

## CURRICULUM VITAE

University of Pittsburgh, Pittsburgh, PA

### BIOGRAPHICAL

**Name:** Rajesh Narendran, M.D.

**Business Address:** Department of Radiology  
PET Facility, B-938  
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### EDUCATION AND TRAINING

#### MEDICAL EDUCATION:

1995	Stanley Medical College Madras, India	MB., B.S. (MD Equivalent)	Medicine
2002	New York State Education Department	MD (Conferred)	Medicine

#### INTERNSHIP

1994-1995	Intern in Medicine Government Stanley Hospital Madras, India		
1997-1998	Intern in Psychiatry State University of New York at Buffalo (SUNYAB) Consortium Hospitals Buffalo, New York		

#### RESIDENCY

1998-2001	Resident in Psychiatry SUNYAB Consortium Hospital Buffalo, New York		
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#### FELLOWSHIPS

1996 - 1997	Research Fellow in Psychiatry Bipolar and Psychotic Disorder Program McLean Hospital Belmont, Massachusetts		
2001- 2004	Research Fellow in Psychiatry Division of Functional Brain Mapping New York State Psychiatric Institute New York, New York		

## **APPOINTMENTS AND POSITIONS**

### **ACADEMIC:**

- 1996 - 1997  
Research Fellow in Psychiatry  
Consolidated Department of Psychiatry  
Harvard Medical School  
Boston, MA
- 1997 - 2001  
Assistant Clinical Instructor in Psychiatry  
University at Buffalo School of Medicine and Biomedical Sciences,  
SUNYAB  
Buffalo, NY
- 2001 - 2004  
Instructor in Psychiatry  
Columbia University College of Physicians and Surgeons  
New York, NY
- 2004 - 2006  
Assistant Professor of Clinical Psychiatry  
Columbia University College of Physicians and Surgeons  
New York, NY
- 2006 - 2011  
Assistant Professor of Radiology and Psychiatry  
University of Pittsburgh  
Pittsburgh, PA
- 2011- 2016  
Associate Professor of Radiology and Psychiatry  
University of Pittsburgh  
Pittsburgh, PA
- 2016- 2018  
Visiting Professor of Radiology  
University of Pittsburgh  
Pittsburgh, PA
- 2018 – Current  
Professor of Radiology (with tenure)  
Professor of Psychiatry  
University of Pittsburgh  
Pittsburgh

### **HOSPITAL:**

- 2000 - 2001  
Junior Attending Psychiatrist  
Comprehensive Psychiatric Emergency Program  
Erie County Medical Center  
Buffalo, NY
- 2001 - 2004  
Assistant Attending Psychiatrist  
New York- Presbyterian Hospital  
New York, NY
- 2002 - 2006  
Attending Psychiatrist  
Our Lady of Mercy Medical Center  
Bronx, NY
- 2004 - 2006  
Attending Psychiatrist  
New York- Presbyterian Hospital  
New York, NY

2006 - 2009  
Attending Psychiatrist  
Psychiatric Emergency and Intervention Service  
Western Psychiatric Institute and Clinics  
UPMC  
Pittsburgh, PA

2009 – Present  
Attending Psychiatrist  
Resolve Crisis Network  
Western Psychiatric Institute and Clinics  
UPMC  
Pittsburgh, PA

2018 - Present  
Attending Psychiatrist  
Telepsychiatry service (outpatient coverage)  
Western Psychiatric Institute and Clinics  
UPMC  
Pittsburgh, PA

**RESEARCH LAB:**

2001- 2006  
Lead Primate PET Imaging Program  
Co-lead Biological Imaging Core  
Division of Functional Brain Mapping (DFBM)  
New York State Psychiatric Institute (NYSPI)  
New York, NY

2006 - Present  
Psychiatric Molecular Imaging Program (PMIP)  
University of Pittsburgh PET Facility  
University of Pittsburgh  
Pittsburgh, PA

**BOARD CERTIFICATION**

American Board of Psychiatry and Neurology  
(General Psychiatry)  
Board Certified  
2003

**MEMBERSHIPS IN PROFESSIONAL AND SCIENTIFIC SOCIETIES**

American Psychiatric Association  
1997- Present

**HONORS**

The Excellence in Psychiatry Residency Award,  
151<sup>st</sup> Annual Meeting, American Psychiatric Association, Toronto, Canada.  
1998

Intern of the Year, Psychiatry Residency Training Program, SUNYAB, Buffalo, New York  
1998

American Psychiatric Institute for Research and Education/Janssen Scholar in Research on  
Severe Mental Illness Award, 153<sup>rd</sup> Annual Meeting, American Psychiatric Association, Chicago, Illinois.  
2000

APA Research Colloquium for Junior Investigators Travel Award, 153<sup>rd</sup> Annual Meeting,  
American Psychiatric Association, Chicago, Illinois.  
2000

Resident Service Award, Psychiatry Residency Training Program, SUNYAB, Buffalo, New York 2000

Department of Psychiatry Grand Rounds ‘The Treatment of Resistant Psychotic Disorders’ at SUNYAB, Buffalo, New York. 2001

Young Investigator Award, Neuroscience Track, 51<sup>st</sup> Annual Meeting, Society of Nuclear Medicine, Philadelphia, PA. 2004

GSK Young Investigator Award, Neuroreceptor Mapping 2006, Copenhagen, Denmark 2006

Distinguished Investigator Award, The Academy for Radiology and Biomedical Imaging Research 2018 Chicago, IL

## PUBLICATIONS

### 1. Refereed Articles

1. Zarate CA Jr, Narendran R, Tohen M, Greaney J, Berman A, Pike S, Madrid A. Clinical predictors of acute response with olanzapine in psychotic mood disorders. *J Clin Psychiatry* 1998; 59:24-28
2. Zarate CA Jr, Tohen M, Narendran R, Tomassini EC, McDonald J, Sederer M, Madrid A. The adverse effect profile and efficacy of divalproex sodium compared with valproic acid: a pharmacoepidemiology study. *J Clin Psychiatry* 1999; 60:232-236
3. Kim KY, Hwang W, **Narendran R**. Acute liver damage possibly related to sertraline and venlafaxine ingestion. [letter] *Ann Pharmacother* 1999; 33:381-382
4. Leo RJ, Narendran R, DeGuiseppe B. Methadone detoxification of tramadol dependence. [brief report] *Journal of Substance Abuse Treatment* 2000; 19: 297-299
5. **Narendran R**, Young CM, Pato M. Possible risperidone-induced tardive dystonia. [letter] *Ann Pharmacother* 2000; 34:1487-88
6. **Narendran R**, Young CM, Valenti AM, Pristach CA, Pato MT, Grace JG. Olanzapine therapy in treatment resistant psychotic mood disorders- a long term follow-up study. *J Clin Psychiatry* 2001; 62: 509-16
7. **Narendran R**, Young CM, Valenti AM, Nickolova MK, Pristach CA. Psychosis exacerbated by modafinil? [letter] *Arch Gen Psychiatry* 2002; 59(3): 292-3
8. Huang Y, Hwang D-R, Narendran R, Sudo Y, Chatterjee R, Bae S-A, Mawlawi O, Kegeles L, Wilson AA, Kung HF, Laruelle M. Comparative Evaluation of five positron emission tomography radiotracers for imaging serotonin transporters in vivo: [<sup>11</sup>C] McN 5652, [<sup>11</sup>C] ADAM, [<sup>11</sup>C] DASB, [<sup>11</sup>C] DAPA, and [<sup>11</sup>C] AFM. *J Cereb Blood Flow* 2002; 22:1377-1398
9. **Narendran R**, Young CM, Pristach CA, Pato MT, Valenti AM, Fass AR. Efficacy of clozapine in the treatment of atypical antipsychotic refractory schizophrenia- a pilot study. *J Clin Psychopharmacol.* 2003; 23(1): 103-4
10. Valenti AM, Narendran R, Young CM, Pristach CA. Who are patients on conventional antipsychotics? *Schizophrenia Bulletin* 2003; 29 (2): 195-9
11. Hwang D-R, Narendran R, Huang Y, Slifstein M, Talbot PS, Sudo Y, Van Berckel BN, Kegeles LS, Martinez D, Laruelle M. Quantitative analysis of (-)-N-[<sup>11</sup>C]-propyl-norapomorphine in vivo binding in nonhuman primates. *J Nucl Med* 2004 45: 338-346

