- Using novel molecular tools, demonstrated the importance of thyrotropin releasing hormone receptors in the hind brain nuclei in mediating gastric motor activity
- Using the microinjection approach *in vivo*, revealed hind brain neuropharmacological mechanisms responsible for mediating vagally-induced gastric motor activity

Graduate- and research assistant, School of Pharmacy, University of Louisiana, Monroe, LA; 8/1991-6/1993.
- Established a 2-butoxyethanol-induced autoprotection model for hemolytic toxicity in rats
- Worked in a media lab to deliver audio-visual support to classrooms; engraved name plates for new faculty and prepared slides and transparencies

Teaching assistant, University College of Pharmaceutical Sciences, Kakatiya University, Warangal, India; 1/1990-6/1991.
- Characterized a novel, water-soluble analog of acetaminophen
- Taught pharmacology laboratory and conducted tutorials in pharmacology

Management Trainee, Quality Assurance Division, Aristo Laboratories Ltd., Hyderabad, India, 1/1989-11/1989.

- Performed quality assurance for several marketed drugs (quantitative assays for active ingredients based on United States, British and Indian Pharmacopeias)

Education and Training:

Postdoctoral Research Fellowship, Center for Swallowing and Motility Disorders, West Roxbury VA Medical Center and Harvard Medical School, Boston, MA. (Mentor: Prof. Raj K. Goyal); 10/1997-9/2000.

Ph.D (Pharmacology and Experimental Therapeutics), Louisiana State University Health Sciences Center, New Orleans, LA. (Advisor: Prof. Pamela J. Hornby); 8/1993-8/1997.

M.S. (Toxicology), University of Louisiana, Monroe, LA. (Advisor: Prof. Harihara Mehendale), 8/1991-7/1993.

M.S. (Master of Pharmacology), Kakatiya University, Warangal, India. (Advisor: Prof. D.R. Krishna), 1/1990-8/1991.

B.S. (Pharmacy), Kakatiya University, Warangal, India; 2/1985-12/1988.

Grants/Contracts:

Established: A Master Service Agreement (MSA) between Cerevel Therapeutics (Watertown, MA) and ETSU has been established in August 2023 for providing research service as needed. A research service valued at $ 310,000 has been completed.

Established: A Master Service Agreement (MSA) between Sosei Heptares Therapeutics (Cambridge, UK) and ETSU has been established in September 2023 for providing research service as needed. A research service task valued at $25,000 has been completed.

In process: A Master Service Agreement (MSA) between Neumora (Newton Highlands, MA) and ETSU is in the works for providing research service as needed.

Funded: Developing patient-centered tools to accelerate personalized medical care for those with mental illness (ETSU Research Funding Program; collaborative grant, $20,000; role, PI)

Submitted: Harmonic Response Dynamics as Translational Biomarkers for Treatment Development (NIMH UG3-UH3; role, PI) (Resubmitted as A1, October 20, 2022; reviewed and scored but not funded).

Submitted: Harmonic Response Dynamics as Translational Biomarkers for Treatment Development (NIMH UG3-UH3; role, PI) (Submitted in October 2021; reviewed and scored but not funded).

Funded: Validation of the 40-Hz auditory steady-state response as a biomarker for neuropsychiatric disorders (RDC major grant; $12,000; role, PI).

Submitted: Translational biomarkers for neuropsychiatric drug discovery (NIH SBIR Phase I grant; consultant) (Not funded).

Completed: Physiology and pathophysiology of esophageal motility (4/1998-4/2003)
PI: Raj K. Goyal
NIDDK R01 award, DK031092 ($1,635,387)
Role: Co-investigator; my postdoctoral work on micronized esophageal manometry formed a key portion of this grant which I co-wrote with the PI. The proposal included my preliminary data.

Nitrergic neuro-smooth muscle transmission in the gut (4/2004-12/2008)
PI: Raj K. Goyal
NIDDK R01 award, DK062867 ($1,571,462)
Role: my postdoctoral work on pyloric sphincter dysfunction in $nNos^{-/-}$ and W/W^{v} mice formed a key part of this grant that I co-wrote with the PI. The proposal included my published in vivo data.

As a volunteer for Association for India's Development, a voluntary organization, wrote and won a social services grant ($12,000; role, PI) from the i2 Foundation, to support a school for tribal children in Kerala, India.

