CURRICULUM VITAE

NAME: Ganesh A. Thakur, Ph.D.

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CITIZENSHIP: U.S. Citizen

I . EDUCATION AND EMPLOYMENT HISTORY:

1. EDUCATION

Year	Degree	Institution
1990-1993	B.S. (Chemistry)	University of Mumbai, India
1993-1995	M.S. (Chemistry)	Indian Institute of Technology (IIT), Mumbai, India
1995-2000	Ph.D. (Organic Chemistry)	Institute of Chemical Technology (ICT), Mumbai, India.

2. POSTDOCTORAL TRAINING

07/2000- 08/2003 Postdoctoral Fellow, Department of Pharmaceutical Sciences, School of Pharmacy, University of Connecticut, Storrs, CT.

3. ACADEMIC APPOINTMENTS

09/2003-10/2004 Assistant Research Professor, Department of Pharmaceutical Sciences, School of Pharmacy, University of Connecticut, Storrs, CT.

11/2004-06/2005 Senior Research Scientist, Center for Drug Discovery, NEU, Boston, MA, USA

07/2005- 08/2010 Assistant Research Professor, Center for Drug Discovery, NEU, Boston, MA, USA.

09/2010- 08/2016 Assistant Professor (Tenure-track), Department of Pharmaceutical Sciences, Northeastern University, Boston, MA, USA.

09/2016 – 06/2021 Associate Professor (Tenured), Department of Pharmaceutical Sciences, Northeastern University, Boston, MA, USA.

07/2017-06/2018 Vice Chair, Department of Pharmaceutical Sciences, Northeastern University, Boston, MA.

07/2021- current Professor, Department of Pharmaceutical Sciences, Northeastern University, Boston, MA, USA.

07/2018- 06/2020 Interim Chair, Department of Pharmaceutical Sciences, Northeastern University, Boston, MA.

07/2020- current Chairman, Department of Pharmaceutical Science, Northeastern University, Boston, MA.

4. AWARDS AND HONORS

1995 Recipient of Fellowship of University Grant Commission (UGC, India) as a Junior Research Fellow

1998 Recipient of Fellowship of University Grant Commission (UGC, India) as a Senior Research Fellow

1998 Recipient of "Best Paper Presentation Award" in XIVth Carbohydrate Conference Conducted by Indian Institute of Technology (IIT) in collaboration with Association of Carbohydrate Chemists & Technologists, India.

2009 Early Career Development Award in Chemistry of Drug Abuse and Addiction (ECHEM) from NIDA.

2011 Excellence in Teaching Award, School of Pharmacy, Northeastern University, Boston, MA 02115

2014 The Schumacher Award for Excellence in Research, Northeastern University, Boston, MA 02115

2015 RISE (Research, Innovation, Scholarship, and Expo) Award in Health Sciences, NEU, Boston, 2015 (Graduate Student: Abhijit Kulkarni)

2015 Nominated for Northeastern University's University-wide "Excellence in Teaching Award."

2015 Nominated for "Bouve College Distinguished Educator Award" for the year 2015.

2015 Guest Speaker, Rho Chi Society's Annual Lecture Series, 2015.

2018 Best Patent Award from the Boston Patent Law Association (BPLA). Patent Title: Allosteric Modulators of CB1 Cannabinoid Receptor. *United States Patent #9,926,275 B2

2019 Excellence in Teaching Award, School of Pharmacy, Northeastern University, Boston, MA 02115

2022 RISE (Research, Innovation, Scholarship, and Expo) Award in Health Sciences, NEU, Boston, MA 02115 (Graduate Student: Lucas Cantwell)

2023 Hind Rattan Award, Given by the NRI Welfare Society of India

2023 Distinguished Mentor Award, Bouve College of Health Sciences, Northeastern University, Boston, MA.

5. IN NEWS/MEDIA:

1) "Last Dance with Mary Jane" http://www.northeastern.edu/news/2014/03/thakur/
2) "A Promising Alternative to Medical Marijuana: http://www.northeastern.edu/news/2014/09/promising-alternative-medical-marijuana/
3) "Smarten Up" http://www.northeastern.edu/news/2014/03/smarten-up/
4) "Local researchers work to eliminate high from medical marijuana" http://boston.cbslocal.com/tag/ganesh-thakur/
5) "Hope the prescription can mimic marijuana's benefits" https://www.bostonglobe.com/lifestyle/health-wellness/2014/11/17/some-parents-children-who-have-seizures-are-hoping-that-prescription-drug-will-able-mimic-marijuana-benefits/KoGizuhG99EO3w0RkyOrcO/story.html
6) Discovering drug treatments for alcohol addiction (Project with an undergraduate student) https://news.northeastern.edu/2017/04/discovering-drug-treatments-for-alcohol-addiction/
7) Novel Compound Alleviates Hard-to-Treat Pain in Mice (NIH Highlight) https://www.drugabuse.gov/news-events/nida-notes/2018/06/novel-compound-alleviates-hard-to-treat-pain-in-mice

8) "The drug could stop the opioid epidemic"
https://news.northeastern.edu/2018/12/05/this-drug-could-stop-the-opioid-epidemic/

II. RESEARCH AND SCHOLARSHIP:

GOOGLE SCHOLR ANALYSIS: (as of 03/23/2023)**: H-index = 40**; **i10-index = 90**; Total Citations = **4422;**

Total publications = **115**; Manuscripts under review = **1**; Book Chapters = **4**; Total patents = **8**.

A. PEER-REVIEWED PUBLICATIONS (IN CHRONOLOGICAL ORDER)

1. Rao, P. S., **Thakur, G.A.**, Lahiri, G. K., Synthesis, characterization and redox properties of ruthenium (II) phenolato Schiff base mixed ligand complexes. *Indian Journal of Chemistry, Sect. A: Inorganic, Bio-inorganic, Physical, Theoretical and Analytical Chemistry*, **1996**, 35A (11), 946-951.

2. Santra, B. K., **Thakur G. A.**, Ghosh, P., Pramanik, A., Lahiri, G. K., A novel example of metal-mediated aromatic thiolation in ruthenium complex: crystal structure of RuII (SC6H4N:NC5H4N)2. *Inorganic Chemistry*, **1996**, 35(10), 3050-3052.

3. **Thakur, G. A.**, Narayanswami, K., Lahiri, G. K., Synthesis, characterization and redox properties of ruthenium (II) dithiocarbonato complexes having 2,2'-bipyridine co-ligands. *Indian Journal of Chemistry, Section A: Inorganic, Bio-inorganic, Physical, Theoretical and Analytical Chemistry*, **1996**, 35A (5), 379-384.

4. Nikas, S. P., **Thakur, G. A.**, Makriyannis, A., A convenient and effective synthesis of 3-(3,5-Dimethoxyphenyl)propanal. *Synthetic Communications*, **2002**, 32(11), 1751-1756.

5. Palmer, S., **Thakur, G. A.**, Makriyannis, A., Cannabinergic ligands. *Chemistry and Physics of Lipids*, **2002**, 121(1-2), 3-19.

6. Nikas, S. P., **Thakur, G. A.**, Makriyannis, A., Synthesis of side chain specifically deuterated(-)-Δ^9-tetrahydrocannabinoids. *Journal of Labelled Compounds and Radiopharmaceuticals*, **2002**, 45, 1-12.

7. Nikas, S. P., **Thakur, G. A.**, Makriyannis, A., Regiospecifically deuterated (-)-Δ^9-tetrahydrocannabivarins. *J. Chem. Soc. Perkin. Trans.*1, **2002**, 22, 2544-2548.

8. **Thakur, G. A.,** Palmer, S., Harrington, P. E., Stergiades, I. A., Tius, M. A., Makriyannis, A., Enantiomeric resolution of a novel chiral cannabinoid receptor ligand. *Journal of Biochemical and Biophysical Methods*, **2002**, 54(1-3), 415-422.

9. Lu, D., Meng, Z., **Thakur, G. A.**, Fan, P., Steed, J., Tartal, C. L., Hurst, D. P., Reggio, P. H., Deschamps, J. R., Parrish, D. A., George, C., Jarbe, T. U., Lamb, R. J., Makriyannis, A., Adamantyl Cannabinoids: A novel class of cannabinergic ligands. *Journal of Medicinal Chemistry*, **2005**, 48 (14), 4576-4585.

10. McLaughlin, P. J., Lu, D., Winston, K. M., **Thakur, G. A.**, Swezey, L. A., Makriyannis, A., Salamone, J. D., Behavioral effects of the novel cannabinoid CB1 agonist AM411. *Pharmacology Biochemistry and Behavior*, **2005**, 81(1), 78-88.

11. McLaughlin, P. J., Brown, C. M., Winston, K. M., **Thakur, G. A.**, Lu, D., Makriyannis, A., Salamone, J. D., The novel cannabinoid agonist AM 411 produces a biphasic effect on accuracy in a visual target detection task in rats. *Behavioral Pharmacology*, **2005**, 16(5-6), 477-486.

12. Picone, R. P., Khanolkar, A. D., Xu, W., Ayotte L. A., **Thakur, G. A.**, Hurst, D. P., Abood, M. E., Reggio, P. H., Fourier, D. J., Makriyannis, A., (-)-7'-Isothiocyanato-11-hydroxy-1',1'-dimethylheptylhexahydrocannabinol (AM841), a high-affinity electrophilic ligand, interacts covalently with a cysteine in helix six and activates the CB1 cannabinoid receptor. *Molecular Pharmacology*, **2005**, 68 (6), 1623-1635.