12. **Narendran R**, Hwang D-R, Slifstein M, Talbot PS, Erritzoe D, Huang Y, Cooper T, Martinez D, Kegeles LS, Abi-Dargham A, Laruelle M. In vivo vulnerability to competition by endogenous dopamine: comparison of the D<sub>2</sub> receptor agonist radiotracer (-)-N-[<sup>11</sup>C]propyl-norapomorphine ([<sup>11</sup>C]NPA) with the D<sub>2</sub> receptor antagonist radiotracer [<sup>11</sup>C]-raclopride. *Synapse* 2004 52 (3): 188-208.
13. Slifstein M, Hwang D-R, Huang Y, Guo N, Sudo Y, Narendran R, Talbot PS, Laruelle M. In vivo affinity of [<sup>18</sup>F]fallypride for striatal and extrastriatal dopamine D<sub>2</sub> receptors in nonhuman primates. *Psychopharmacology (Berl)* 2004 175 (3):274-86.
14. Huang Y, Hwang D-R, Bae SA, Sudo Y, Guo N, Zhu Z, Narendran R, Laruelle M. A new positron emission tomography imaging agent for the serotonin transporter: synthesis, pharmacological characterization and pharmacokinetic analysis of [<sup>11</sup>C]2-[2-(Dimethylaminomethyl)phenylthio]-5-fluoromethylphenylamine ([<sup>11</sup>C]AFM). *Nuclear Medicine and Biology* 2004 :31 (5):543-56.
15. Huang Y, Narendran R, SA Bae, Erritzoe D, Guo N, Zhu Z, Hwang D-R, Laruelle M. A PET Imaging Agent with Fast Kinetics: Synthesis and In Vivo Evaluation of the Serotonin Transporter Ligand [<sup>11</sup>C]2-[2-(Dimethylaminomethylphenylthio)]-5-fluorophenylamine ([<sup>11</sup>C]AFA). *Nuclear Medicine and Biology* 2004; 31 (6):727-38
16. Slifstein M, Narendran R, Hwang D-R, Sudo Y, Talbot PS, Huang Y, Laruelle M. Effect of amphetamine of [<sup>18</sup>F]fallypride in vivo binding to D<sub>2</sub> receptors in striatal and extrastriatal regions of primate brain: Single bolus and bolus plus constant infusion studies. *Synapse*. 2004 54 (1):46-63
17. Zhu Z, Guo N, Narendran R, Erritzoe D, Ekelund J, Hwang DR, Bae SA, Laruelle M, Huang Y. The new PET imaging agent [<sup>11</sup>C]AFE is a selective serotonin transporter ligand with fast brain uptake kinetics. *Nucl Med Biol*. 2004 31(8):983-94.
18. Talbot PS, Narendran R, Butelman ER, Huang Y, Ngo K, Slifstein M, Martinez D, Laruelle M, Hwang DR. [<sup>11</sup>C]-GR103545, a Radiotracer for Imaging {kappa}-Opioid Receptors In Vivo with PET: Synthesis and Evaluation in Baboons. *J Nucl Med*. 2005 46 (3):484-94.
19. Frankle WG, Narendran R, Huang Y, Hwang D-R, Lombardo I, Cangiano C, Gil R, Laruelle M, Abi-Dargham A. Serotonin Transporter Availability in Patients with Schizophrenia: A Positron Emission Tomography Imaging Study with [(11)C]DASB. *Biol Psychiatry*. 2005 57(12):1510-6.
20. **Narendran R**, Frankle G, Keefe R, Gill R, Martinez D, Kegeles LS, Talbot PS, Huang Y, Hwang D-R, Khenissi L, Cooper T, Laruelle M, Abi-Dargham A. Dopaminergic alterations in a group of chronic recreational ketamine users. *Am J Psych* 2005; 162 (12):2352-9
21. Huang Y, Narendran R, Bischoff F, Guo N, Bae S-A, Lesage AS, Laruelle M. A Positron Emission Tomography Radioligand for the *in vivo* Labeling of Metabotropic Glutamate 1 Receptor: (3-Ethyl-2-[<sup>11</sup>C]methyl-6-quinolinyl)(*cis*-4-methoxycyclohexyl)methanone. *J Med Chemistry* 2005 11; 48 (16):5096-9
22. **Narendran R**, Hwang D-R, Slifstein M, Hwang Y, Huang Y, Ekelund J, Guillin O, Scher E, Martinez D, Laruelle M. Measurement of the proportion of D<sub>2</sub> receptors configured in state of high affinity for agonists in vivo: a Positron Emission Tomography study using [<sup>11</sup>C]N-propyl-norapomorphine and [<sup>11</sup>C]raclopride in baboons. *J PET*. 2005 315(1): 80-90.
23. van Berckel BN, Kegeles LS, Waterhouse R, Guo N, Hwang D-R, Huang Y, Narendran R, Van Heertum R, Laruelle M. Modulation of amphetamine induced dopamine release by group II metabotropic glutamate receptor agonist LY354740 in non human primates studied with positron emission tomography. *Neuropsychopharmacology* 2006; 31 (5): 967-77