Membership:

1. Society for Neuroscience
2. American Physiological Society
3. American Gastroenterological Association
4. New York Academy of Sciences
5. Sigma-Xi

Peer Review:

Review Editor:
Frontiers in Systems Neuroscience (2023-

Ad hoc reviewer:
Molecular Psychiatry
Schizophrenia Bulletin
Expert Opinion in Pharmacotherapy
Scientific Reports
Translational Psychiatry
Biological Psychiatry
Journal of Pharmacology and Experimental Therapeutics
Clinical and Translational Science
Annals of the New York Academy of Sciences
Brain Structure and Function
Neurochemistry International
In silico Pharmacology

Academic Service:

ETSU Faculty Senator, 2021-2024

Co-chair, Personal and Professional Development Committee (PPDC) 2022-23

Founding faculty advisor for the Gatton chapter of Industrial Pharmacists Organization (IPhO). 2020-

Faculty co-advisor for NCODA (National Community Oncology Dispensing Association). 2021-

Member, ETSU's Intellectual Property (IP) committee, Fall 2022-

Member, Assessment Committee, 2019-2021

Member, Personal and Professional Development Committee, 2021-2022

Member, Postgraduate Preparatory Committee (focusing on Industrial fellowship opportunities for Gatton graduates), 2021-

Member, Student Admissions Committee, 2019-

Member, Equity and inclusion council, 2021-

Member, ACPE Self-study Steering Committee, 2022-

Invited Presentations:

From environment to neural dynamics: on the interaction between rhythmic sensation and neural oscillations (co-Chair of an invited mini-symposium at the Society for Neuroscience Annual Meeting in Chicago, IL, October 5-9, 2024)

Clicks-train associated gamma oscillations: induced but not evoked, A presentation made to Neumora Therapeutics, Watertown, MA (May 21, 2024)

Laboratory for studying brain oscillatory dynamics: an overview of contract services. Remote presentation to Cerevel Therapeutics, Cambridge, MA (Feb 14, 2023)

Laboratory for studying brain oscillatory dynamics: an overview of capabilities presented to drug development scientists from Sosei Heptares, Cambridge, United Kingdom (presentation, Feb 7, 2023).

The importance of biomarkers for psychiatric drug development. Remote presentation made to the students and staff of SRR College of Pharmaceutical Sciences, Warangal on December 7, 2022.

Timing Matters: 40 Hz synchrony deficit in schizophrenia and its use as a biomarker for new drug development April 6, 2020, Department of Chemistry, East Tennessee State University, Johnson City, TN.

Neural oscillatory deficits in schizophrenia and an opportunity for rational drug development. September 5, 2019, Department of Chemistry and Physics, University of Tennessee at Chattanooga, TN.

Timing is of the essence: Neural oscillatory deficits in schizophrenia and an opportunity for rational drug development. Biomedical Sciences, Internal Seminar series, Aug 30, 2019, East Tennessee State University, Johnson City, TN.

40 Hz Auditory Steady State Response: a biomarker for cortical NMDA activity. Invited lecture, Interdisciplinary Neuroscience Program, University of Rhode Island, Kingston, RI.

EEG-based translational biomarkers in neuropsychiatry, invited speaker, St. Joseph's College of Pharmacy, Hartford, CT. 9/2017

40 Hz Auditory Steady State Response: Are we ready for translation? Invited speaker, Boston ERP group, Biogen, May 23, 2016, Cambridge, MA. 05/2016

Recent Advances in the Gamma-Band Auditory Steady-State Response as a Psychosis Endophenotype, Invited speaker, Molecular Psychiatry Association meeting, San Francisco, November, 2014; https://www.molecularpsychiatry.net/past-meetings/2014-san-francisco/2014-schedule/#sunday786d-288f 11/2014

Translational Psychiatry: *Light at the end of the tunnel*, invited speaker and co-organizer, New York Academy of Sciences, April 8, 2014; http://www.nyas.org/Events/Detail.aspx?cid=da154e7a-756c-4ef7-8013-cd643c3a77a6. 4/2014. The proceedings of the above meeting along with speaker interviews were featured on the Schizophrenia Research Forum, a premier online forum for schizophrenia education and research, funded by the National Institute of Mental Health; http://www.schizophreniaforum.org/news/nyas-meeting-suggests-progress-schizophrenia-depression-biomarkers

Small fiber neuropathies and the promise of novel sodium channel blockers. Guest lecture, University College of Pharmaceutical Sciences, Kakatiya University, Warangal. 12/2014

Event related potentials in schizophrenia research. Guest lecture for Life Science majors at St. Xavier's College, Mumbai. 6/2011

Transgenic and mutant mouse models of upper gastrointestinal dysfunction. Adjunct Faculty lecturer for postgraduate students, University College of Pharmaceutical Sciences, Kakatiya University, Warangal, India. 12/2006

Methodology of pharmacological drug discovery. Guest Lecture, Bhavan's Postgraduate Science College, Secunderabad, India. 12/2006

Neurophysiological effects of CRF and its antagonism. Guest Lecture at Suven Pharmaceuticals, Geedimetla, Hyderabad, India. 12/2006

Invited lecture and demonstration of rodent visceral nociception models at Algos Therapeutics, St. Paul, MN. 5/2005

Colorectal distension as a model of visceral pain. Guest Lecture at Dr.Reddy's Research Foundation, Hyderabad, India. 12/2003

Murine models of upper gastrointestinal dysfunction and their relevance to human disease. Guest Faculty for a training workshop for Pharmacology teachers, University College of Pharmaceutical Sciences, Kakatiya University, Warangal, India. 11/2003.