13. **Thakur, G. A.**, Nikas, S. P., Makriyannis, A., CB1 Cannabinoid receptor ligands. *Mini Reviews in Medicinal Chemistry*, **2005**, 5(7), 631-640.

14. **Thakur, G. A.**, Duclos, R.I., Jr., Makriyannis, A., Natural cannabinoids: templates for drug discovery. *Life Sciences*, **2005**, 78(5), 454-466.

15. Pavlopoulos, S., **Thakur, G. A.**, Nikas, S. P., Makriyannis, A., Cannabinoid receptors as therapeutic targets. *Curr. Pharm. Design*, **2006**, 12(14), 1751-1769.

16. Kapur, A., Hurst, D. P., Fleischer, D., Whitnell, R., **Thakur, G. A.**, Makriyannis, A., Reggio, P. H., Abood, M. E., Mutation studies of Ser7.39 and Ser2.60 in the human CB_1 cannabinoid receptor: evidence for a serine induced bend in CB_1 transmembrane helix 7. *Molecular Pharmacology*, **2007**, 71(6), 1512-1524.

17. Nikas, S. P., **Thakur, G. A.**, Parrish, D. A., Alapafuja, S. O., Huestis, M., Makriyannis, A., A concise methodology for the synthesis of (−)-Δ^9-tetrahydrocannabinol and (−)-Δ^9-tetrahydrocannabivarin metabolites and their regiospecifically deuterated analogs. *Tetrahedron*, **2007**, 63, 8112-8123.

18. Khanolkar, A. D., Lu, D., Ibrahim, M., Duclos, R.I. Jr., **Thakur, G. A.**, Malan, T. P. Jr., Porreca, F., Veerappan, V., Tian, X., George, C., Parrish, D. A., Papahatjis, D. P., Makriyannis, A., Cannabilactones: a novel class of CB2 selective agonists with peripheral analgesic activity. *Journal of Medicinal Chemistry*, **2007**, 50 (26), 6493-6500.

19. Sink, K.S., McLaughlin, P.J., Wood, J.A., Brown, C., Fan, P., Vemuri, V.K., Peng, Y., Olzewska, T., **Thakur, G.A.**, Makriyannis, A., Parker, L.A., Salamone, J.D., The novel cannabinoid CB1 receptor neutral antagonist AM4113 suppresses food intake and food-reinforced behavior but does not induce signs of nausea in rats. *Neuropsychopharmacology*, **2008**, 33(4), 946-955.

20. Kapur, A., Samaniego, P., **Thakur, G. A.**, Makriyannis, A., Abood, M. E., Mapping the structural requirements in the CB1 cannabinoid receptor transmembrane helix II for signal transduction. *Journal of Pharmacology and Experimental Therapeutics*, **2008**, 325 (1), 341-348.

21. Bergman, J., Delatte, M. S., Paronis, C. A., Vemuri, V. K., **Thakur, G. A.**, Makriyannis, A., Some effects of CB1 antagonists with inverse agonist and neutral biochemical properties. *Physiology & Behavior*, **2008**, 93(4-5), 666-670.

22. Rahn, E. J., Zvonok, A. M., **Thakur, G. A.**, Khanolkar, A. D., Makriyannis, A., Hohmann, A. G., Selective activation of cannabinoid CB_2 receptors suppresses neuropathic nociception induced by treatment with the chemotherapeutic agent paclitaxel in rats. *Journal of Pharmacology and Experimental Therapeutics*, **2008**, 327(2), 584-591.

23. Pei, Y., Mercier, R. W., Anday, J. K., **Thakur, G. A.**, Zvonok, A. M., Reggio, P. H., Janero, D. R., Makriyannis, A., Ligand-binding architecture of human CB2 cannabinoid receptor: evidence for a receptor subtype-specific binding motif and modeling GPCR activation. *Chemistry & Biology*, **2008**, 15(11), 1207-1219.

24. Sink K. S., Segovia K. N., Nunes E. J., Collins L. E., Vemuri V. K., **Thakur G. A.**, Makriyannis A., Salamone J. D. Intracerebroventricular administration of cannabinoid CB1 receptor antagonists AM251 and AM4113 fails to alter food-reinforced behavior in rats. *Psychopharmacology* (Berl.), **2009**, 206(2), 223-232.

25. **Thakur GA***, Tichkule, R., Bajaj, S., Makriyannis, A. R Recent advances in cannabinoid receptor agonist. *Expert Opinion on Therapeutic Patents*. **2009**, 19 (12), 1647-73.

26. Dixon, D. D., Sethumadhavan, D., Benneche, T., Banaag, A. R., Tius, M. A., **Thakur, G. A.**, Bowman, A., Wood, J., Makriyannis, A. Heteroadamantyl Cannabinoids. *Journal of Medicinal Chemistry*, **2010**, 53(15), 5656-66.

27. Rahn, E., **Thakur, G. A.**, Zvonok, A. M., Vemuri, V. K., Makriaynnis, A., Hohmann, A. G., Pharmacological characterization of putative cannabinoid CB2 agonist from the cannabilactone class: Antinociception without central nervous system side-effects. *Pharmacology, Biochemistry & Behavior*, **2011**, 98, 493-502.

28. Teng, H.[1], **Thakur, G. A.[1]**, Makriyanis, A. Conformationally restricted analogs of BAY59-3074 as novel cannabinoid receptor ligands. *Bioorganic & Medicinal Chemistry Letters*, **2011**, 21, 5999-6002. (**[1]** Equal author contribution)

29. Szymanski,D. W., Papanastasiou, M., Melchior, K., Zvonok, N., Mercier, R. W., Janero, D. R., **Thakur, G. A.**, Cha, S., Wu, B., Karger, B., Makriyannis, A. Mass spectrometry-based proteomics of human cannabinoid receptor 2: covalent cysteine 6.47(257)-ligand interaction affording megagonist receptor activation, *Journal of Proteome Research*, **2011**, 10, 4789-4798.

30. Wilkerson, J.L., Gentry, K.R., Dengler, E.C., Wallace, J.A., Kerwin, A.A., Kuhn, M.N., Zvonok, A.M., **Thakur, G.A.,** Makriyannis, A., Milligan, E.D. Immunofluorescent spectral analysis reveals the intrathecal cannabinoid agonist, AM1241, produces spinal anti-inflammatory cytokine responses in neuropathic rats exhibiting relief from allodynia. *Brain and Behavior*, **2012**, 2(2), 155-177.

31. Wilkerson, J.L., Gentry, K.R., Dengler, E.C., Wallace, J.A., Kerwin, A.A., Armijo, L.M., Kuhn, M.N., **Thakur, G.A.,** Makriyannis, A., Milligan, E.D., Intrathecal cannabilactone CB(2)R agonist, AM1710, controls pathological pain and restores basal cytokine levels. *Pain*, **2012**, 153(5), 1091-1106.

32. Dixon, D.D., Tius, M.A., **Thakur,** G.A., Zhou, H., Bowman, A.L., Shukla, V.G., Peng, Y., Makriyannis, A. C3-Heteroaroyl cannabinoids as photolabeling ligands for the CB2 cannabinoid receptor. *Bioorganic & Medicinal Chemistry Letters*, **2012**, 22(16), 5322-5325.

33. Deng, L., Guindon, J., Vemuri, K.V., **Thakur, G.A.**, White, F.A., Makriyannis, A., Hohmann, A.The maintenance of cisplatin- and paclitaxel-induced mechanical and cold allodynia is suppressed by cannabinoid CB2 receptor activation and independent of CXCR4 signaling in models of chemotherapy-induced peripheral neuropathy. *Molecular Pain*, **2012**, 8: 71.

34. Desai, R.V., **Thakur, G.A.**, Vemuri, K.V., Bajaj, S.B., Makriyannis, A., Bergman, A. Analysis of tolerance and behavioral/physical dependence during chronic CB1 agonist treatment: effects of CB1 agonists, antagonists, and non-cannabinoid drugs. *Journal of Pharmacology and Experimental Therapeutics*, **2013**, *344*, 319-328.

35. Paronis, C.A., **Thakur, G.A.**, Bajaj, S.B., Nikas, S.P., Vemuri, K.V., Makriyannis, A., Bergman, J. Diuretic Effects of Cannabinoids. *Journal of Pharmacology and Experimental Therapeutics*, **2013**, *314*, 8-14.

36. **Thakur, G.A.*,** Bajaj, S.B., Paronis, C.A., Peng, Y., Bowman, A.L. Barak, L., Caron, M.G. Parrish, D.A., Deschamps, J., Makriyannis, A. Novel Adamantyl Cannabinoids as CB1 Receptor Probes, *Journal of Medicinal Chemistry,* **2013**, 6(10):3904-3921.

37. McLaughlin, P.J., **Thakur, G. A.**, McClure, E.D., Brown, C.M., Winston, K.M., Wood, J.T., Makriyannis, A., Salamone, J.D. Behavioral effects of the novel potent cannabinoid CB1 agonist AM4054, *Pharmacology Biochemistry and Behavior*. **2013**, 119:16-22.