24. **Narendran R**, Slifstein M, Guillin O, Hwang Y, Hwang DR, Scher E, Reeder S, Rabiner E, Laruelle M. Dopamine (D2/3) receptor agonist positron emission tomography radiotracer [<sup>11</sup>C]-(+)-PHNO is a D3 receptor preferring agonist in vivo. *Synapse*. 2006; 60(7):485-95.
25. Frankle WG, Slifstein M, Gunn RN, Huang Y, Hwang DR, Darr EA, Narendran R, Abi-Dargham A, Laruelle M. Estimation of serotonin transporter parameters with [<sup>11</sup>C]-DASB in healthy humans: reproducibility and comparison of methods. *J Nucl Med*. 2006; 47(5):815-26.
26. **Narendran R**, Slifstein M, Hwang D-R, Hwang Y, Scher E, Reeder S, Martinez D, Laruelle M. Amphetamine-induced dopamine release: duration of action as assessed with the D2/3 agonist radiotracer (-)-N [<sup>11</sup>C]propyl-norapomorphine in an anesthetized nonhuman primate. *Synapse* 2007 61(2): 106-109
27. Martinez D, Narendran R, Foltin RW, Slifstein M, Hwang D-R, Broft A, Huang Y, Cooper TB, Fischman MW, Kleber HD, and Laruelle M. Amphetamine-induced dopamine release is markedly blunted in cocaine dependence and predictive of the choice to self administer cocaine. *Am J Psychiatry* 2007; 164 (4): 622-9
28. Ekelund J, Slifstein M, Narendran R, Guillin O, Belani H, Guo NN, Hwang Y, Hwang DR, Abi-Dargham A, Laruelle M. In vivo DA D<sub>1</sub> receptor selectivity of NNC 112 and SCH 23390. *Mol Imaging Biol*. 2007; 9(3):117-25
29. **Narendran R**, Martinez D. Cocaine abuse and striatal dopamine transmission: a critical review of the preclinical and clinical imaging literature. *Synapse* 2008 62(11): 851-69
30. Frankle WG, Cho RY, Narendran R, Mason NS, Vora S, Litschge M, Price JC, Lewis DA, Mathis CA. Tiagabine Increases [<sup>11</sup>C]flumazenil Binding in Cortical Brain Regions in Healthy Control Subjects. *Neuropsychopharmacology*. 2009; 34(3):624-33
31. **Narendran R**, Frankle WG, Mason NS, Laymon CM, Lopresti B, Price CJ, Kendro S, Vora S, Litschge M, Mountz JM, Mathis C.. PET Imaging of D2/3 agonist binding in healthy human subjects with the radiotracer [<sup>11</sup>C]-N-propyl-nor-apomorphine (NPA): preliminary evaluation and reproducibility studies. *Synapse* 2009 63(7):574-84
32. **Narendran R**, Frankle WG, Mason NS, Rabiner EA, Gunn R, Searle GE, Vora S, Litschge M, Kendro S, Cooper TB, Mathis C, Laruelle M. Positron Emission Tomography Imaging of Amphetamine-Induced Dopamine Release in the Human Cortex: A comparative evaluation of the high affinity dopamine D2/3 radiotracers [<sup>11</sup>C]FLB 457 and [<sup>11</sup>C]fallypride. *Synapse* 2009 63(6):447-61.
33. Laymon CM, Mason NS, Frankle WG, Carney JP, Lopresti BJ, Litschge MY, Mathis CA, Mountz JM, **Narendran R**. Human Biodistribution and Dosimetry of the D2/3 Agonist 11C-N-Propylnorapomorphine (11C-NPA) Determined from PET. *J Nucl Med*. 2009; 50(5):814-7.
34. Martinez D, Slifstein M, Narendran R, Foltin RW, Broft A, Hwang DR, Perez A, Abi-Dargham A, Fischman MW, Kleber HD, Laruelle M. Dopamine D1 receptors in cocaine dependence measured with PET and the choice to self-administer cocaine. *Neuropsychopharmacology*. 2009; 34(7):1774-82
35. Martinez D, Greene K, Broft A, Kumar D, Liu F, Narendran R, Slifstein M, Van Huertum R, Kleber HD. Lower level of endogenous dopamine in patients with cocaine dependence: findings from PET imaging of D<sub>2</sub>/D<sub>3</sub> receptors following acute dopamine depletion. *Am J Psych* 2009; 166(10):1170-7
36. Martinez D, Orłowska D, Narendran R, Slifstein M, Liu F, Kumar D, Broft A, Van Huertum R, Kleber HD, Dopamine type 2/3 receptor availability in the striatum and social status in healthy volunteers. *Biol Psychiatry*. 2010; 67 (3): 275-8

37. Guo N, Guo W, Kralikova M, Jiang M, Schieren I, Narendran R, Slifstein M, Abi-Dargham A, Laruelle M, Javitch JA, Rayport S. Impact of D<sub>2</sub> receptor internalization on binding affinity of neuroimaging radiotracers. *Neuropsychopharmacology* 2010; 35 (3): 806-17

38. **Narendran R**, Mason NS, Laymon CM, Lopresti BJ, Velasquez ND, May MA, Kendro S, Martinez D, Mathis CA, Frankle WG. A comparative evaluation of the dopamine D<sub>2/3</sub> agonist radiotracer [<sup>11</sup>C]NPA and antagonist [<sup>11</sup>C]raclopride to measure amphetamine-induced dopamine release in the human striatum. *JPET* 2010 333: 533-39

39. Frankle WG, Mason NS, May MA, Asmonga D, Chen C-M, Kendro S, Cooper TB, Mathis CA, **Narendran R**. No effect of dopamine depletion on the binding of the high affinity D<sub>2/3</sub> radiotracer [<sup>11</sup>C]FLB 457 in the human cortex. *Synapse* 2010; 64 (12):879-85

40. **Narendran R**, Mason NS, May MA, Chen C-M, Kendro S, Ridler K, Rabiner EA, Laruelle M, Mathis CA and Frankle WG. PET imaging of D<sub>2/3</sub> receptors in the human cortex with [<sup>11</sup>C]FLB 457: reproducibility studies. *Synapse* 2011; 65 (1): 35-40

41. **Narendran R**, Mason NS, Chen CM, Himes M, Keating P, May MA, Rabiner EA, Laruelle M, Mathis CA, Frankle WG. Evaluation of dopamine D<sub>2/3</sub> specific binding in the cerebellum for the PET radiotracer [<sup>11</sup>C]FLB 457: Implications for measuring cortical dopamine release. *Synapse* 2011; 65 (10): 991-7

42. **Narendran R**, Martinez D, Mason NS, Lopresti BJ, Himes M, Chen-Min C, May MA, Price JC, Mathis CA, Frankle WG. Imaging of D<sub>2/3</sub> agonist binding in cocaine dependence: A [<sup>11</sup>C]NPA PET study. *Synapse* 2011; 65(12): 1344-9

43. **Narendran R**, Lopresti BJ, Martinez D, Mason NS, Himes M, May MA, Daley DC, Price JC, Mathis CA, Frankle WG. In vivo evidence for reduced striatal vesicular monoamine transporter (VMAT2) availability in cocaine abusers. *Am J Psych* 2012; 169 (1): 55-63

44. Laymon CM, Narendran R, Mason NS, Carney JP, Lopresti BJ, Mathis CA, Mountz JM, Sashin D, Frankle WG. Human biodistribution and dosimetry of the PET radioligand [<sup>11</sup>C]flumazenil. *Mol Imaging Biol* 2012; 14 (1): 115-22

45. Abi-Dargham A, Xu X, Thompson JL, Gil R, Kegeles LS, Urban NB, Narendran R, Hwang DR, Laruelle M, Slifstein M. Increased prefrontal cortical D1 receptors in drug naïve patients with schizophrenia: a PET study with [<sup>11</sup>C]NNC112. *J Psychopharmacol*: 26 (6): 794-805

46. Bailer UF, Narendran R, Frankle WG, Himes ML, Duvvuri V, Mathis CA, Kaye WH. Amphetamine-induced dopamine release increases anxiety in individuals recovered from anorexia nervosa. *Int. J. Eat Disord* 2012; 45 (2): 263-71

47. Frankle WG, Cho RY, Mason SN, Chen C-M, Himes M, Walker C, Lewis DA, Mathis CA, **Narendran R**. [<sup>11</sup>C]flumazenil binding is increased in a dose-dependent manner with tiagabine induced elevations in GABA levels. *PLoS One* 2012; 7 (2):e32443

48. Huang Y, Narendran R, Bischoff F, Guo N, Bae S-A, Hwang D-R, Lesage A, Laruelle M. Synthesis and characterization of two PET radioligands for the metabotropic glutamate 1 (mGlu1) receptor. *Synapse* 2012; 66 (12): 1002-14

49. **Narendran R**, Frankle WG, Mason NS, Muldoon MF, Moghaddam B. Improved working memory but no effect on striatal vesicular monoamine transporter type 2 after omega-3 polyunsaturated fatty acid supplementation. *PLoS One* 2012;7(10):e46832