Demonstration of micronized upper gastrointestinal manometry recording in mice at Thomas Jefferson Medical School (Dr. S. Rattan's lab) 6/2002

Awards and Honors:

Invited Speaker for Prescription for Success, Class of 2023 (Graduating class selects faculty speakers for their farewell banquet)
Outstanding Teacher for the P1 year for 2022
BMS Star Awards 2015, 2014, 2013, 2012, 2010, 2009, 2008, 2007, 2006, 2005, 2005, 2003, and 2002; Certificate of Recognition, 2005.
BMS Applied Biotechnology Innovation Award 2010.
Marqui's Who's Who in America, 60th Diamond Anniversary edition, 2006.
BMS Applied Biotechnology Innovation Award, 2004.
"Young Investigator Award" from the American Motility Society, 1998.
Nominated for Chancellor's award for "Outstanding Graduate Student of the Year", LSU Health Sciences Center, 1997.
"Young Investigator Award" from the American Motility Society, 1996.
Travel Award for best poster from the LSU Health Sciences Center,'s Neuroscience Center of Excellence, 1996.
Junior Research Fellowship, University Grants Commission, Government of India, 1990.
University rank in B.Pharm (2nd overall; 1984 to1988), Kakatiya University, Warangal, India.

Personnel trained in Neuropharmacology/brain oscillatory dynamics:

Deepshila Gautam, MS., 2022-
Ummear Raza, M.S., PhD. (Awarded PhD, 2023)
Ping Chen, M.S., Bristol Myers Squibb Co.
Kimberly Newberry, B.S. Bristol Myers Squibb Co.
Shaun Langdon, B.S. Bristol Myers Squibb Co.
Arun Senapati, M.S., Bristol Myers Squibb Co.
Yili Yang, M.D., Bristol Myers Squibb Co.
Alicia V. Lee, A.B., Harvard University (class of 2002; summer intern)
Xue Dao He, M.D., Harvard Medical School

Mentoring:

Academic
Class of 2022: Michael Makki, Jonathan Brewster, Iris Kamgue, Ethan Davidson, Dorcas Frempong
Class of 2023: Angela Achia-Poku, Stephen Crispi, Patrick Carnvale, Krystal Chavez
Class of 2024: Debberian Simmons (P2-), Kim Breede (P1 year only)
Class of 2025: Tiffany Green
Class of 2026: Shay Sullivan, Alexus Taylor, Owen Eguavoen, Hanaa Elshoukey
Class of 2027: Timothy Bryant, Michael Estrella

Research
Class of 2022: Esam Odette, Michael Makki, Caige Plcek, Sydney Tabor
Class of 2023: Angela Achia-Poku, Dakota Rorie
Class of 2024: Debberian Simmons, James Owen; Braden Phillip (ETSU Nursing program); Ashley Eastman (ETSU School of Public Health)
Class of 2025: Robert Berger, Wesley Brillhart, Jennifer Pham, Jimmy Owen
Class of 2026: Emily Krepps, Abigail Shields, Rebekkah Skags, Summer Wilson, Austen Boucher, Andrew Hensley, Owen Eguaoven
Class of 2027: Soliyana Gatemesay, Madison Hatley
Class of 2028: Christine Chapman, Holly Rutherford, Matt Phillip, Olivia Grytza

IPhO
Class of 2021: Harrison Flynn
Class of 2022: Maria Bertoni, Justin Pearson, Austin Kidd
Class of 2023: Jonathan Holan, Ben Kennard, Yu-Wei Marcarelli, Krystal Chavez, Rochelle Matos, Noma Mgutshini
Class of 2024: Deberrian Simmons, Rebecca Lessaint
Class of 2026: Jacob Burger, Adela Agyumang, Owen Eguavoen, Krishna Mahida, Hanaa Elshoukey

Publications:

Reviews, book chapters, monographs

A.Breska, E.Coffey, K.Doelling, K.Duecker, **D.V.Sivarao,** B.Zoefel, From environment to neural dynamics: on the interaction between rhythmic sensation and neural oscillations Journal of Neuroscience, 40 (44), 2024 (invited review)

Apte et al., Harihara Mehendale: A life dedicated to mentoring and research. International J Toxicol., 42 (4), 2023 (tribute article).

D.V.Sivarao*, 40 Hz Auditory Steady State Response: a selective biomarker for cortical NMDA function. **Ann. N.Y. Acad. Sci**., 1344: 27-36, **2015** (invited review).

K.A.Jones, F.S.Menniti and **D.V.Sivarao**, Translational Psychiatry - light at the end of the tunnel. **Ann. N.Y. Acad. Sci.,** 1344:1-11, **2015** (invited review).

D.V.Sivarao and Raj K.Goyal, Functional anatomy and Physiology of the Upper Esophageal Sphincter. **Am. J. Medicine**, 108: Suppl4a. 27s-37s, **2000** (invited Review).

Raj K.Goyal and **D.V.Sivarao**, Functional anatomy and physiology of swallowing and esophageal motility In: **The Esophagus** (3rd ed.), edited by D.O.Castell and J.E.Richter, Lippincott Williams & Wilkins, New York, NY, **1999** (book chapter).