38. Miller R.L., **Thakur G. A.**, Stewart W.N., Bow J.P., Bajaj S., Makriyannis A., McLaughlin P.J. Effects of a novel CB1 agonist on visual attention in male rats: role of strategy and expectancy in task accuracy. *Experimental & Clinical Psychopharmacology* **2013**; 21(5):416-25.

39. Kangas BD, Delatte M.S., Vemuri V.K., **Thakur G.A.**, Nikas SP, Subramanian KV, Shukla VG, Makriyannis A, Bergman J. Cannabinoid discrimination and antagonism by CB(1) neutral and inverse agonist antagonists. *Exp Clin Psychopharmacology*, **2013**, 344(3):561-567.

40. Chopda, G. R., Vemuri, V. K., Sharma, R., **Thakur, G.A.,** Makriyannis, A., Paronis, C.A. Diuretic effects of cannabinoid agonists in mice. *European Journal of Pharmacology*, **2013**; 721(1-3):64-69

41. Kulkarni AR, **Thakur G.A.***. Microwave-assisted Expeditious and Efficient Synthesis of Cyclopentene Ring-fused Tetrahydroquinoline Derivatives Using Three-component Povarov Reaction. *Tetrahedron Letters*, **2013**, 54(48), 6592-6595.

42. Papke RL, Horenstein NA, Kulkarni AR, Stokes C, Corrie LW, Maeng CY, **Thakur G.A.***. The activity of GAT107, an allosteric activator and positive modulator of α7 nAChR, is regulated by aromatic amino acids that span the subunit interface. *Journal of Biological Chemistry*, **2014**, 289(7), 4515-4517.

43. **Thakur G.A.***, Kulkarni AR, Deschamps JR, Papke RL. Expeditious Synthesis, Enantiomeric Resolution, and Enantiomer Functional Characterization of (4-(4-Bromophenyl)-3a,4,5,9b-tetrahydro-3H-cyclopenta[c]quinoline-8-sulfonamide (4BP-TQS): An Allosteric Agonist-Positive Allosteric Modulator of α7 Nicotinic Acetylcholine Receptors. *J. Med. Chem.* **2013**; 56(21):8943-8947.

44. Sharma R, Nikas SP, Paronis CA, Wood JT, Halikhedkar A, Guo JJ, **Thakur G.A.**, Kulkarni S, Benchama O, Raghav JG, Gifford RS, Järbe TU, Bergman J, Makriyannis A. Controlled-detoxification Cannabinergic Ligands. *Journal of Medicinal Chemistry,* **2013**, 56(24):10142-10157.

45. Gamage, T., Ignatowska-Jankowska, B. M., Abdelrahman, M., Trembleau. L., **Thakur, G. A.,** Tichkule, R. B. ; Poklis, J. ; Ross, R. A., Pertwee, R. G. and Lichtman, A. H. Investigation of the *in vivo* pharmacological effects of the CB1 receptor allosteric modulator Org-27569. *Behavioral Pharmacology*, **2014** Apr; 25(2):182-185.

46. Rahn, E.J., Deng, L., **Thakur, G.A.,** Vemuri, V.K., Zvonok, A. M., Lai, Y. Y. Makriyannis, A. and Hohmann, A.G. Prophylactic cannabinoid administration blocks the development of paclitaxel-induced neuropathic nociception during analgesic treatment and following cessation of drug delivery *Molecular Pain*. **2014**, 10(1):27; doi:10.1186/1744-8069-10-27.

47. Fichna, J., Bawa, M., **Thakur, G.A.**, Tichkule, R., Makriyannis, A., McCafferty, D.M., Sharkey, K.A., Storr, M. Cannabinoids alleviate experimentally induced intestinal inflammation by acting at central and peripheral receptors. *PLoS One*. **2014** Oct 2;9(10): e109115.

48. Nikas, S.P., Sharma R., Paronis, C.A., Kulkarni, S., **Thakur G.A.**, Hurst, D., Wood, J.T., Gifford, R.S., Rajarshi, G., Liu, Y., Raghav, J.G., Guo, J.J., Järbe, T.U., Reggio, P.H., Bergman, J., Makriyannis, A. Probing the Carboxyester Side Chain in Controlled Deactivation (-)-Δ^8-Tetrahydrocannabinols. *Journal of Medicinal Chemistry*. **2015,** 58(2), 665-681.

49. Keenan, C.M, Storr, M.A., **Thakur, G.A.,** Wood, J.T., Wager-Miller J., Straiker, A., Eno, M.R., Nikas S.P., Bashashati, M., Hu, H., Mackie, K., Makriyannis, A. and Sharkey, K.A. AM841, a covalent cannabinoid ligand, powerfully slows gastrointestinal motility in normal and stressed mice in a peripherally-restricted manner. *British Journal of Pharmacology*, **2015**, 172(9), 2406-2418.

50. Lee, W.H.; Xu, Z.; Ashpole, N.; Hudmon, A.; Kulkarni, P.M.; **Thakur, G.A.**; Lai, Y.; Hohmann, A.H. Small molecule inhibitors of protein-protein interaction as novel analgesics; *Neuropharmacology*, **2015**; 97:464-475.

51. Abalo, R.; Chen, C.; Vera, G.; Fichna, J.; **Thakur, G. A**.; López-Pérez, A. E., Makriyannis, A.; Martín-Fontelles, M. I.; Storr, M. In vitro and non-invasive in vivo effects of the cannabinoid-1 receptor agonist AM841 on gastrointestinal motor function in the rat. *Neurogastroenterology and Motility*, **2015**, 27(12), 1721-1735.

52. Papke R.L., Bagdas, D., Kulkarni, A.R., Gould, T., AlSharari, S.D., **Thakur, G. A.**, Damaj, M. I. The analgesic-like properties of the alpha7 nAChR silent agonist NS6740 is associated with non-conducting conformations of the receptor. *Neuropharmacology*, **2015**; 91:34-42.

53. Kulkarni, P.M., Kulkarni, A.R., Korde A., Tichkule, R.B., Laprairie R.B., Denovan-Wright E.M., Zhou H., Janero D.R., Zvonok N., Makriyannis A., Cascio M.G., Pertwee R.G., **Thakur G.A.***. Novel Electrophilic and Photoaffinity Covalent Probes for Mapping the Cannabinoid 1 Receptor Allosteric Site(s). *Journal of Medicinal Chemistry*, **2016** ;59(1):44-60.
***This manuscript was highlighted as the Editor's choice article.**

54. Horenstein, N.A., Papke, R.L., Kulkarni, A.R., Chaturbhuj, G.U., Stokes, C., Manther, K., **Thakur GA*.** Critical Molecular Determinants of α7 Nicotinic Acetylcholine Receptor Allosteric Activation: Separation of Direct Allosteric Activation and Positive Allosteric Modulation. *Journal of Biological Chemistry*, **2016** Mar 4;291(10):5049-5067.

55. Laprairie, R.B., Kulkarni, A.R., Kulkarni, P.M., Hurst, D.P., Lynch, D., Reggio, P.H., Janero, D.R., Pertwee, R.G., Stevenson, L.A., Kelly, M.E., Denovan-Wright, E.M., **Thakur, G.A.*.** Mapping Cannabinoid 1 Receptor Allosteric Site(s): Critical Molecular Determinant and Signaling Profile of GAT100, a Novel, Potent, and Irreversibly Binding Probe. *ACS Chemical Neuroscience*, **2016**;7(6):776-798.

56. Smith, A.E., Xu, Z., Lai, Y.Y., Kulkarni, P.M., **Thakur G.A.**, Hohmann A.G., Crystal J.D. Source memory in rats is impaired by an NMDA receptor antagonist but not by PSD95-nNOS protein-protein interaction inhibitors. *Behavioral Brain Research*, **2016**; 305:23-29.

57. Chopda, G.R., Parge, V., **Thakur, G.A.**, Gatley, S.J., Makriyannis, A., Paronis, C.A. Tolerance to the Diuretic Effects of Cannabinoids and Cross-Tolerance to κ-Opioid Agonist in THC-Treated Mice. *Journal of Pharmacology and Experimental Therapeutics.* **2016**; 358(2):334-341.

58. Bagdas D.*, Wilkerson J.L., Kulkarni A., Toma W., AlSharari S., Gul Z., Lichtman A.H., Papke R.L., **Thakur G.A.*,** Damaj M.I. The α7 nicotinic receptor dual allosteric agonist and positive allosteric modulator GAT107 reverses nociception in mouse models of inflammatory and neuropathic pain. *British Journal of Pharmacology*, **2016,**173(16):2506-2520.

59. Järbe, T.U., LeMay, B.J., **Thakur, G.A.**, Makriyannis, A. A high efficacy cannabinergics ligand (AM4054) used as a discriminative stimulus: Generalization to other adamantyl analogs and Δ^9-THC in rats. *Pharmacology Biochemistry and Behavior*, **2016**; 148:46-52.

60. Janero D.R., **Thakur G.A.***. Leveraging allostery to improve G protein-coupled receptor (GPCR)-directed therapeutics: cannabinoid receptor 1 as discovery target. *Expert Opinion on Drug Discovery*, **2016**;11(12):1223-1237.

61. Kulkarni A.R., Garai S., **Thakur G.A.*.** Scalable, One-Pot, Microwave-Accelerated Tandem Synthesis of Unsymmetrical Urea Derivatives. *Journal of Organic Chemistry*, **2017**; 82(2):992-999.