50. **Narendran R**, Himes M, Mason NS. Reproducibility of post-amphetamine [<sup>11</sup>C]FLB 457 binding potential to cortical D<sub>2/3</sub> receptors. *PLoS One* 2013; 8(9):e76905
51. **Narendran R**, Jedema HP, Lopresti B, Mason NS, Gurnsey K, Ruskiewicz J, Chen C-M, Deutch L, Frankle WG, Bradberry CW. Imaging dopamine transmission in the frontal cortex: a simultaneous microdialysis and [<sup>11</sup>C]FLB 457 PET study. *Molecular Psychiatry* 2014; 19 (3): 302-10
52. Forbes EE, Rodriguez EE, Musselman S, **Narendran R**. Prefrontal response and frontostriatal functional connectivity to monetary reward in abstinent alcohol-dependent young adults *PLoS One* 2014; 9(5):e94640
53. **Narendran R**, Mason NS, Paris J, Himes ML, Douaihy AB, Frankle WG. Prefrontal cortical dopamine transmission is decreased in alcoholism. *Am J Psych* 2014; 171:881-888
54. Jedema H, Narendran R and Bradberry CW. Amphetamine-induced release of dopamine in primate prefrontal cortex and striatum: striking differences in magnitude and time course. *J Neurochem* 2014; 130 (4): 490-7
55. **Narendran R**, Jedema H, Lopresti BJ, Mason NS, Himes M, Bradberry CW. Decreased vesicular monoamine transporter, type 2 availability in the striatum following chronic cocaine self-administration in non human primates. *Biol Psychiatry* 2015; 77 (5): 488-92
56. **Narendran R**, Lopresti BJ, Mason NS, Deutch L, Paris J, Himes M, Chowdari KV, Nimgaonkar VL. Cocaine abuse in humans is not associated with increased microglial activation: an 18-kDa translocator protein positron emission tomography imaging study with [<sup>11</sup>C]PBR28. *J Neurosci* 2014; 34 (30):9945-50
57. Slifstein M, van de Giessen E, Snellenberg JV, Thompson JL, Narendran R, Gil R, Hackett E, Girgis R, Ojeil N, Moore H, D' Souza D, Malison RT, Huang Y, Lim K-P, Nabulsi N, Carson RE, Lieberman JA, Abi-Dargham A. Deficits in prefrontal cortical and extra-striatal dopamine release in schizophrenia: a PET fMRI study. *JAMA Psychiatry* 2015; 72 (4) 316-24
58. Frankle WG, Cho RY, Prasad KM, Mason NS, Paris J, Himes ML, Walker C, Lewis DA, **Narendran R**. In vivo measurement of GABA transmission in healthy comparison subjects and subjects with schizophrenia. *Am J Psych* 2015; 172 (11): 1148-59
59. Weidner LD, Paris A, Frankle WG, **Narendran R**. Safety of oral amphetamine administered during positron emission tomography scans in medically screened humans. *PLoS ONE* 2015; 10(12): e0140647. (doi:10.1371/journal.pone.0140647)
60. **Narendran R** and Frankle WG. Comment on the analyses and conclusions of, "Microglial activity in people at Ultra High Risk of Psychosis and in Schizophrenia: An [<sup>11</sup>C]PBR28 PET Brain Imaging Study". *Am J Psych* 2016; 173(5):536-7.
61. **Narendran R**, Tumuluru D, May MA, Chowdari KV, Himes ML, Fasenmyer K, Frankle WG, Nimgaonkar VL. Cortical dopamine transmission as measured with the [<sup>11</sup>C]FLB457 -amphetamine PET imaging paradigm is not influenced by COMT genotype. *PLoS ONE* 2016; 11(6):e0157867 (doi:10.1371/journal.pone.0157867)
62. Frankle WG, Narendran R, Wood AT, Suto F, Himes ML, Kobayashi M, Ohno T, Yamauchi A, Mitsui K, Duffy K, Bruce M. Brain translocator protein occupancy by ONO-2952 in healthy adults: A phase I PET study using [<sup>11</sup>C]PBR28. *Synapse* 2017 Jul; 71(7) e21970
63. **Narendran R**, Ciccocioppo R, Lopresti B, Paris J, Himes ML, Mason NS. Nociceptin receptors in alcohol use disorders: a PET study using [<sup>11</sup>C]NOP-1A. *Biol Psychiatry* 2018 Nov 15; 84(10): 708-14



64. Frankle WG, Paris JL, Himes ML, Mason NS, Mathis CA, **Narendran R**. Amphetamine-induced dopamine release measured with an agonist radiotracer in schizophrenia. *Biol Psychiatry*. 2018 Apr 15; 83(8):707-714
65. Frankle WG, Robertson B, Maier G, Paris J, Asmonga D, May MA, Himes ML, Mason NS, Mathis CA, **Narendran R**. An Open-Label Positron Emission Tomography (PET) Study to Evaluate Serotonin Transporter Occupancy Following Escalating Dosing Regimens of (R)-(-)-O-desmethylvenlafaxine and Racemic O-Desmethylvenlafaxine. *Synapse*. 2018 Mar; 72 (3) e22021
66. Gertler J, Tollefson S, Jordan R, Himes M, Mason NS, Frankle WG, **Narendran R**. Failure to detect amphetamine-induced dopamine release in the cortex with [<sup>11</sup>C]FLB 457 positron emission tomography: methodological considerations. *Synapse* 2018 Jun 6:e22037
67. Tollefson S, Gertler J, Himes ML, Paris J, Kendro S, Mason NS, **Narendran R**. Imaging PDE10a availability in cocaine use disorders with [<sup>11</sup>C]IMA107 and PET. *Synapse* 2019 Jan; 73 (1): e22070
68. **Narendran R**, Tollefson S, Fasenmyer K, Paris J, Himes ML, Lopresti B, Ciccocioppo R, Mason NS. Decreased nociceptin receptors are related to resilience and recovery in college women who have experienced sexual violence: therapeutic implications for PTSD. *Bio Psychiatry* 2019 Jun 15;85(12):1056-1064
69. **Narendran R**, Tollefson S, Himes ML, Paris J, Lopresti B, Ciccocioppo R, Mason NS. Nociceptin receptors are upregulated in cocaine use disorder: a positron emission tomography imaging study using [<sup>11</sup>C]NOP-1A. *Am J Psych* 2019 Jun 1;176(6):468-476
70. Flanigan M, Tollefson S, Himes ML, Jordan R, Roach K, Stoughton C, Lopresti B, Mason NS, Ciccocioppo R, **Narendran R**. Acute Elevations in Cortisol Increase the In Vivo Binding of [<sup>11</sup>C]NOP-1A to Nociceptin Receptors: A Novel Imaging Paradigm to Study the Interaction Between Stress- and Anti stress-Regulating Neuropeptides. *Biol Psychiatry* 2020: 87 (6): 570-76
71. Borruto AM, Fotio Y, Stopponi S, Brunori G, Petrella M, Caputi FF, Romualdi P, Candeletti S, Narendran R, Rorick-Kehn LM, Ubaldi M, Weiss F, Ciccocioppo R. NOP receptor antagonism reduces alcohol drinking in male and female rats through mechanisms involving the central amygdala and ventral tegmental area. *Br J Pharmacol*. 2020: 177(7):1525-1537
72. Narendran R, Mason NS, Himes ML, Frankle WG. Imaging cortical dopamine transmission in cocaine dependence: a [<sup>11</sup>C]FLB 457-amphetamine positron emission tomography (PET) study. *Biol Psychiatry* 2020: 88(10):788-96