D.V.Sivarao, Excitatory and Inhibitory Influences on the Vagal Regulation of Gastric Motor Function (Doctoral dissertation submitted to Louisiana State University Health Sciences Center, New Orleans, **1997**; Advisor, Prof. Pamela J. Hornby); UMI Publications, Ann Arbor, MI

D.V.Sivarao*, Opioid receptors and their endogenous ligands. **The Eastern Pharmacist**, 35: 81-85, **1992** (review).

D.V.Sivarao, Pharmacological and Pharmacokinetic profiles of a new prodrug of paracetamol. (Master's thesis submitted to Kakatiya University, Warangal, **1991**; Thesis Advisor, Prof. D.R.Krishna).

Original reports

Deepshila Gautam, Muhammad Raza, Abby Shields, Emily Krepps and Digavalli V Sivarao. Click train elicited local gamma synchrony: differing performance and pharmacological responsivity of primary auditory and prefrontal cortices Brain Research 1841, 2024.

Swerdlow NR, Gonzalez CE, Ummear Raza M, Gautam D, Miyakoshi M, Clayson PE, Joshi YB, Molina JL, Talledo J, Thomas ML, Light GA*, **Sivarao D.V**. Effects of memantine on the auditory steady state and harmonic responses to 40 Hz stimulation across species, Biological Psychiatry: Cognitive Neuroscience and Imaging 9(3), 2024 https://doi.org/10.1016/j.bpsc.2023.08.009

Deepshila Gautam*, Muhammad Ummear Raza*, Miyakoshi M, Molina JL, Joshi YB, Clayson PE, Light GA, Swerdlow NR, **Sivarao D.V.** Click-train evoked steady state harmonic response as a novel pharmacodynamic biomarker of cortical oscillatory synchrony. Neuropharmacology 240, 2023 https://doi.org/10.1016/j.neuropharm.2023.109707

Raza, M.U., Gautam, D., Rorie, D, **Sivarao D.V**. Differential Effects of Clozapine and Haloperidol on the 40 Hz Auditory Steady State Response-mediated Phase Resetting in the Prefrontal Cortex of the Female Sprague Dawley Rat, *Schizophrenia Bulletin*, Volume 49, Issue 3, May 2023, Pages 581–591, https://doi.org/10.1093/schbul/sbac203

Raza, M.U., **Sivarao, D.V.** Test-retest reliability of tone- and 40 Hz train-evoked gamma oscillations in female rats and their sensitivity to low-dose NMDA channel blockade. *Psychopharmacology* (2021). https://doi.org/10.1007/s00213-021-05856-1

Luo G, Chen L, Easton A, Newton A, Bourin C, Shields E, Mosure K, Soars MG, Knox RJ, Matchett M, Pieschl RL, Post-Munson DJ, Wang S, Herrington J, Graef J, Newberry K, **Sivarao DV**, Senapati A, Bristow LJ, Meanwell NA, Thompson LA, Dzierba C. Discovery of Indole- and Indazole-acylsulfonamides as Potent and Selective NaV1.7 Inhibitors for the Treatment of Pain. J Med Chem. 2019 Jan 24;62(2):831-856. doi: 10.1021/acs.jmedchem.8b01550. Epub 2019 Jan 8.

Rick L. Pieschl, Regina Miller, Kelli M. Jones, Debra J. Post-Munson, Ping Chen, Kimberly Newberry, Yulia Benitex, Thaddeus Molski, Daniel Morgan, Ivar M. McDonald, John E. Macor, Richard E. Olson, Yukiko Asaka, **Sivarao Digavalli**, Amy Easton, James Herrington, Ryan S. Westphal, Nicholas J. Lodge, Robert Zaczek, Linda J. Bristow, Yu-Wen Li. Effects of BMS-902483, an α7 nicotinic acetylcholine receptor partial agonist, on cognition and sensory gating in relation to receptor occupancy in rodents. **European Journal of Pharmacology**, 807: 1–11, **2017**.

Matthew D. Hill, Haiquan Fang, **Sivarao V. Digavalli**, Francine L. Healy, Lizbeth Gallagher, Debra Post-Munson, Ping Chen, Joanne Natale, Yulia Benitex, Daniel Morgan, Nicholas Lodge, Linda Bristow, John E. Macor, Richard E. Olson. Development of spiroguanidine-derived a7 neuronal nicotinic receptor partial agonists. **Bioorganic & Medicinal Chemistry Letters**, 27(3):578-581, **2017**.

Wu, Yong-Jin; Guernon, Jason; McClure, Andrea; Luo, Guanglin; Rajamani, Ramkumar; Ng, Alicia; Easton, Amy; Newton, Amy; Bourin, Clotilde; Parker, Dawn; Barnaby, Omar; Soars, Matthew; Knox, Ronald; Matchett, Michele; Pieschl, Rick; Herrington, James; Chen, Ping; **Sivarao, D.V**.; Bristow, Linda; Meanwell, Nicholas; Bronson, Joanne; Thompson, Lorin; Dzierba, Carolyn. Discovery of non-zwitterionic aryl

sulfonamides as Nav1.7 inhibitors with efficacy in preclinical behavioral models and translational measures of nociceptive neuron activation. **Biorg. Med. Chem**. (***in press*** **2017**).