62. Laprairie R.B., Kulkarni P.M., Deschamps J.R., Kelly M.E.M., Janero D.R., Cascio M.G., Stevenson L.A., Pertwee R.G., Kenakin T.P., Denovan-Wright E.M., **Thakur GA*.** Enantiospecific Allosteric Modulation of Cannabinoid 1 Receptor. *ACS Chemical Neuroscience*, **2017,** 8(6):1188-1203.

63. Zhou, H., Peng, Y., Halikhedkar, A., Fan, P., Janero, D.R., **Thakur, G.A.**, Mercier, R.W., Sun, X., Ma, X., Makriyannis. A. Human Cannabinoid Receptor 2 Ligand-Interaction Motif: Transmembrane Helix 2 Cysteine, C2.59(89), as Determinant of Classical Cannabinoid Agonist Activity and Binding Pose. *ACS Chemical Neuroscience*, **2017**; 8(6):1338-1347.

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8. A comparision of the novel CB1 agonist AM411 with the muscarinic antagonist Scopolamine a spatial discrimination task in rats by P. J. McLaughlin, K. M. Winston, L. A. Swezey, D. Lu, **G. A. Thakur**, A. Makriyannis, J. D. Salomone, Washington, DC: Society for neuroscience, 2004.

9. Some behavioral effects of the novel CB1-receptor agonist AM 411 in squirrel monkeys, by M. S. Delatte, M. Zielstroff, **G. Thakur**, A. Makriyannis, and J. Bergman, CPDD 67th annual meeting, Orlando, FL, June 18-23, 2005. McLean Hospital, Belmont, MA and University of Connecticut, Storrs, CT.

10. Synthesis and SAR of CB1 selective classical/non-classical hybrid cannabinoids, **Ganesh A. Thakur** and Alexandros Makriyannis, 229th ACS National Meeting, San Diego, CA, United States, March 13-17, 2005.

11. A ligand based structural biology approach for the characterization of the cannabinoid receptor binding domains, by John Williamns, Suma Yaddanapudi, Wei Xu, **Ganesh A. Thakur**, Nikolai Zvonok, Paul Vouros, Alexandros Makriyannis, 54th ASMS Conference on mass Spectrometry, in May-June 2006, Seattle, Washington. *FASEB J.* 2007 21:631.6.

12. Physiological and behavioral effects of novel CB1-receptor agonists AM 411 and AM 4054 in monkeys, by M.S. Delatte, **G.A. Thakur**, M. Riolo, A. Makriyannis and J. Bergman, Experimental Biology (Advancing the biomedical frontier), San Francisco, California, April 1-5, 2006.

13. Physiological and behavioral effects of novel CB1-receptor agonists AM 411 and AM 4054 in monkeys, by Marcus S Delatte, **G.A. Thakur**, Matthew Riolo, Alexandros Makriyannis, and Jack Bergman, Experimental Biology Annual Meeting, Washington, D.C. April 28-May2, 2007 *FASEB J.* 2006 20:A682.

14. Discriminative stimulus effects of methamphetamine and in vivo microdialysis in rat, by R. I. Desai, C. A. Paronis, A. Makriyannis, **G. A. Thakur**, and J. Bergman, Experimental Biology Annual Meeting, Washington, D.C. April 28-May2, 2007, *FASEB J.* 2007 21:715.3

15. Partial agonist and antagonist effects of Δ^9-tetrahydrocannabinol (Δ^9THC) in Rats, by Carol A Paronis; **Ganesh A Thakur**; Kiran Vemuri; Alex Makriyannis; Jack Bergman, Experimental Biology Annual Meeting, Washington, D.C. April 28-May2, 2007, *FASEB J.* 2007 21:562.2

16. Effects of a Selective Cannabinoid Agonist and Antagonist on Body Temperature in Rats, by Carol A Paronis; **Ganesh A Thakur**; Kiran Vemuri; Alex Makriyannis; Jack Bergman, Experimental Biology Annual Meeting, Washington, D.C. April 28-May 2, 2007, *FASEB J.* 2007 21:562.1

17. Synthesis of (-)-Δ^9-tetrahydrocannabinol and (-)-Δ^9-tetrahydrocannabivarin metabolites and their regiospecifically deuterated analogs, by Nikas, Spyros P.; **Thakur, Ganesh A.**; Parish, Damon; Alapafuja, Shakiru O.; Huestis, Marilyn A.; Makriyannis, Alexandros. Abstracts of Papers, 234th ACS National Meeting, Boston, MA, United States, August 19-23, 2007, MEDI-031

18. Diuretic effect of cannabinoid agonists, by Carol A. Paronis, J. Martin, J. Bergman, **G. A. Thakur**, A. Zvonok and A. Makriyannis 12th European Behavioural Pharmacology Society, Tübingen, Germany, Aug 31-Sept 03, 2007.

19. New and efficient synthesis of regiospecifically deuterated covalent probes for cannabinoid receptors, by **Thakur Ganesh A.**; Sharma, Rishi; Makriyannis, Alexandros, 240th ACS National Meeting, Boston, MA, United States, August 22-26, 2010, MEDI 63.

20. Hybrid adamantyl cannabinoids by Bajaj, Shama; **Thakur G.A.**; Tichkule, Ritesh; Makriyannis, Alexandros, 240th ACS National Meeting, Boston, MA, United States, August 22-26, 2010, MEDI-370.

21. Structure activity relationship study of BAY 59-3074, a partial agonist of the CB1 cannabinoid receptor by Teng, Heidi; **Thakur, Ganesh A.**; Makriyannis, Alexandros. 240th ACS National Meeting, Boston, MA, United States, August 22-26, 2010, MEDI-353.

22. Conformationally constrained analogs of BAY 59-3074, a CB1 cannabinoid receptor partial agonist by Teng, Heidi; **Thakur, G. A**., Makriyannis, Alexandros. 240th ACS National Meeting, Boston, MA, United States, August 22-26, 2010, MEDI-216.

23. The cannabinoid-1 (CB1) agonist AM841 slows GI motility in the rat by peripheral actions. *R. Abalo*, C. Chen, G Vera, M.A. Castillo, J. Fichna, **G.A. Thakur**, A. Makriyannis, M.I. Martín, M Storr. Neurogastroenterology and Motility Joint International meeting (NGM), August 26-29, 2010 Boston, MA.

24. Cannabinoid CB2 receptors activation suppresses neuropathic pain evoked by the chemotherapeutic agent cisplatin in rats by Josée Guindon, Spyridon Nikas, **Ganesh A. Thakur**, V. Kiran Vemuri, Alexandros Makriyannis and Andrea G. Hohmann. 21st Annual symposium of the International Cannabinoid Research Society, St. Charles, IL, USA, July 05-10, 2011.

25. Intrathecal cannabinoid receptor 2 (CB2) agonists alter spinal and dorsal root ganglion inflammatory factors in neuropathic rats, by Jenny L. Wilkerson, Ellen C. Dengler, James A. Wallace, Audra A. Kerwin, **Ganesh A. Thakur**, Alexandros Makriyannis, and Erin D. Milligan. 21st Annual symposium of the International Cannabinoid Research Society, St. Charles, IL, USA, July 05-10, 2011.

26. Amino acids D2.63 and K373 are important for maintaining the CB1R binding pocket, while residues K3.28 and S1.39 are involved in selective ligand recognition, by Jahan P. Marcu, Ankur Kapur, Megan Trznadel, Patricia H. Reggio, **Ganesh A. Thakur**, Alexandros Makriyannis, and Mary E. Abood. 21st

Annual symposium of the International Cannabinoid Research Society, St. Charles, IL, USA, July 05-10, 2011.

27. Cannabinoid and κ-opioid mediated diuresis in rats, by Carol A. Paronis, **Ganesh A. Thakur**, and Alexandros Makriyannis. 21st Annual symposium of the International Cannabinoid Research Society, St. Charles, IL, USA, July 05-10, 2011.

28. Diuresis: a simple and efficient measure to screen cannabinoids, by Girish R Chopda, Joseph B Anderson, **Ganesh A Thakur**, Alexandros Makriyannis, and Carol A Paronis. 21st Annual symposium of the International Cannabinoid Research Society, St. Charles, IL, USA, July 05-10, 2011.

29. The selective cannabinoid receptor 2 (CB_2R) agonist AM1710 acts independently of cannabinod receptor 1 (CB_1R) responses in neuropathic mice. Jenny L. Wilkerson, Ellen C. Dengler, James A. Wallace, Audra A. Kerwin, Lauren B. Alberti, Brandi Bowman, Pamela S. Platero, **Ganesh A. Thakur**, Alexandros Makriyannis, Erin D. Milligan. Society of Neuroscience meeting, Washington, D.C., USA, November 12-16, 2011.

30. Selective activation of cannabinoid CB2 receptors suppresses chemotherapy-induced neuropathy independent of CB1 or CXCR4 receptor signaling. Deng, L., Guindon, J., Makie, K., White, F., **Thakur, G.A**., Makriyannis, A., and Hohmann, A.G. 22nd Annual symposium of the International Cannabinoid Research Society, Freiburg, Germany, July 22-27, 2012.