## 2. Reviews, invited published papers, proceedings of conference and symposia, monographs, books and book chapters

1. Leo RJ, **Narendran R**. Anticonvulsant use in the treatment of bipolar disorder: a primer for primary care physicians. *Primary Care Companion- J Clin Psychiatry* 1999; 1: 74-84
2. Hwang D-R, Narendran R, Laruelle M. Positron-labeled dopamine agonists for probing the high affinity states of dopamine subtype 2 receptors. *Bioconj Chem*. 2005: 16(1):27-31.
3. Abi-Dargham A, Guo N, Narendran R, Hwang D-R, Ekelund J, Guillin O, Martinez D, Frankle G, Laruelle M. S40 prefrontal dopamine transmission in schizophrenia: is d1 receptor a relevant biomarker? *Behavioral Pharmacology* 2005 Suppl 1: S13
4. Laruelle M, Frankle WG, Narendran R, Kegeles LS, Abi-Dargham A. Mechanism of action of antipsychotic drugs: from dopamine D(2) receptor antagonism to glutamate NMDA facilitation. *Clin Ther*. 2005;27 Suppl A:S16-24.

5. Price JC, Laymon CL, Narendran R, Lopresti BJ. Single Photon Emission Computed Tomography (SPECT) and Positron Emission Tomography (PET). In: Handbook of Neuroimaging Research in Geriatric Mental Health (Aizenstein HJ, Reynolds, CF, III, Ferandes M, eds). New York: Springer Publishing, 2010; 17-70.

6. Martinez D and **Narendran R**. Imaging neurotransmitter release by drugs of abuse. *Curr Top Behav Neurosci*. 2010; 3: 219-45

7. Deutch L and **Narendran R**. Imaging of neurochemical transmission in the Central Nervous System. *Imaging of the Human Brain in Health and Disease* (Seeman P, Madras B, Johnson JE). E-book: neuroscience-net at neuroscience.com

8. Tollefson S, Himes M, **Narendran R**. Imaging corticotrophin releasing factor-nociceptin interactions in addiction and PTSD models. *International Review of Psychiatry* 2017; 29(6):567-579

9. Frankle WG, Narendran R. Distinguishing schizophrenia subtypes: can dopamine imaging improve the signal to noise ratio? *Biol Psychiatry*. 2020 Feb 1;87(3):197-199.

### 3. Published abstracts (select list)

1. **Narendran R**, Young CM, Pato MT, Grace J. Olanzapine therapy in treatment-resistant psychotic mood disorders-a long term follow-up study. Proc 153<sup>rd</sup> Annual Meeting, American Psychiatric Association Research Colloquium for Junior Investigators, Chicago, IL 2000.

2. **Narendran R**, Young CM, Valenti AM, Yap D, Pristach CA. Treatment of atypical antipsychotic resistant schizophrenia. Proc 154<sup>th</sup> Annual Meeting, American Psychiatric Association, New Orleans, LA

3. **Narendran R**, Talbot PS, Slifstein M, Sudo Y, Guo N, Hackett E, Ali M, Huang Y, Hwang D-R, Laruelle M. Effects of d-amphetamine on the binding of <sup>18</sup>F-fallypride in striatal and extrastriatal regions in baboons: single bolus and bolus plus constant infusion studies. Proc 49<sup>th</sup> Annual Meeting, Society of Nuclear Medicine, Los Angeles CA 2002

4. **Narendran R**, Talbot PS, Slifstein M, Sudo Y, Guo N, Hackett E, Ali M, Huang Y, Hwang D-R, Abi-Dargham A, Laruelle M. Effects of d-amphetamine on [<sup>18</sup>F]fallypride binding in striatal and extrastriatal regions. Program No. 404.17. 2002 Abstract Viewer/Itinerary Planner. Orlando, FL: Society for Neuroscience, 2002. Online.

5. **Narendran R**, Talbot PS, Kegeles LS, Ngo K, Hackett E, Martinez D, Huang Y, Abi-Dargham A, Laruelle M, Hwang D-R. Comparison of the invivo vulnerability of a dopamine-2-agonist tracer [<sup>11</sup>C]-N-propylnorapomorphine (NPA), with a D2 antagonist tracer [<sup>11</sup>C]raclopride, on striatal binding following an amphetamine challenge. T-118 2002 Abstract Viewer/Itinerary Planner. Puerto Rico: ACNP, 2002.

6. **Narendran R**, Talbot PS, Slifstein M, Sudo Y, Hackett L, Huang Y, Abi-Dargham A, Laruelle M. Vulnerability of [<sup>18</sup>F]fallypride in vivo binding in striatal and extrastriatal regions following a d-amphetamine challenge in baboons: Single bolus and bolus plus constant infusion studies. *Schizophrenia Research* 2003; 60 (1): 244.

7. **Narendran R**, Talbot PS, Kegeles LS, Martinez D, Huang Y, Ngo K, Hackett E, Castrillon J, Abi-Dargham A, Laruelle M, Hwang D-R. In vivo vulnerability to endogenous dopamine: comparison of the D<sub>2</sub> agonist tracer [<sup>11</sup>C]NPA with the D<sub>2</sub> antagonist tracer [<sup>11</sup>C]raclopride. *JNM supplement* 2003; 44(5) 2003:5 [Abstract #226]

8. **Narendran R**, Huang Y, Talbot PS, Erritzoe D, Hwang D-R, Sokoloff P, Mann A, Thomas C, Laruelle M. Pharmacological evaluation of the benzamide [<sup>11</sup>C]nafadotride as a potential PET imaging agent for the dopamine D<sub>3</sub> receptors. *JNM supplement* 2003; 44(5) 2003; 5: [Abstract #231]

9. **Narendran R**, Talbot PS, Kegeles LS, Martinez D, Huang Y, Ngo K, Abi-Dargham A, Laruelle M,

Hwang D-R. In vivo vulnerability to endogenous dopamine: comparison of the D<sub>2</sub> agonist tracer [<sup>11</sup>C]NPA with the D<sub>2</sub> antagonist tracer [<sup>11</sup>C]raclopride. Program No. 21.8, 2003 Abstract Viewer/Itinerary Planner. New Orleans, LA: Society for Neuroscience, 2003. Online.

10. **Narendran R**, Frankle WG, Keefe R, Gil R, Martinez D, Kegeles LS, Huang Y, Hwang D-R, Khenissi L, Cooper TB, Laruelle M, Abi-Dargham A. Dopaminergic alterations in human ketamine abusers. Abstract #26. Abstract Viewer/Itinerary Planner. Philadelphia, PA: Society for Nuclear Medicine, 2004. Online

11. **Narendran R**, Hwang D-R, Slifstein M, Hwang YC, Huang Y, Guillin O, Ekelund J, Martinez D, Abi-Dargham A, Laruelle M. Measurement of the D<sub>2</sub> high affinity site receptor density (R<sub>high</sub>) in baboons using [<sup>11</sup>C]raclopride and [<sup>11</sup>C]NPA. Program 123.12, 2004 Abstract Viewer/Itinerary Planner. San Francisco, CA: Society for Neuroscience, 2004. Online.