Linda J Bristow, Jyoti Gulia, Michael R Weed, Bettadapura N Srikumar, Yu-Wen Li, John D Graef, Sreenivasulu Naidu, Charulatha Sanmathi, Jayant Aher, Tanmaya Bastia, Mahesh Paschapur, Narasimharaju Kalidindi, Kuchibhotla Vijaya Kumar, Thaddeus Molski, Rick Pieschl, Jeffrey M Brown, **Digavalli V Sivarao**, Kimberly Newberry, Mark Bookbinder, Joe Polino, Deborah Keavy, Amy Newton, Eric Shields, Jean Simmermacher, James Kempson, Jianqing Li, Huiping Zhang, Arvind Mathur, Raja Reddy Kallem, Meenakshee Sinha, Manjunath Ramarao, Reeba Kannimel Vikramadithyan, Srinivasan Thangathirupathy, Jayakumar Warrier, Joanne J Bronson, Richard E Olson, John E Macor, Michael Sinz, Dalton King, Lorin A Thompson, Lawrence R Marcin. Preclinical Characterization of (*R*)-3-((3*S*,4*S*)-3-fluoro-4-(4-hydroxyphenyl)piperidin-1-yl)-1-(4-methylbenzyl)pyrrolidin-2-one (BMS-986169), a Novel, Intravenous, Glutamate N-Methyl-D-Aspartate 2B (GluN2B) Receptor Negative Allosteric Modulator with Potential in Treatment Resistant Depression. **J Pharmacol. Expt. Therap.** (***in press*** **2017**).

D.V.Sivarao*, Ping Chen, Arun Senapati, Yili Yang, Alda Fernandes, Yu-Wen Li, Yulia Benitex, Valerie Whiterock and Michael Ahlijanian. 40 Hz Auditory Steady State Response is a Pharmacodynamic Biomarker for Cortical NMDA Receptors. **Neuropsychopharmacology** 41(9):2232-40, **2016**.

L J Bristow, A Easton, Y-W Li, **D V Sivarao**, R Lidge, K M Jones, D Post-Munson, C Daly, N Lodge, L Gallagher, T Molski, R Pieschl, P Chen, A Hendricson, R Westphal, J Cook, C Iwuagwu, D Morgan, Y Benitex, D King, J Macor, R Zaczek, R Olson. The Novel, Nicotinic Alpha7 Receptor Partial Agonist, BMS-933043, Improves Cognition and Sensory Processing in Preclinical Models of Schizophrenia. **PLoS One, 2016**. DOI:10.1371/journal.pone.0159996.

Keavy D, Bristow LJ, **Sivarao DV**, Batchelder M, King D, Thangathirupathy S, Macor JE, Weed MR. The qEEG Signature of Selective NMDA NR2B Negative Allosteric Modulators; A Potential Translational Biomarker for Drug Development. **PLoS One**, **2016** Apr 1;11(4):e0152729. doi: 10.1371/journal.pone.0152729.

Degnan AP, Maxwell D, Balakrishnan A, Brown JM, Easton A, Gulianello M, Hanumegowda U, Hill-Drzewi M, Miller R, Santone KS, Senapati A, Shields EE, **Sivarao DV**, Westphal R, Whiterock VJ, Zhuo X, Bronson JJ, Macor JE, Difluorocyclobutylacetylenes as positive allosteric modulators of mGluR5 with reduced bioactivation potential. **Bioorg Med Chem Lett**. **2016** Dec 15;26(24):5871-5876. doi: 10.1016/j.bmcl.2016.11.014.

Yang F, Snyder LB, Balakrishnan A, Brown JM, **Sivarao DV**, Easton A, Fernandes A, Gulianello M, Hanumegowda UM, Huang H, Huang Y, Jones KM, Li YW, Matchett M, Mattson G, Miller R, Santone KS, Senapati A, Shields EE, Simutis FJ, Westphal R, Whiterock VJ, Bronson JJ, Macor JE, Degnan AP. Discovery and Preclinical Evaluation of BMS-955829, a Potent Positive Allosteric Modulator of mGluR5. **ACS Med Chem Lett**. **2016** Jan 4;7(3):289-93. doi: 10.1021/acsmedchemlett.5b00450.

Huang H, Degnan AP, Balakrishnan A, Easton A, Gulianello M, Huang Y, Matchett M, Mattson G, Miller R, Santone KS, Senapati A, Shields EE, **Sivarao DV**, Snyder LB, Westphal R, Whiterock VJ, Yang F, Bronson JJ, Macor JE. Oxazolidinone-based allosteric modulators of mGluR5: Defining molecular switches to create a pharmacological tool box. **Bioorg Med Chem Lett**. 26(17):4165-9, **2016**

D.V.Sivarao*, Ping Chen, Yili Yang, Rick Pieschl, Yu-Wen Li and Michael Ahlijanian, NR2B antagonist CP101,606 abolishes pitch-mediated deviance detection in awake rats, **Frontiers in Psychiatry**, 5:96 1-15 **2014**.