31. Selective activation of cannabinoid CB2 receptors suppresses the maintenance of chemotherapy-induced neuropathy and is independent of CB1 signaling. Deng, L., Guindon, J., **Thakur, G.A**., Makriyannis, A., Mackie, K., and Hohmann, A.G. Society for Neuroscience, 2012.
32. Positive Allosteric Modulators of CB1 as Pharmacotherapy of Anorexia Nervosa. Kulkarni, P. M., Jarbe, T.U., Goldberg, S., Barbarich-Marsteller, N., **Thakur, G. A.**, RISE, NEU, Boston, 2013

33. Identification of a Potent Modulator of Nicotinic α7Acetylcholine Receptors for the Treatment of Cognitive Disorders. Kulkarni, A. R., Deschamps, J.R., Papke R.L and **Thakur, G. A.** RISE, Northeastern Univ. Boston, March 22nd, 2013

34. Novel positive allosteric modulators of CB1 cannabinoid receptor for the treatment of anorexia nervosa By Kulkarni, Pushkar M.; Jarbe, Torbjorn; Goldberg, Steven; Barbarich-Marsteller, Nicole r; **Thakur, Ganesh A.** From Abstracts of Papers, 246th ACS National Meeting & Exposition, Indianapolis, IN, United States, September 8-12, 2013 (2013), MEDI-84.

35. Stereochemical requirements within the tetrahydroquinoline scaffold for the positive allosteric modulation at alpha7 nicotinic acetylcholine receptors. Kulkarni, Abhijit R.; Deschamps, Jeffrey; Papke, Roger L.; **Thakur, Ganesh A.** From Abstracts of Papers, 246th ACS National Meeting & Exposition, Indianapolis, IN, United States, September 8-12, 2013 (2013), MEDI-83.

36. Mutations of α7 nAChR W55 enhance the allosteric agonism of GAT107, the active isomer of 4BP-TQS, and decouple interactions between orthosteric and allosteric sites. R. L. Papke, N. A. Horenstein, C. Stokes, Cheol-Young Maeng, A. R. Kulkarni, and **G. A. Thakur**, Society for Neuroscience, New Orleans, LA, November 10, 2013.

37. Modifying CB1 receptor signaling to reduce IOP in a mouse model of ocular hypertension. Elizabeth A. Cairns, Michele L. Archibald, Alex J. Straiker, Pushkar M. Kulkarni, **Ganesh A. Thakur**, William H. Badridge and Melanie E.M. Kelly, International Cannabinoid Research Society (ICRS), Braveno, Italy, June 28-July 3, 2014.

38. Design, Synthesis and Biochemical Evaluation of Novel Electrophilic and Photoaffinity Covalent Probes to Map the CB1 Receptor Allosteric Site(s). Kulkarni, A. R., Pushkar M. Kulkarni, Anisha

Korde, Nikolai Zvonok, Maria G. Cascio, Alexandros Makriyannis, Roger Pertwee and **Ganesh A. Thakur**. World Pharma Congress 2014, Boston, USA.

39. Positive allosteric modulation of CB1 with GAT211 suppresses paclitaxel-induced neuropathic pain while by passing unwanted side effects of CB1 receptor activation. Richard A. Slivicki, Liting Deng, Pushkar M. Kulkarni, Maria Cascio, Roger G. Pertwee, **Ganesh A. Thakur** and Andrea G. Hohmann. International Cannabinoid Research Society (ICRS), Braveno, Italy, June 28-July 3, 2014.
**** This work received the best presentation award.***

40. Silent and Allosteric Agonists of α7Acetylcholine Receptors for the Treatment of Inflammation and Neuropathic Pain. R. L. Papke, N. A. Horenstein, C. Stokes, Cheol-Young Maeng, Abhijit. R. Kulkarni, and **Ganesh A. Thakur**, Nicotinic Acetylcholine Receptor 2014 Conference, Cambridge (London), UK.

41. Expeditious Microwave-assisted Synthesis of 4BP-TQS, an ago-PAM of α7 nAChRs, its Stereochemical Requirement and the Target Amino Acids Responsible for Activity. Abhijit R. Kulkarni, Nicole A. Horenstein, Clare Stokes, Lu W Corrie, Cheol-Young Maeng, Jeffrey Deschamps, Roger L. Papke, **Ganesh A. Thakur** American Association of Pharmaceutical Scientists' (AAPS) NorthEast Regional Discussion Group (NERDG), Connecticut, USA, 2014
**** This work received the best presentation award.***

42. Enantiomer-specific positive allosteric modulation of the type 1 cannabinoid receptor for the treatment of Huntington's disease. Robert B. Laprairie, Adel Zrein, Amina M. Bagher, Pushkar M. Kulkarni, **Ganesh A. Thakur**, Melanie E. Kelly, and Eileen M. Denovan-Wright, International Cannabinoid Research Society (ICRS), Wolfville, Canada, 2015.
**** This work received the best oral presentation award.***

43. Actions of the ago-PAM GAT211 and its enantiomer GAT229 on intraocular pressure and retinal ganglion cell loss in the nee mouse model of ocular hypertension. Elizabeth A. Cairns, Alex J. Straiker, Pushkar M. Kulkarni, Ganesh A. Thakur, William H. Badridge, and Melanie E.M. Kelly. International Cannabinoid Research Society (ICRS), Wolfville, Canada, 2015.

44. Design, synthesis and biochemical evaluation of novel electrophilic and photoaffinity covalent probes to map the CB1receptor allosteric site(s). Abhijit R. Kulkarni, Pushkar M. Kulkarni, Anisha Korde, Nicolai Zvonok, Maria Cascio, Alexandros Makriyannis, Roger G. Pertwee and **Ganesh A. Thakur**. International Cannabinoid Research Society (ICRS), Wolfville, Canada, 2015.
**** This work received the best oral/poster presentation award.***

45. Fluorine-walk on GAT211, A Positive Allosteric Modulator of the Cannabinoid 1 Receptor: Identification of Critical Sites for Advancing Structure-activity Relationship Studies. Pushkar M. Kulkarni, Sumanta Garai, Robert B. Laprairie, Melanie Kelly, Eileen Denovan-Wright, Lesley A. Stevenson, Roger Pertwee, **Ganesh A. Thakur**, ICRS, 2016.

46. Mapping Cannabinoid Receptor 1 Allosteric Site(S): Critical Molecular Determinant And Signaling Profile Of GAT100 - A Novel, Potent And Irreversibly Binding Probe. Robert B. Laprairie, Abhijit R. Kulkarni, Pushkar M. Kulkarni, Dow P. Hurst, Diane Lynch, Patricia H. Reggio, David R. Janero, Roger G. Pertwee, Lesley A. Stevenson, Melanie E. M. Kelly, Eileen M. Denovan-Wright, and **Ganesh A. Thakur**, ICRS, 2016.

47. Positive Allosteric Modulators of CB1 Receptor Signaling Produce Synergistic Antinociceptive Effects with Inhibitors of Fatty-Acid Amide Hydrolase And Monacylglyerol Lipase. Richard A. Slivicki, Pushkar M. Kulkarni, Ken Mackie, **Ganesh A. Thakur** and Andrea G. Hohmann. ICRS, 2016

48. Highly efficient, one-pot and scalable microwave-accelerated synthesis of urea derivatives via Curtius rearrangement. Abhijit R. Kulkarni, Sumanta Garai, **Ganesh A. Thakur**, *Chemistry and Pharmacology of Drugs of Abuse*, Northeastern University, Boston, 2016.

49. Novel Pharmacotherapy for Treating Cognitive Dysfunction and Chronic Pain in Alzheimer's disease. Abhijit R. Kulkarni, Qi Ye, Deniz Bagdas, Jonghan Kim, Roger L. Papke, Imad Damaj, **Ganesh A. Thakur**, *Chemistry and Pharmacology of Drugs of Abuse*, Northeastern University, Boston, 2016.

50. Mapping Cannabinoid Receptor 1 Allosteric Site(S): Critical Molecular Determinant And Signaling Profile Of GAT100 - A Novel, Potent And Irreversibly Binding Probe. Robert B. Laprairie, Abhijit R. Kulkarni, Pushkar M. Kulkarni, Dow P. Hurst, Diane Lynch, Patricia H. Reggio, David R. Janero, Roger G. Pertwee, Lesley A. Stevenson, Melanie E. M. Kelly, Eileen M. Denovan-Wright, and **Ganesh A. Thakur**, *Chemistry and Pharmacology of Drugs of Abuse*, Northeastern University, Boston, 2016.

51. Positive Allosteric Modulators of CB1 Receptor Signaling Produce Synergistic Antinociceptive Effects With Inhibitors Of Fatty-Acid Amide Hydrolase And Monacylglyerol Lipase. Richard A. Slivicki, Pushkar M. Kulkarni, Ken Mackie, **Ganesh A. Thakur** and Andrea G. Hohmann. *Chemistry and Pharmacology of Drugs of Abuse, 2016*, NEU, Boston.

52. Highly efficient, one-pot and scalable microwave-accelerated synthesis of urea derivatives via Curtius rearrangement. Abhijit R. Kulkarni, Sumanta Garai, **Ganesh A. Thakur** *Research Showcase* 2016, Department of Pharmaceutical Sciences, BCHS, NEU, Boston.