12. **Narendran R**, Slifstien M, Guillin O, Hwang Y, Hwang D-R, Scher E, Reeder S, Rabiner E, Laruelle M. Pharmacological evaluation of the novel D<sub>2/3</sub> agonist radiotracer [<sup>11</sup>C]PHNO in anesthetized non-human primates: A potential D<sub>3</sub> receptor preferring agonist? Neuroreceptor Mapping 2006, Copenhagen, Denmark. Neuroimage Vol 31, Suppl 2. Page T 116

13. **Narendran R**, Frankle WG, Mason N, Lopresti BJ, Litschge M, Vora SN, Asmonga D, Mountz J, Mathis CA. Imaging D<sub>2</sub> agonist binding sites in healthy humans with [<sup>11</sup>C]NPA: Preliminary validation and reproducibility studies. Neuroreceptor mapping 2008, Pittsburgh, PA. Neuroimage Vol 41. Suppl 2. Page T41.

14. **Narendran R**, Mason N, Rabiner EA, Riddler K, May MA, Chen C-M, Kendro S, Mathis CA, Laruelle M, Frankle WG. Further validation of [<sup>11</sup>C]FLB 457 as a tool to measure prefrontal cortical DA release. Neuroreceptor mapping 2010, Glasgow, UK. Neuroimage Vol 52. Suppl 1. Page S40.

15. Forbes EE, Rodriguez E, Hariri A, Keating P, Himes M, **Narendran R**. Alcohol dependence: altered neural response to monetary reward? Biol Psychiatry 2011; 69: 1S: Page 272S

16. **Narendran R**. Validation of [<sup>11</sup>C]FLB 457 as a tool to measure cortical dopamine release. Neuropsychopharmacology 2011; 36(S1): 20

17. Frankle WG, Robinson B, Maier G, Paris J, Asmonga D, Chen C-M, Maureen M, Mason NS, Mathis CA, **Narendran R**. An open label PET study to evaluate serotonin transporter (SERT) occupancy following escalating dose of desvenlafaxine. JCBFM 2012; 32: S59: P023

18. **Narendran R**, Jedema H, Lopresti B, Mason NS, Gurnsey K, Ruskiewicz J, Chen C-M, Mathis C, Frankle WG. Imaging dopamine transmission in the prefrontal cortex: a combined microdialysis and [<sup>11</sup>C]FLB 457 PET study. JCBFM 2012; 32: S157: P131

19. Deutch L, Gurnsey K, Ruskiewicz J, Himes ML, Griswold K, Frankle WG, Jedema HP, Bradberry CW, **Narendran R**. Imaging of prefrontal cortical dopamine transmission with [<sup>11</sup>C]FLB 457 and amphetamine. Program No. 74.09.2012. Neuroscience Meeting Planner. New Orleans, LA, Society for Neuroscience, 2012, Online.

20. Himes ML, Pazehoski D, Riley M, Paris J, Deutch L, Lopresti BJ, Muldoon MF, Moghaddam B, **Narendran R**. Omega-3 polyunsaturated fatty acid supplementation does not increase VMAT2 availability in humans. A [<sup>11</sup>C]DTBZ positron emission tomography study. Program No. 256.23.2012. Neuroscience Meeting Planner. New Orleans, LA, Society for Neuroscience, 2012, Online.

21. **Narendran R**. Imaging dopamine in prefrontal cortex. Page 436. Program/Abstracts. Dopamine 2013, Alghero, May 24-28, 2013, Online.

22. **Narendran R**. Imaging vesicular monoamine transporter, type 2 in cocaine dependence. Neuropsychopharmacology 2014; 40, SI-III: Panel Abstract 7.1

23. **Narendran R.**, Lopresti BJ, Paris J, Himes ML and Mason NS. Imaging nociceptive opioid peptide receptors in humans with alcohol use disorders. *Biological Psychiatry* May 15, 2017; 81: S277-S413

24. Tollefson S, Gertler J, Himes ML, Lopresti B, Mason NS, **Narendran R.** Cocaine abuse is not associated with an increase in medium spiny neurons: A phosphodiesterase 10a (PDE10a) PET study with [<sup>11</sup>C]IMA107. *Biological Psychiatry* May 15, 2018; 81: S277-S413

35. **Narendran R.**, Tollefson S, Himes ML, Lopresti B, Mason NS. Imaging nociceptin receptors in cocaine use disorders with [<sup>11</sup>C]NOP-1A and PET. *Neuroreceptor mapping 2018*, authorea.com, Book of Abstracts NRM 2018 OP20

36. Flanigan MR, Tollefson S, Jordan R, Stoughton C, Himes ML, Lopresti B, Mason NS, **Narendran R.** Imaging corticotrophin releasing factor and nociceptin receptor interactions with [<sup>11</sup>C]NOP-1A and PET. *Brain PET* 2019. *JCBFM* 39 (1\_suppl):524-608, PP01-RO1.

#### 4. Other publications

None

#### 5. Presentations:

None

### PROFESSIONAL ACTIVITIES

#### TEACHING:

- 2006 - present Clinical supervision of PGY I to IV psychiatry residents at WPIC (elective rotation at resolve crisis)  
Clinical preceptor for medical students at WPIC (elective rotation at resolve crisis)
- 2008- 2010 Mentor for PGY III and IV residents for research  
(Natalie Velasquez, MD and Avinash Hosanagar, MD)
- 2011- 2015 'An introduction to human brain imaging techniques'  
Guest lecture for undergraduate neuroscience students at the University of Pittsburgh for NROSCI 1042, "Neurochemical Basis of Behavior", Course Director: Dr. Bitu Moghaddam
- 2013- 2015 'Neurobiology of addiction'  
Lecture for the 'Introduction to Psychiatry Course' for UPSOM MS1  
Course Director: Dr. Jason Rosenstock
- 2016 Guest faculty mentor for University of Pittsburgh Physician Scientist and Medical Scientist Training Program Journal Club (students: Audrey Kindsfather and Maryanna Owoc)
- 2016- 2017 Mentored undergraduate neuroscience students in PET research  
(Savannah Tollefson and Joshua Gertler )
- 2017- 2021 Mentored medical student in PET Research  
(Margaret Flanigan, MS4)
- 2020- current Mentored medical student in PET Research  
(Savannah Tollefson, MS1)

#### RESEARCH:

#### Current Research Support:

R01 DA026472 Narendran (PI) 4/2009-12/2019, NCE  
NIH/NIDA FY17 direct costs \$415, 773; indirect costs \$145, 877  
PET Imaging of Cortical Dopamine Transmission in Cocaine Addiction  
This study proposes to develop and validate a PET imaging technique to measure amphetamine-induced DA release in the cortex to study cocaine dependence.  
Role: PI (33% effort)

RO1 DA026472-08 S1 Narendran (PI) 2018, NCE  
NIH/NIDA FY18 direct costs \$99, 997; indirect costs \$30, 558  
PET Imaging of Cortical Dopamine Transmission in Cocaine Addiction  
This study proposes to image [11]NOP-1A to image subjects with Opioid use disorders (OUD), and contrast the results with that in cocaine use disorders and healthy controls.