D.V.Sivarao*, Mikhail Frenkel, Ping Chen, Francine Healy, Nicholas J. Lodge and Robert Zaczek, MK-801 disrupts and nicotine augments 40 Hz auditory steady state responses in the auditory cortex of the urethane-anesthetized rat. **Neuropharmacology**, 73: 1-9, **2013**.

N.J.Lodge, Yu-Wen Li, Snjezana Lelas, Ted Molski, **D.V.Sivarao**, Francine Healy, Joanne Bronson, Richard Hartz, John Macor and Robert Zaczek, Pharmacological and behavioral effects of a novel CRF1 receptor antagonist, BMS-763534. **Neuropharmacology**, 67: 284-293, **2013**.

D.V.Sivarao, H.L.Mashimo and Raj K. Goyal, Pyloric sphincter dysfunction in $nNOS^{-/-}$ and W/W^{v} mutant mice: Animal models of gastroparesis and duodenogastric reflux. **Gastroenterology**, 135: 1258:1266, **2008**.

D.V.Sivarao*, Shaun Langdon, Christopher Bernard and Nicholas J.Lodge, Colorectal distension-induced motor and cardiovascular changes as indices of nociception in the anesthetized rat: morphine and strain effects on visceral sensitivity **J. Pharmacol. Toxicol. Methods**, 56: 43-50, **2007**.

D.V.Sivarao*, K.Newberry, S.Langdon, A.V.Lee, P.Hewawasam, M.Plym, L.Signor, R.Myers and N.J. Lodge, Effect of BMS-223131, a novel opener of large conductance Ca^{2+}-activated K^{+} (maxi-K) channels on normal and stress aggravated motility and visceral nociception. **J. Phramacol. Expt. Therap**., 313:840-847, **2005**.

D.V.Sivarao*, K. Newberry and N.J. Lodge, Effect of $5HT_{1A}$ receptor partial-agonist buspirone on colorectal distension-induced psuedoaffective and affective responses in the Wistar rat. **European Journal of Pharmacology** 494:23-29, **2004**.

Wu YJ[1], Boissard CG, Greco C, Gribkoff VK, Harden DG, He H, L'Heureux A, Kang SH, Kinney GG, Knox RJ, Natale J, Newton AE, Lehtinen-Oboma S, Sinz MW, **Sivarao DV**, Starrett JE Jr, Sun LQ, Tertyshnikova S, Thompson MW, Weaver D, Wong HS, Zhang L, Dworetzky SI. (*S*)-*N*-[1-(3-Morpholin-4-yl-phenyl)-ethyl]-3-phenyl-acrylamide: an Orally Bioavailable KCNQ2 Opener with Significant Activity in a Cortical Spreading Depression Model of Migraine. **J. Med.Chem**., 46: 3197-3200, **2003**.

Wu YJ, Davis CD, Dworetzky S, Fitzpatrick WC, Harden D, He H, Knox RJ, Newton AE, Philip T, Polson C, **Sivarao DV**, Sun LQ, Tertyshnikova S, Weaver D, Yeola S, Zoeckler M, Sinz MW.Fluorine substitution removes CYP3A4 metabolism dependent inhibition: Identification of (*S*)-*N*-[1-(4-Fluoro-3-morpholin-4-yl-phenyl)-ethyl]-3-(4-fluoro-phenyl)-acrylamide as an Orally Bioavailable KCNQ2 Opener Devoid of CYP3A4-Metabolism Dependent Inhibition. **J. Med.Chem**., 46:3788-81, **2003**.

D.V.Sivarao, Hemant Thatte, Hiroshi L.Mashimo and Raj K.Goyal, ICC in neurotransmission: Hard to swallow a lack of involvement (letter to the editor). **Gastroenterology**, 122: 1186-1187, **2002**.

D.V.Sivarao, Hemant Thatte, Hiroshi L.Mashimo and Raj K.Goyal, Lower esophageal sphincter is achalasic in $nNOS^{-/-}$ and hypotensive in W/W^{v} mutant mice. **Gastroenterology**, 121: 34-42, **2001**.

D.V.Sivarao, Z.K.Krowicki, P.T.Abrahams and P.J.Hornby, Vagally-regulated gastric function: Evidence for kainate and NMDA receptor mediation. **Eur. J. Pharmacol**. 368:173-182, **1999**.

Z.K.Krowicki, **D.V.Sivarao**, T.P.Abrahams and P.J.Hornby, Excitation of dorsal motor vagal neurons evokes non-nicotinic receptor mediated gastric relaxation **J. Auton. Nerv. Syst**., 77:83-89, **1999**.

Krowicki, Z.K., Moerschabaecher, J.M., **Sivarao, D.V**., Winsauer, P. and Hornby, P.J.: □^{9}-Tetrahydrocannabinol inhibits gastric motor function in the rat through CB1 cannabinoid receptors. **Eur. J. Pharmacol**., 371:187-196, **1999**.