53. Mapping Cannabinoid Receptor 1 Allosteric Site(S): Critical Molecular Determinant and Signaling Profile of GAT100 - A Novel, Potent and Irreversibly Binding Probe. Robert B. Laprairie, Abhijit R. Kulkarni, Pushkar M. Kulkarni, Dow P. Hurst, Diane Lynch, Patricia H. Reggio, David R. Janero, Roger G. Pertwee, Lesley A. Stevenson, Melanie E. M. Kelly, Eileen M. Denovan-Wright, and **Ganesh A. Thakur**. *Research Showcase* 2016, Department of Pharmaceutical Sciences, BCHS, NEU, Boston.

54. Effects of the type 1 cannabinoid receptor positive allosteric modulator GAT211 on absence seizures and the anxiety-like phenotype of genetic absence epilepsy rats from Strasbourg. Mariam Alaverdashvili, Quentin Greba, Michael Anderson, Andrew J. Roebuck, Wendie N. Marks, Sumanta Garai, Terrance P. Snutch, **Ganesh A. Thakur**, John G. Howland, and Robert B. Laprairie. Presented at the International Cannabinoid Research Society Conference (Leiden, July 31).

55. Positive allosteric modulation Of CB1 receptor signaling to lower intraocular pressure. Anna-Maria Szczesniak, Anaelle Zimmowitch, Laura Daily, Ken Mackie, Alex Straiker, Peter Schaffer, Sumanta Garai, **Ganesh A. Thakur,** and Melanie Kelly. Presented at the International Cannabinoid Research Society Conference, Leiden, July 31, 2018.

56. Positive allosteric modulation of CB1 cannabinoid receptor signaling Enhances the anti-allodynic effects of morphine and attenuates morphine tolerance. Richard A. Slivicki, Sonali S. Mali, Sumanta Garai, **Ganesh A. Thakur,** and Andrea G. Hohmann. Presented at the International Cannabinoid Research Society Conference, Leiden, July 31, 2018.

57. Exploring the structure-activity relationship of type 1 cannabinoid receptor positive allosteric modulators via "fluorine-walk". Robert B Laprairie, Sumanta Garai, Pushkar M Kulkarni, Eileen M Denovan-Wright, and **Ganesh A. Thakur**. Presented at the Canadian Society for Chemistry Conference Edmonton, May 27, 2018.

58. Structure-activity relationship of CB1R positive allosteric modulators via "fluorine walk". Sumanta Garai, Peter Schaffer, Pushkar M. Kulkarni, Robert B Laprairie, Anna-Maria Szczesniak, Eileen M

Denovan-Wright, Alex Straiker, Roger Pertwee, Melanie Kelly, and **Ganesh A. Thakur**. Presented at the CPDA Conference, Boston, August 1-2, 2018.

59. Development of GAT1508, a Novel Subtype Selective Positive Allosteric Modulator (PAM) for GIRK1/2 Channels as a Novel Pharmacotherapy for Post-Traumatic Stress Disorder. Lucas N. Cantwell, Yu Xu, Yuchen Yang, Sumanta Garai, Abhijit R. Kulkarni, Takeharu Kawano, Leigh Plant, Anantha Shekhar, Diomedes Logothetis, **Ganesh A. Thakur**. Presented at the CPDA Conference Boston, August 1-2, 2018.

60. Discovery of highly biased novel positive allosteric modulators of CB1R. Sumanta Garai, Pushkar M. Kulkarni, Peter Schaffer, Robert B Laprairie, Anna-Maria Szczesniak, Alex Straiker, Roger Pertwee Melanie Kelly and **Ganesh A. Thakur**. Presented at the CPDA Conference, Boston, August 1-2, 2018.

61. Synthesis and Biological Characterization of Novel Ago-PAM of α7 nAChR, B-973 as a Non-addictive Pain Pharmacotherapy. Sumanta Garai, Krishnamohan Raja, Roger Papke, M. Imad Damaj, **Ganesh A. Thakur.** Presented at *Research Showcase,* Department of Pharmaceutical Sciences, NEU, Boston, June 12, 2018.
62. Development of GAT1508 a Novel Subtype Selective Positive Allosteric Modulator (PAM) for GIRK1/2 Channels as a Novel Pharmacotherapy for Post-Traumatic Stress Disorder. Lucas N. Cantwell, Yu Xu, Yuchen Yang, Sumanta Garai, Abhijit R. Kulkarni, Takeharu Kawano, Leigh Plant, Anantha Shekhar, Diomedes Logothetis, **Ganesh A. Thakur**. Presented at *Research Showcase,* Department of Pharmaceutical Sciences, Boston, June 12, 2018.

63. The small molecule GAT1508 activates brain-specific GIRK1/2 heteromers and facilitates extinction of conditioned fear. Yu Xu, Lucas Cantwell, Andrei I. Molosh, Leigh D. Plant, Dimitris Gazgalis, Stephanie D. Fitz, Erik T. Dustrude, Yuchen Yang, Takeharu Kawano, Sumanta Garai, Sami F. Noujaim, Anantha Shekhar, Diomedes E. Logothetis, **Ganesh A. Thakur**. Pharm Sci Research Showcase 2019, Northeastern University, Boston.

64. Mapping the GAT211 Scaffold *via* a Fluorine- and Nitrogen-Walk Approach
Sumanta Garai, Pushkar M. Kulkarni, Peter C. Schaffer David R. Janero, **Ganesh A. Thakur**. Pharm Sci Research Showcase 2019, Northeastern University, Boston.

65. Safer and Effective Pharmacotherapy for Glaucoma through CB1R Biased Ago-PAM. Sumanta Garai, Peter C. Schaffer, Anna-Maria Szczesniak, Luciana M. Leo, Ayat Zagzoog, Asher L Brandt, Tallan Black, Jeffrey R. Deschamps, Alex Straiker, Roger G. Pertwee, Mary E. Abood, Melanie E. M. Kelly, Robert B. Laprairie, and **Ganesh A. Thakur**. Pharm Sci Research Showcase 2019, Northeastern University, Boston.

66. Novel Selective and Potent PAMs of α4β2 nAChR as a Pharmacotherapy for Nicotine addiction. Sahil Seth, Sumanta Garai, and **Ganesh A. Thakur**. Pharm Sci Research Showcase 2019, Northeastern University, Boston.

67. A Comprehensive Investigation of the CB1R Positive Allosteric Modulator, GAT211, by Structural Modifications and Computational Simulations Peter Schaffer, Pushkar Kulkarni, and **Ganesh A. Thakur**. Pharm Sci Research Showcase 2019, Northeastern University, Boston.

III. RESEARCH FUNDING INFORMATION:

Currently active grants:

1. **2R01GM057481-17 NIH/NIGMS**
   Title: Targeting the Alpha7 nAChR for Therapeutic Effects
   Role: Co-I (PI on subcontract)
   Date: 03/01/2020- 02/28/2025
   Thakur Lab: $68,000 (for Yr. 2022)
   The proposal aims to develop novel compounds (ago-PAMs and silent agonists) selectively targeting α7 nAChR with desired cytokine profiles and good predicted pharmacokinetic properties and advance them into animal models of neuropathic and inflammatory pain.

2. **Canadian Institutes of Health Research (CIHR)**
   Title: Development of Novel Type 1 Cannabinoid Receptor Positive Allosteric Modulators for Infantile Spasms
   Role: Co-I (PI: Dr. Robert Laprairie)
   Date: 05/01/2020- 05/30/2025
   Project Total Cost: $692,325
   Direct Cost only (Thakur Lab): $100,000
   This project examines the development of CB1 receptor positive allosteric modulators (PAMs) and their possible use in the treatment of Infantile Spasms, a debilitating form of epilepsy that occurs mainly in the young for which current treatments are largely inadequate. The Aims of the study are to characterize the CB1R allosteric modulator binding site (1) as well as the in vivo effects of novel CB1R PAMs (2), and finally to test these new drugs in two relevant animal models of epilepsy (3).

3. **RO1HL059949-23 NIH/NHLBI**
   Title: Structural Determinants of PIP2 Regulation
   Role: Co-I (PI- Dr. Logothetis)
   Date: 07/01/2020- 06/30/2024
   Total Requested Cost: $3,865,654.
   Total Cost (Thakur Lab) = $353,400
   The proposal aims to set the stage in coupling the molecular insights of small molecule regulators of activity to specifically reverse the PKC-mediated overstimulation of GIRK channel activity. Our small molecule inhibitors will be tested in transgenic models of PKC-mediated AF with the goal to dial down the aberrant activity enough to correct the AF problem without compromising cardiac health.

Recently completed grants:

1. **1R01 EY024717-01/NIH-NEI**
   Title: A Novel Pharmacotherapy for Glaucoma
   Role: PI
   Date: 09/01/2014- 08/31/2021 (NCE)
   Total Cost: $2,207,605
   The goal of this proposal is to optimize 2-phenylindole class of CB1 Positive Allosteric Modulators and establish the therapeutic utility of optimized candidates in reducing IOP and neuroprotection of RGCs in animal models.

2. **R43MH103936 NIH/NIMH**
   Title: Novel treatment of posttraumatic stress disorder (PTSD)
   Role: PI on the subcontract / Anagin Inc. (primary recipient)
   Date: 08/01/2014-07/31/2016
   Total Cost = $160,000
   The objective of this project is to develop selective and potent, small molecule inhibitors of nNOS-PSD95 protein-protein interaction for treating post-traumatic stress disorder.