RO1AA025247 Narendran (PI) 7/2016 - 6/2020, NCE  
NIH/NIAAA FY17 direct costs \$336,117; indirect costs \$186, 545  
Imaging Nociceptin Receptors in Alcoholism  
This study will use [<sup>11</sup>C]NOP-1A and positron emission tomography to contrast the in vivo status of NOP receptors in human alcoholics with that measured in matched controls. In addition, it will also establish the relationship between NOP receptor availability and stress, anxiety and relapse to alcohol  
Role: PI (37% effort)

RO1AA25247 S1 Narendran (PI) 2018, NCE  
NIH/NIAAA FY18 direct costs \$250, 000; indirect costs \$86, 694  
Imaging beta-amyloid in middle age alcoholics as a mechanism that increases risk for Alzheimer's disease  
This study uses [<sup>11</sup>C]PiB and PET to contrast the rate (%) of Ab positivity (+) in 40-65 year old alcoholics and controls. We hypothesize increased Ab+ in alcoholics will be increased compared to controls.  
Role: PI (5% effort)

### Completed Research Support:

PR150716 Narendran (Partnering PI) 2016 – 2020  
Department of Defense (DoD) Moghaddam (Partnering PI)  
Total award (3 yrs) direct costs \$959, 809; indirect costs \$360, 332  
Omega-3 Polyunsaturated Fatty Acid Status, Microglial Activation, Stress Resilience, and Cognitive Performance  
The study will use parallel animal and human experiments to inform us of immunological mechanisms that underlie impaired stress resilience and cognitive performance in n-3 PUFA deficiency  
Role: Partnering PI (10% effort)

R21 DA044555 Richardson (Multiple PI) 9/2017- 9/2019  
NIH/NIDA Narendran (Multiple PI)  
Exploration of mechanisms of effects of prenatal cocaine exposure in young adults  
Role: Multiple PI

R21 DA042633 Narendran (PI) 7/2016-6/2018  
NIH/NIDA  
In vivo imaging of corticotropin releasing factor-nociceptin receptor interactions  
This study will evaluate alterations in [<sup>11</sup>C]NOP-1A binding following an acute intravenous hydrocortisone challenge in healthy humans  
Role: PI

2015 NARSAD Independent Investigator Award Narendran (PI) 9/2015- 9/2017

Imaging nociceptin receptors (NOP) in post-traumatic stress disorder (PTSD) and resilience  
This study proposes to evaluate nociceptin receptors in college women who have experienced sexual violence and difference in nociceptin receptors available between women who develop PTSD and those who did not.

Role: PI

1R01AA018330 Narendran (PI) 9/2009-8/2015

NIH/NIAAA

Imaging Cortical Dopamine Transmission in Alcohol Dependence

This study evaluates amphetamine-induced DA release with [<sup>11</sup>C]FLB 457 in alcoholics

Role: PI

RO1 MH086523 Frankle (PI)/Narendran (PI) 11/2009-11/2015

NIH/NIMH

In vivo measurement of dopamine transmission in schizophrenia

To measure amphetamine-induced dopamine transmission in schizophrenia with [<sup>11</sup>C]NPA and [<sup>11</sup>C]FLB 457

Role: PI

Clinical Trials Agreement Narendran (PI) 2012- 2014

Ono Pharmaceutical Co., Ltd.

PET Imaging study to evaluate receptor occupancy of a novel ONO compound

Role: PI

RC1 MH088913 Phillips (PI) 10/2009-9/2012

NIH/NIMH/ARRA

Validation of Functional MRI-based Reward Processing Task as a Non-invasive Tool To Measure Dopamine Release

To validate a reward task with functional MRI and PET

Role: Co-Investigator

Clinical Trials Agreement Narendran (PI) 2008 – 2012

GlaxoSmithKline

Measurement of endogenous dopamine levels at baseline using [<sup>11</sup>C]FLB 457

This study evaluates AMPT-induced DA depletion in the cortex

Role: PI

1R21DA023450 Narendran (PI) 03/15/2009 - 03/15/2012

NIH/NIDA

Imaging Dopamine D2 Agonist Binding Sites in Cocaine Dependence with [<sup>11</sup>C]NPA

This study evaluates dopamine D2high receptor sites in cocaine dependence

Role: PI

1R03DA024704-01A1 Narendran (PI) 05/15/2009 - 05/15/2011

NIH/NIDA/ARRA

Vesicular Monoamine Transporter 2 Imaging in Cocaine Abuse

This study evaluates [<sup>11</sup>C]DTBZ binding sites in cocaine dependence

Role: PI

Clinical Trials Agreement Narendran (PI) 2006 – 2010

GlaxoSmithKline

Evaluation of cortical D2/3 binding and amphetamine induced dopamine (DA) release with [<sup>11</sup>C]fallypride and [<sup>11</sup>C]FLB 457

This study contrasts [<sup>11</sup>C]fallypride and [<sup>11</sup>C]FLB 457 vulnerability to endogenous competition by dopamine following an acute amphetamine challenge.

Role: PI

5K08MH068762-04

Narendran (PI)

06/01/2005 - 06/01/2010

NIH/NIMH

Imaging of dopamine-2 (D2) receptor sites in schizophrenia.

This study evaluates dopamine D2high receptor sites in schizophrenia

Role: PI

### **Seminars and invited lectureships:**

CAMH Azrieli Centre for Neuro-Radiochemistry, Toronto, Canada, December 3, 2018

Imaging nociceptin receptors in addictive and stress disorders

Multimodal Translational Imaging Lab Talk, Stony Brook, NY, October 11, 2018

Imaging nociceptin receptors in stress and addictive disorders

Meet the PI Lecture, Department of Psychiatry, Pittsburgh, PA, Feb 23, 2018

Positron Emission Tomography Imaging in Addictive disorders

Brain PET 2017, Berlin, Germany, April 1-4, 2017

"Imaging nociceptive opioid peptide receptors in addictive disorders" in the symposium titled, 'PET Imaging in addictive disorders: Is there life beyond dopamine?'

Department of Radiology Research Seminar, Pittsburgh, PA, Sept 28, 2016

"PET Imaging of the brain in addictive disorders"

Research Society on Alcoholism, San Antonio, TX, June 23, 2015

"Neurochemical abnormalities in the prefrontal cortex in alcoholism" in the symposium titled, "Recent basic and clinical advances identifying mesocorticolimbic neurochemical, structural and synaptic neuroadaptations in ethanol dependence"

Yale PET Talks, New Haven, CT, Jun 16, 2014

"Imaging cortical dopamine transmission in alcoholism"

Colorado Translational Research Center Lecture, Denver, CO, Jul 19, 2013

"Dopamine transmission in cocaine addiction: linking the animal and human studies"

Dopamine 2013, Alghero, Italy, May 24-28

"Imaging dopamine in the prefrontal cortex" in the symposium titled, 'Imaging and the role of dopamine across addictions: differences and commonalities'

Lieber Center for Schizophrenia Research and Treatment, Columbia University, New York, NY, Apr 17, 2013

"Dopamine transmission in cocaine addiction: linking the animal and human studies"

10th International Symposium on Catecholamines, Pacific Grove, CA, Sept 11, 2012

"Dopamine transmission in cocaine addiction: linking the animal and human studies"

Departmental research conference, Department of Psychiatry, Johns Hopkins University School of Medicine, Baltimore, Mar 6, 2012

"Imaging dopamine transmission in addiction: moving beyond [<sup>11</sup>C]raclopride"

Grand Rounds, Department of Radiology, University of Pittsburgh, Pittsburgh, Oct 28, 2011

“Recent advances in imaging neurotransmitter release”

Guest Lecture, Sackler Institute, Weill Medical College of Cornell University, Center for Brain, Gene and Behavioral (CBGB) research across development and the Neuroscience Graduate Program, New York, NY, March 31, 2011

“Dopamine transmission in cocaine addiction”

Grand Rounds, Department of Psychiatry, University of Pittsburgh, Pittsburgh, Jan 28, 2011

“Recent advances in imaging neurochemical transmission”