D.V.Sivarao, Z.K.Krowicki, P.T.Abrahams and P.J.Hornby, Role of $GABA_A$ receptors in rat hindbrain nuclei controlling gastric motor function. **Neurogastroenterol. and Motility**, 10: 305-313, **1998**.

D.V.Sivarao, Z.K.Krowicki, P.T.Abrahams and P.J.Hornby, Intracisternal antisense oligonucleotides to Thyrotropin releasing hormone receptor mRNA abolish TRH-evoked hind brain gastric motor excitation. **Am. J. Physiol**., 272: G1372-1381, **1997**.

D.V.Sivarao and H.M.Mehendale, 2-Butoxyethanol autoprotection is due to the resiliency of newly formed erythrocytes. **Arch. Toxicol**., 69: 526-532, **1995**.

Abstracts (selected):

Gautam D, Pham J, Burger, R, Sivarao DV. Dynamics of 40 Hz click train elicited gamma: the rodent prefrontal cortex imposes a minimum number of clicks criterion for phase synchrony Soc. Neurosci. Abstr., 2024

Gautam D, Allen, B, Krepps E, Shields, A, Pham, J, Sivarao, D.V. 40 Hz click train related narrow band gamma oscillations: induced or evoked? Soc. Neurosci. Abstr., 2023.

Molina JL, Raza MU, Miyakoshi M, Joshi YB, Clayson PE, Swerdlow NR, Light GA, **Digavalli SV**, Steady State and Harmonic Responses: Cross-Species Similarities and Differential Responses to the NMDA antagonist, Memantine (American Society of Neuropsychopharmacology, 2022).

D. Gautam, M.U. Raza, D.R. Simmons, **S.V. Digavalli**, 40 hz gamma synchrony: association cortices are more vulnerable than primary auditory cortex to NMDA blockade. Soc. Neurosci. Abstr., 385.11, 2022.

M.U. Raza and **S.V.Digavalli**, NMDA antagonism disrupts gamma frequency auditory steady state response (ASSR) as well as harmonics in female SD rats. Soc. Neurosci. Abstr., P901.02, 2021.

M.U. Raza and **S.V.Digavalli**, Clozapine dose-dependently improves 40 Hz auditory steady-state response but partially protects against MK-801-induced disruption. Soc. Neurosci. Abstr., P181.03, 2020.

D.V.Sivarao, Ping Chen, Yili yang, Rick pieschl, Yu-Wen Li and Michael Ahlijanian, NR2B antagonist CP101,606 abolishes pitch-mediated deviance detection in awake rats. Soc. Neurosci. Abstr., 2014.

D.V.Sivarao, P.Chen, Y.Yang, A.Easton, K.Jones, Y.Benitex, E.Schaeffer, I.McDonald, R.Olson, L.Bristow, M.Ahlijanian, An alpha7 agonist (EVP6124) improves mismatch negativity deficit to pitch in neonatal PCP treated rats. Soc. Neurosci. Abstr., A5103, 2013.

D.V. Sivarao, N.J. Lodge and P.Chen, Deviance-based negativity in the conscious rat: modulation by nicotinic agonists. Soc. Neurosci. Abstr., A789.11, 2011.

A. Easton, R. Lidge, K. Jones, Y-W. Li, R. Pieschl, **D.V. Sivarao**, P. Chen, D. King, C. Iwuagwu, J. Macor, R. Zaczek, R. Olson, L.J. Bristow, the novel alpha7 receptor partial agonist BMS-902483 demonstrates robust efficacy across multiple models of cognitive and sensory déficits in schizophrenia (American College of Neuropsychopharmacology, 2011 prodeedings)

A. Easton. K. Jones, **D.V. Sivarao**, P. Chen, J. Corradi, N. Barrazueta, Y-W Li, A. Cacase and L.J.Bristow. The rodent neonatal PCP model recapitulates core features of schizophrenia Soc. Neurosci. Abstr., A507.1, 2010.

D.V.Sivarao, Ping Chen, Francine Healy, Mikhail Frenkel, Robert Zaczek and Nicholas Lodge, MK-801 selectively disrupts while nicotine augments steady state 40 Hz gamma oscillations in the rat auditory cortex Soc. Neurosci. Abstr., A443.22, 2009

D.V.Sivarao, C.Boissard and N.J.Lodge, Nicotine-mediated effects on rat cortical and hippocampal EEG are mediated by □4□2 nicotinic acetylcholine receptors Soc. Neurosci. Abstr., A326.5, 2006

F.H.Healy, N.J.Lodge and **D.V.Sivarao**, A combination of CRF1 and V1B antagonism is required to abolísh restraint stress-induced rise in corticosterone in the female Wistar rat Soc. Neurosci. Abstr., A61.18, 2006

S.W.Langdon, D.Sanchez, N.J.Lodge and **D.V.Sivarao**, Corticotropin releasing factor-induced desynchronization of the electrocorticographic activity in the anesthetized rat is mediated by beta-1 adrenoceptors Soc. Neurosci. Abstr., A61.2, 2006

D.V.Sivarao, K.Krocheski, A.V.Lee and N.J.Lodge, Effect of BMS-223131, a Novel BK-Channel Opener, on Basal and Stress-exacerbated Colonic Motility and Visceral Nociception. Gastroenterology, 126:A747, 2004.