3. **RO3 DA027113 NIH/NIDA**
   Early Career Development Award in Chemistry of Drug Abuse and Addiction
   Title: Allosteric Modulators of CB1 Cannabinoid Receptor
   Role: PI; Date: 08/01/2009-07/31/2013
   Total Cost = $390,000
   The primary goal of this project is to develop high affinity, potent and efficacious negative allosteric modulators of the CB1 receptor, based on structure of the current lead PSNCBAM-1.

4. **Undergraduate Research Creative Endeavor Award**
   Student Name: Mr. Ethan Rawl
   My Role: Mentor
   Title: Positive Allosteric Modulators of CB1R for Treating Neuropathic Pain
   Total Cost: $3000
   Date: November 2018

5. **R01CA206028 NIH/NCI**
   Title: (PQ9) Mitigation of Chemotherapy Induced Peripheral Neuropathy
   Role: PI on the subcontract/Dr. David Gewirtz; VCU (Primary recipient)
   Date: 04/15/2016-03/31/2017
   Total Cost = $1,733,136
   Total Cost (Thakur Lab year 1 only) = $88,257
   The objective of this project is to test utility of α7 nAChR silent agonists and partial agonists to prevent or ameliorate the development of peripheral neuropathy induced by chemotherapy drugs cisplatin and paclitaxel.

6. **Undergraduate Research Creative Endeavor Award**
   Northeastern University Provost's Office
   Student Name: Ms. Angela Sung
   My Role: Mentor
   Title: Novel Allosteric Modulators of CB1R Receptor
   Total Cost: $3000
   Date: December 2016

7. **R01DA026795 NIH/NIDA**
   Title: Novel Medications for Cannabis Dependence
   Role: Co-Investigator; Makriyannis (PI);
   Date: 07/15/2009- 05/31/2014
   Total Direct Cost: $397,860/year to CDD.
   The goal of this project is to develop novel medications for the clinical management of cannabis dependence and addiction. In this work, we developed compounds with improved 'druggability', i.e., predictable and controllable time course and inactivation through detoxification to inactive metabolic products.

8. **Davis Foundation Post-doc Fellowship Program in Eating Disorder Research**
   Title: Positive Allosteric Modulators of CB1 Cannabinoid Receptor for treatment of Anorexia Nervosa. (Dr. Pushkar Kulkarni, postdoctoral fellow)
   Role: Mentor
   Date: 07/01/2012- 06/30/2015
   Total Cost: $153,000.

9. **Indo-US Singh Obama Post-doctoral Fellowship Program**
   Title: Development of peripherally acting CB2-selective ligands.
   (Dr. Ganesh Chaturbhuj, post-doctoral fellow)
   Role: Mentor
   Date: 10/01/2013- 09/30/2014
   Total Cost = $30,000

IV. MAJOR COMMITTEE ASSIGNMENTS

A. Service to the Department of Pharmaceutical Sciences, School of Pharmacy and BCHS.

2011- 2013	Member, Faculty Research Development and Mentoring.
2012- current	Scholarship and Award Committee (SOP).
2012	John Neumeyer Award Committee (Pharm Sci).
2013-current	Assessment Committee (SOP).
2013-Present	Pharm Sci Research Showcase – coordinator (Pharm Sci)
2017-2018	BCHS Faculty Council (BCHS)
2013-2017	Member, Merit Review Committee (Pharm Sci)
2015-current	Faculty Development and Recognition Committee (BCHS)
2015-current	Faculty Development Committee (BCHS)
2018- current	Curriculum committee (SOP)
2018- current	Executive committee (SOP)
2017- current	Dean's Leadership Team (BCHS)
2017-2018	Vice Chair, Department of Pharmaceutical Sciences
2018-2020	Interim Chair, Department of Pharmaceutical Sciences
2020- current	Chair, Department of Pharmaceutical Sciences

B. NIH and International Grant Committees:

2014	NIH Study Section, Drug Discovery for the Nervous System, Ad Hoc reviewer, June 2014
2014	NIH Study Section, Special Emphasis Panel, Molecular Probes, June 2014
2014	NIH Study Section, DDNS, Ad Hoc reviewer, October 2014
2014	NIH Study Section, Special Emphasis Panel, Molecular Probes, Ad Hoc Reviewer, 2014
2016-2017	RRD8 Study Section, Career Development Award Review Committee, US Department of Veteran Affairs, Ad Hoc Reviewer

2016	NIH, Behavioral Neuroscience Fellowship Study Section, ZRG1 F02A-K (20)
2016	NIH Study Section, Small Business: Drug Discovery for Aging, Neuropsychiatric and Neurologic Disorders, ZRG1 ETTN-M (11).
2017	Auckland Medical Research Foundation, Auckland, NZ.
2017	Research Council UK (RCUK)
2019	Member of NIH Study Section, SBIR/STTR Review Panel; ZRG1 BCMB-G (10) B; Drug Discovery & Development
2020-	Member of NIH Study Section, Special Emphasis Panel: Step Up for Substance Use Disorders (SUD)- A Drug Target Initiative for Scientists Engaged in Fundamental Research; U18 Grants.
2022	New Zealand Government's Marsden Funds (July 2022).
2022	NIH Study Section, Drug Discovery for the Nervous System, Ad Hoc reviewer, June 2022
2022	NINDS Special Emphasis Panel, ZNS1 SRB-R (03), Initial Translation Efforts for Non addictive Analgesic Therapeutics Development (HEAL U19); Feb 2022

C. Reviewer (selected list)

1) Chemical Biology and Drug Design
2) Expert Opinion on Therapeutic Patents
3) Bio-organic Medicinal Chemistry
4) Chem Bio Chem (Wiley VCH-de)
5) Recent Patents on CNS Drug Discovery
6) Life Sciences
7) Journal of Pharmacology and Experimental Therapeutics (JPET)
8) Neuropsychopharamcology, Nature Publishing Group (NGP)
9) Bio-organic Medicinal Chemistry Letters
10) Drugs of the Future
11) Journal of Medicinal Chemistry
12) Journal of Organic Chemistry
13) ACS Chemical Neuroscience
14) Frontiers in Pharmacology, section Translational Pharmacology

D. MEMBERSHIP PROFESSIONAL SOCIETIES

1999- current	Association of Carbohydrate Chemists and Technologists
2000- current	American Chemical Society
2003- current	International Cannabinoid Research Society (ICRS)

2008- current Member of NIDA Networking Project (NNP)

2010- current Member of American Association of Pharmaceutical Scientists (AAPS)

2011- current Member of Rho Chi Honor Society

2015- 2017 Member of Society of Neuroscience

MAJOR TEACHING EXPERIENCE

2006-2010: Assistant Research Professor (CDD; Northeastern University)
2010-2021: Assistant/Associate Professor (Northeastern University)
2021-present: Professor (Northeastern University)

Graduate Courses

2011-*2020* : Drug Discovery Journal Club (PHSC6300-003; Fall semester)- Course Coordinator
2011 : Chemistry and Biology of Drugs of Abuse (PHSC6222; Fall semester)
2013- *Present* : Pharmacokinetics and Drug Metabolism (PMST6252; Spring semester)
2016- *2019* : Principles of Drug Design (PHSC5400; Fall semester);

Undergraduate Courses

2006-2020 : Pharmacology and Medicinal Chemistry I (PHSC4501); Principal instructor for teaching medicinal chemistry
2007-2021 : Pharmacology and Medicinal Chemistry II (PHSC4502); Course coordinator and Principal instructor for teaching medicinal chemistry (Course Coordinator)
2014-Present : Anti-infective Agents (PHSC5360)

RESEARCH MENTORING: (* indicate students for whom my role is mentor as well as advisor)

UNDERGRADUATE MENTORING:

#	Year	Student's name	Degree	Current Position
1	08/2011-12/2011	Shivan Acharya	Pharm.D.	Clinical Pharmacist, CA.
2.	01/2012-04/2012	Monica Taing	Pharm. D	Medical Science Liaison, 4Front
3.	02/2014- 09/2014	Olatokunbo Onabanjo	Pharm. D.	Graduated from NEU
4.	02/2014- 08/2014	Lucia Zhu	Pharm. D.	Graduate from NEU
5.	09/2018- 04/2019	Ethan Rawl	Pharm. D.	Current Student at NEU (P4)
6.	09/2016 – 12/2017	Angela Sung	Pharm. D.	PGY-1 Pharmacy Resident
7.	10/2019- 02/2020	Mark DiFulvio	Pharm.D.	Student at NEU (P1)
8.	09/2021- current	Tavesh Gadkari	B.S. Pharm Sci	Second year student at NEU
9.	08/2022- current	Andrew Wohlbruck	B.S. Pharm Sci	Second year student at NEU
10.	08/2022- current	Aisha Bailey	B.S. Pharm Sci	Second year student at NEU

PH.D./M.S. THESIS MENTORING:

1.	1999-2001	Alok Singh*	M.S. Med. Chem.	Novartis (NIBR), MA.
2.	2003-2006	Jin Zhang*	M.S. Med. Chem.	Harvard Medical School, MA.
3.	01/2007-08/2007	Vince Abeyta^{+}*	M.S. Med. Chem.	Boehringer Ingelheim, CT.