Guest Lecture, Neuroscience Research Training Program (NRTP), Yale University, New Haven, CT, Sept 17, 2010

“Dopamine transmission in cocaine addiction-linking the animal and human studies”

Grand Rounds, State University of New York at Buffalo, Feb 12, 2010

“Recent advances in imaging neurochemical transmission in the brain with positron emission tomography”

IXth International Conf. on Quantification of Brain Function with PET (Brain PET), Chicago, IL, July 1, 2009, Symposium, Measuring endogenous neurotransmitter release,

“Overview of imaging dopamine release with emission tomography methods”

Lieber Center for Schizophrenia Research and Treatment, Columbia University, New York, NY, Jan 7, 2009

“Imaging neurotransmitter release: moving beyond [C-11]raclopride”

Society for Nuclear Medicine Annual Meeting 2009, Brain Imaging Council, June 13, 2009

Course: A critical evaluation of molecular imaging in neuropsychiatry

“New paradigms in imaging transmitter release”

WFSBP Regional Symposium Marseille: South European Biological Psychiatry Associations Joint Meeting, Marseille, France, Nov 4

Symposium: Sensitization in schizophrenia and substance abuse: would the dopamine D<sub>3</sub> receptor have a key role?

“The role of dopamine in schizophrenia: evidences from PET imaging”

#### **List of current research interests:**

1. To develop and validate novel imaging paradigms to measure neurochemical transmission (e.g., cortical dopamine, GABA, nociception-CRH interactions, etc.) in humans
2. To use novel PET imaging paradigms to understand neurochemical abnormalities in addictive disorders
3. To characterize neuropeptides that regulate stress (corticotrophin releasing factor) and resilience (nociception, neuropeptide Y) in addiction.

#### **Other activities (research service/administrative):**

FDA Advisory Committee

**6/2017- 6/2021 Chair, Psychopharmacology Drug Advisory Committee (PDAC)**

**2/2016 - 6/2021 Permanent member (voting), Psychopharmacology Drug Advisory Committee**

10/2020 Chair and permanent member (voting) Psychopharmacologic Drug Advisory Committee (AR19, amphetamine sulfate)

Chair and permanent member (voting) Psychopharmacologic Drug Advisory Committee (olanzapine/samidorphan)

3/2019 Chair and permanent member (voting) Psychopharmacologic Drug Advisory Committee (esketamine)

11/2018 Chair and permanent member (voting) Psychopharmacologic Drug Advisory Committee (brexanolone)

Chair and permanent member (voting) Psychopharmacologic Drug Advisory Committee (buprenorphine/samidorphan)

3/2018 Chair and permanent member (voting) Psychopharmacologic Drug Advisory Committee



(lofexidine hydrochloride)

10/2017 & 11/2017 Chair and permanent member (voting) Joint Meeting Psychopharmacology Drug Advisory Committee and Drug Safety and Risk Management Advisory Committee (Buprenorphine subcutaneous injection, submitted by Indivior Pharmaceuticals & Braeburn Pharmaceuticals)

9/2016 Permanent member (voting), Joint Meeting Psychopharmacology Drug Advisory Committee and Drug Safety and Risk Management Advisory Committee (Varenicline)

3/2016 Temporary member (voting), Psychopharmacology Drug Advisory Committee (Pimavanserin)

2/2016 Temporary member (voting), Psychopharmacology Drug Advisory Committee (Vortioxetine)

1/2016 Temporary member (voting), Psychopharmacology Drug Advisory Committee (Probuphine)

12/2015 Temporary member (voting), Psychopharmacology Drug Advisory Committee (Gepirone ER)

#### NIH Study Sections

07/2020 Temporary member, 2020/10 ZMH1 ERB-N (02) R Special emphasis panel Early phase clinical trials, Pharma/Device

01/2019 Ad hoc reviewer, NIMH Board of Scientific Counselors Intramural program review

07/2017 Temporary member, ZRG1 BDCN-J (02) M, Member Conflict application review

08/2016 Temporary member, ZRG1BDCN-W (05), Member Conflict application review

04/2016 Temporary member, ZRG1 BDCN-W (05), Member Conflict application review

09/2015 Temporary member, ZRG1-IFCN-B (40), PAR13-259: P01 review Drug Addiction

06/2015 Temporary member, ZRG1-BDCN-A-02, Member Conflict applications review

03/2015 Temporary member, ZRG1-BDCN-C-02, Member Conflict applications review

03/2015 Temporary member, ZRG1-BDCN-A-02, Member Conflict applications review

02/2015 Temporary member, ZDA1-MXL-F-06 NIDA I/START Small grant review

10/2014 Temporary member, ZRG1-IFCN-B (50), PAR 13-259: P01 review Drug Addiction

2010-2014 **Permanent member, Neural Basis of Psychopathology, addictions and sleep disorders study section (NPAS)**

11/2013 Temporary member, ZAA1 DD (04) NIAAA Member Conflict applications review- Basic sciences

03/2013 Temporary member, ZAA1 DD (04) NIAAA Member Conflict applications review- Neuroscience

2012 Temporary member, ZRG1-BDCN-W (02) M Neuroimmunology, Multiple sclerosis, Alzheimer's Dementia, Sleep Apnea and Restless Legs Syndrome

2012 Temporary member, ZAA1 DD (01) NIAAA Member Conflict applications review- Biosciences

2010 Temporary member, ZRG1-BDCN-C (85) NIMH Special Emphasis Panel

2009-2010 Temporary member, Neural Basis of Psychopathology, addictions and sleep disorders study section (NPAS)

#### NIH Work Groups

2011 NIMH Research Domain Criteria (RDoC) Positive Valence System Workshop

#### VAMC Grant Study Sections

2011 Temporary member, Special Emphasis Panel (SPLD), Research on Gulf War Veterans' Illness

#### Canada Research Chairs Program

2020 Reviewer

#### Yale Diabetes Research Center, Pilot Project Application

2016 Reviewer

#### Rachel Upjohn Clinical Scholars Award, University of Michigan Comprehensive Depression Center

2015 Reviewer

#### WWTF Vienna Science and Technology Funds

2015 Reviewer, Cognitive Science Projects

#### University of Pittsburgh School of Medicine Committees

2011- 2014 Member, Standing committee for Non-Tenured Faculty Promotions and Appointments  
2018- Current Member, Institutional Review Board

Departmental Committee

2010- 2015 Member, Committee for recruitment of faculty in mechanisms of addiction  
Department of Psychiatry, University of Pittsburgh, Pittsburgh, PA  
2011- 2015 Member, MR Research Center User Advisory Committee,  
Department of Radiology, University of Pittsburgh, Pittsburgh, PA

Peer Review for Journals

JAMA Psychiatry  
American Journal of Psychiatry (Associate Editor, 2017-2021)  
Biological Psychiatry (Member, Editorial Board, 2013-Present)  
Biological Psychiatry Cognitive neuroscience and neuroimaging (Member, Editorial Board, 2015- Present)  
Bipolar Disorders  
Journal of Cerebral Blood Flow and Metabolism  
Journal of Neuroscience  
Journal of Nuclear Medicine  
Molecular Psychiatry  
Neuropsychopharmacology  
PLOS One (Academic Editor, Editorial Board, 2014-2018)  
Proceedings of National Academy of Sciences  
Psychopharmacology  
Schizophrenia Bulletin  
Synapse  
Translational Psychiatry

Peer review for meetings

2008 -2012 Scientific Review Committee, Neuroreceptor Mapping  
2008- 2014 Society for nuclear medicine abstract reviewer