D.V.Sivarao, Xue Dao He, H.L.Mashimo and R.K.Goyal, Pyloric dysfunction in $nNOS^{-/-}$ and W/W^{v} mice. Gastroenterology, 120:A534, 2001.

D.V.Sivarao, H.L.Mashimo and R.K.Goyal, Swallow-induced lower esophageal sphincter relaxation *in vivo* in neuronal nitric oxide gene knock out mice. Gastroenterology, 120:A534, 2001.

D.V.Sivarao, Z.K.Krowicki, T.P.Abrahams, P.J.Hornby, Vagally-regulated gastric function: evidence for kainate and NMDA receptor mediation. Dig.Dis.Sci, 43:A19, 1998.

P.J.Hornby, **D.V.Sivarao**, T.P.Abrahams and D.J.Paul, Medullary raphe and regulation of gastric function. Neurogastroenterol.Motilty, 10:355 1998.

Z.K.Krowicki, **D.V.Sivarao**, and P.J.Hornby, Brain stem nitric oxide protects against stress-induced gastric ulcer formation in the rat. Gastroenterology, 114:4, G4731, 1998

Z.K.Krowicki, **D.V.Sivarao**, T.P.Abrahams and P.J.Hornby, Preganglionic nitrergic neurons in the dorsal vagal motor nucleus evoke gastric relaxation (16th International symposium on gastrointestinal motility, Lorne Victoria, Australia, 1998)

D.V.Sivarao, Z.K.Krowicki and P.J.Hornby, Pretreatment with Thyrotropin releasing hormone receptor antisense oligonucleotides ameliorates cold restraint stress-induced gastric ulceration. Gastroenterology, 112:4, A827, 1997

D.V.Sivarao, Z.K.Krowicki and P.J.Hornby, Gastric motor effects of bicuculline methiodide microinjected into the rat dorsal vagal complex are abolished by the excitatory amino acid antagonist, kynurenic acid. FASEB J, 11:3, A194, 1997

J.M.Moerschbaecher, P.J.Hornby, **D.V.Sivarao**, J.D.Brodkin, and Z.K.Krowicki, Evidence for the involvement of lower brainstem prostanoids in D9-Tetrahydrocannabinoid-evoked gastric motor inhibition and bradycardia in the rat. FASEB J, 11:3, A1176, 1997

Niu, X., Krowicki, Z.K., **Sivarao, D.V**., Hornby, P.J. and Reddix, R.: Cholinergic neural activity is enhanced in streptozotocin-diabetic rats. J. Auton. Nerv. Syst. 1997, 65: 129.

D.V.Sivarao, Z.K.Krowicki and P.J.Hornby, Intracisternal antisense oligonucleotides to TRH receptor: A tool for elucidating central gastric excitatory effects of TRH. A4, Dig. Dis. Sci., 41:9, 1996.

Z.K.Krowicki, **D.V.Sivarao**, J.D.Brodkin, J.M.Moerschbaecher and P.J.Hornby, D9-Tetrahydrocannabinol inhibits gastric motor function through a vagally-dependent mechanism in anesthetized rats. (Fourth Congress of the International Brain-Gut Society, Hungary, 1996.

D.V.Sivarao, Z.K.Krowicki and P.J.Hornby, Intracisternal antisense oligonucleotides to TRH receptor abolish TRH-mediated gastric motor excitation in rats. Soc. Neurosci. Abstr., A10799, 1996.

H.M.Mehendale, S. Chanda, A.Dalu, **D.V.Sivarao**, S.G.Kulkarni, R.S.Mangipudy and P.S.Rao, Tissue repair links infliction of injury and ultimate consequence of toxicity in combination toxicology. (European Conference on Combination Toxicology, Veldhoven, The Netherlands, 1995.)

D.V.Sivarao, Z.K.Krowicki and P.J.Hornby, Microinjection of bicuculline methiodide into the nucleus ambiguus and the nucleus raphe obscurus increases intragastric pressure in rats. Gastroenterology, A1430, 1995.

D.V.Sivarao and H.M.Mehendale, Autoprotection against lethality of 2-butoxyethanol. FASEB Journal 7(4): A4640, 1993.

D.V.Sivarao, T.K.Chakraborty and C.N.Pope, In vitro and in vivo inhibitory profiles of alkyl sulfonyl fluorides on acetylcholine- and neurotoxic esterases. (Annual meeting, Society of Toxicology-South Central Chapter, Memphis, TN, 1992.)

B.Venkateshwarlu, **D.V.Sivarao** and M.C.Prabhakara, Presence of choline esterase activity in chick bile. (Proceedings of the 41st Indian Pharmaceutical Congress, Manipal, India, 1990.)