4.	2007-2011	Heidi Teng*	Ph.D. Med. Chem.	Aldrich, MA.
5.	2010-09/2011	Abhijit Kulkarni	M.S. Med. Chem.	Eli Lilly, Philadelphia
6.	09/2011-04/2012	Khushbu Shah	M.S. Med. Chem.	Scientific Advisor at Kramer Levin
7.	09/2012-09/2014	Prisca Mungalachetty	M.S. Med Chem.	Novartis (NIBR), Boston
8.	09/2011-12/2012	Ameya Ranade	M.S. Med. Chem.	Pursuing Ph.D. in Canada
9.	10/2011-11/2013	Vasantha Duggirla	M.S. Med Chem.	
10.	2007-06/2012	Marsh D'Souza*	Ph.D. Med. Chem.	Post-doc at Scripps
11.	2006-06/2012	Rishi Sharma*	Ph.D. Med. Chem.	Scientist at MicroConstants Inc.
12.	2007-08/2012	Shama Bajaj*	Ph.D. Med. Chem.	MIT, Cambridge, MA.
13.	10/2008-10/2012	Ritesh Tichkule**	Ph.D. Med Chem.	Novartis (NIBR), Boston.
14.	09/2011-08/2016	Abhijit Kulkarni	Ph.D. Med. Chem.	Eli Lilly, Philadelphia
15.	02/2014-08/2015	Siddhi Honavar	M.S. Med. Chem.	GSK, Philadelphia
16.	09/2014-08/2016	Sharvik Shirodkar	M.S. Med Chem.	Kaleido Biosciences, Inc.
17.	09/2014-08/2016	Ninad Dixit	M.S. Med Chem.	Radikal Therapeutics Inc.
18.	09/2016-05/2022	Peter Schaffer	M.S. Med Chem.	Looking for a job in pharma.
19.	09/2017-05/2022	Lucas Cantwell	M.S. Med Chem	Pliant Therapeutics, San Fransico,.
20.	09/2018- 08/2019	Sahil Seth	M.S. Med Chem	Takeda, Cambridge, MA.
21.	09/2018 – 05/2020	Wilder Felix	M.S. Med Chem (Thesis)	Current PhD student

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* indicates my role as co-advisor; + indicates my role as mentor

POST-DOCTORAL FELLOW MENTORING:

1.	2005-2008	Dr. Vidyanand Shukla*	---	Millipore Sigma, Natick, MA.
2.	2007-2009	Dr. Shaine Cararas*	---	Researcher, Louisiana
3.	02/2011-08/2015	Dr. Pushkar Kulkarni (Davis Foundation Fellowship)	---	Barnett Institute/Department of Pharm. Sci. NEU
4.	10/2013-09/2014	Dr. Ganesh Chaturbhuj (Indo-US project; Raman Fellowship)	---	Professor, Institute of Chemical Technology (ICT), Mumbai, India.
5.	05/2015-04/2016	Dr. Gopalkrushna Waghule		Zydus Pharma, India
6.	09/2016-08/2017	Dr. Abhijit Kulkarni		Eli Lilly, Philadelphia.
7.	01/2015-present	Dr. Sumanta Garai (Senior Research Scientist)		Scientist II, Carmot Therapeutics, Berkley, CA.
8.	08/2022- present	Dr. Hina Andleeb		Current post-doc

*** Mentored these two-post docs during my stay in CDD as Research Assistant Professor**

GRADUATE STUDENT THESIS COMMITTEE

1.	2007-2012	Shama Bajaj, (Ph.D.; Medicinal Chemistry)
2.	2007-2012	Ritesh Tichkule, (Ph.D.; Medicinal Chemistry)
3.	2011- 2013	Namita Dodwadkar, (Ph.D.; Pharmaceutics)
4.	2011-2013	Vasantha Duggirala, (M.S.; Medicinal Chemistry)
5.	2011-2013	Ameya Ranade, (M.S.; Medicinal Chemistry)
6.	2012-2014	Madhura Deshpande, (Ph.D.; Pharmaceutics)
7.	2012-2014	Prisca Mungalachetty, (M.S.; Medicinal Chemistry)
8.	2013-2015	Siddhi Honavar, (M.S.; Medicinal Chemistry)
9.	2012-2017	Pranali Deshpande, (Ph.D.; Pharmaceutics)
10.	2011- 2016	Abhijit Kulkarni, (Ph.D.; Medicinal Chemistry)
11.	2014- 2016	Ninad Dixit, (M.S.; Medicinal Chemistry)
12.	2014- 2016	Sharvik Shirodkar (M.S.; Medicinal Chemistry)
13.	2012- 2017	Aditi Jhaveri (M.S.; Pharmaceutics)
14.	2016- 2020	Prisca Mungalachetty (Ph.D.; Bioanalytical Chemistry).
15.	2016-2018	Krishnamohan Raja (M.S.; Medicinal Chemistry)
16.	2017-2019	Sahil Seth (M.S.; Medicinal Chemistry)
17.	2015-2021	Peter Schaffer, (Ph.D.; Medicinal Chemistry)
18.	2016-2021	Lucas Cantwell, (Ph.D.; Medicinal Chemistry)
19.	2018-2020	Wilder Felix, (M.S.; Medicinal Chemistry)
20.	2015-2020	Jiayi Pan, (Ph.D.; Pharmaceutics)

INVITED TALKS:

1. "*Endocannabinoid System as an Emerging Therapeutic Target*" given at Institute of Chemical Technology (ICT, formerly UDCT), Matunga, Mumbai (2011). This lecture was sponsored by Department of Pharmaceutical Sciences and Technology, UGC-Center for Advance Studies, India.
2. "*Cannabinoid Receptors as Therapeutic Targets*" given at Bombay College of Pharmacy (BCP), Mumbai, India (2011).
3. "*Targeting Obesity with Negative Allosteric Modulators of CB1 Cannabinoid Receptor*" in Discovery of Target meeting, (2012).
4. "*Tuning the Endocannabinoid System: Alllosteric Modulators of CB1 Cannabinoid Receptor*" given in the department of Pharmaceutical Sciences, St. John University, (2013).
5. "*Allosteric Modulators of CB1 Cannabinoid Receptor*" given in the department of pharmacology and therapeutics, University of Florida, (2013).
6. "*Tuning Endocannabinoid System for Therapeutic Gain*" given at ICT, India, on 28th March 2014.
7. "*Novel Therapeutic Opportunities via Allosteric Modulation of CB1 Cannabinoid Receptor*" given at Indian Institute of Science Education and Research (IISER), Pune, India, (2014).

8. "*Tuning the Endocannabinoid System: Allosteric Modulators of CB1 Cannabinoid Receptor*" given at Indian Institute of Technology (IIT), Bombay, India, (2014).
9. "*Novel Therapeutic Opportunities via Allosteric Modulation of CB1 Cannabinoid Receptor"* given at McLean Hospital, Harvard Medical School, Belmont, MA, (2014).
10. "Tuning the Endocannabinoid System: Allosteric Modulators of CB1 Cannabinoid Receptors" given at School of Medicine, Dept. of Neuroscience, University of New Mexico, Albuquerque, NM, (2014).
11. "*Tuning the Endocannabinoid System: Allosteric Modulators of CB1 Cannabinoid Receptors*" given at Dept. of Chemistry and Biochemistry, UMASS Dartmouth, MA, (2014).
12. "*Tuning the Endocannabinoid System: Allosteric Modulators of CB1 Cannabinoid Receptors*" given at the *Department of Pharmaceutical Sciences, Eugene Applebaum College of Pharmacy and Health Sciences (EACPHS), Wayne State University, Detroit, MI,* (2014).
13. "*Safer Medications through Allosteric Modulation of CB1 Cannabinoid Receptor*" given at the Dept. of Pharmaceutical Sciences, Duquesne University, Pittsburg, PA, (2014).
14. "*Safer Medications through Allosteric Modulation of CB1 Cannabinoid Receptor*" given at the Dept. of Pharmacology and Molecular Sciences, John Hopkins School of Medicine, Baltimore, MD, (2014).
15. "*Safer Medications through Allosteric Modulation of CB1 Cannabinoid Receptor*" given at the Stark Neuroscience Research Institute, Indiana University School of Medicine, Indianapolis, IN, (2014).
16. "*Safer Medications through Allosteric Modulation of CB1 Cannabinoid Receptor*" given at 2nd International Congress of Society for Ethnopharmacology, Nagpur, India, (2015).
17. "*Safer Medications through Allosteric Modulation of CB1 Cannabinoid Receptor*" given at National Chemical Laboratory, NCL, Pune, (2015).
18. "Therapeutic Potential of CB1 Allosteric Modulators" given at Nagpur University, India, September 2017.
19. "Positive Allosteric Modulation of CB1 Cannabinoid Receptor as a Promising Therapeutic Strategy for Treating Pain, Glaucoma and Neurodegenerative Disorders" given at Temple University, Philadelphia, May 2018.
20. "*Allosteric Modulation of CB1 Cannabinoid Receptor*" given at IISER, Pune, India (2019).
21. "CB1 Positive Allosteric Modulators for Treating Anxiety Disorders" Society of Biological Psychiatry, 74th Annual Meeting, May 16-18, 2019, Chicago, IL.
22. Invited speaker at: 8th International symposium on Current Trends in Drug Discovery Research: Ageing Associated Metabolic & CNS Disorders, 12 - 14 March, 2022. CSIR-Central Drug Research Institute, Lucknow