

## *CURRICULUM VITAE*

**Blaise M. Costa, B.Pharm, M.Pharm, Ph.D.**

Tenured Professor and Discipline Chair for Pharmacology

Department of Biomedical Sciences

Virginia College of Osteopathic Medicine (VCOM)

Center for One Health Research Faculty, Virginia-Maryland College of Veterinary Medicine.  
Virginia Tech, VA

### **CONTACT INFORMATION**

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Lab website: [www.costalabs.com](http://www.costalabs.com)

### **EDUCATION**

- Bachelor of Pharmacy, 1995-1999  
MGR Medical University, Chennai, India
- Master of Pharmacy in Pharmacology, 1999-2001  
MGR Medical University, Chennai, India
- Doctor of Philosophy (Ph.D.) in Psychopharmacology, 2001-2005  
National Institute of Mental Health And Neurosciences (NIMHANS), Bangalore, India  
*Dissertation: Molecular dynamics of NMDA ionotropic glutamate receptors*
- **Postdoctoral fellowships**
  - The Royal Society International Research Fellowship, University of London School of Pharmacy, UK, 2005 -2006
  - Max Planck Institute of Brain Research, Frankfurt, Germany, Department of Neurochemistry, 2006 -2007
  - University of Nebraska Medical Center, Omaha NE, Department of Pharmacology and Experimental Neuroscience, 2007-2010

### **LICENSES AND CERTIFICATES**

- Registered Pharmacist, India, License#TNPC-5899A1, Reg. date: Apr 9, 2001 –present

### **ACADEMIC APPOINTMENTS**

- 2010-2013; Senior Research Fellow, Department of Pharmacology and Experimental Neuroscience, University of Nebraska Med Center, Omaha, NE
- 2013-2017; Assistant Professor of Pharmacology, Edward Via Virginia College of Osteopathic Medicine, Blacksburg, VA
- 2015 –present; Center for One Health Research Faculty, Department of Biomedical Sciences and Pathobiology, Virginia-Maryland College of Veterinary Medicine, Virginia Tech, VA
- 2017-2022; Associate Professor of Pharmacology, Edward Via Virginia College of Osteopathic Medicine, Blacksburg, VA

- 2022-present; Tenured Professor and Discipline Chair for Pharmacology, Edward Via Virginia College of Osteopathic Medicine, Blacksburg, VA

## **TEACHING EXPERIENCE**

### **Medical Pharmacology (didactic)**

- MED 7160 Musculoskeletal System Pharmacology Course, lecturer 2013 – present
- MED 7165 Neurological System and Special Senses Pharm Course, lecturer 2014 – present
- MED 7165 Autonomic Pharmacology Simulation Course, 2022 –present
- MED 7170 Cardiovascular and Pulmonary Sys, lecturer & course director, 2013 – present
- MED 7175 Gastrointestinal and Renal Sys, lecturer & course director from 2013 – present
- MED 7180 Reproductive and Endocrine Sys lecturer & course director from 2013 – present
- MED 7160 Comprehensive Review, Pharm Course director 2021 –present

### **Case Based Learning (CBL)**

- Antimicrobials for Bone & Joint infections, Pharm course director from 2013 – present
- Urinary Tract Infections, Pharm course director from 2020 – present
- Gastrointestinal Infections, Pharm course director from 2020 – present
- Inflammatory Disorders and Osteoarthritis, Pharm course director from 2020 – present

### **Graduate courses**

- 2019- present; Structure and function of ion channels and electrophysiology course to graduate students, at COHR.

## **PROFESSIONAL AFFILIATIONS**

- 2007 – Member, Society for Neuroscience
- 2013 – Member, American Heart Association
- 2016 – Member, The American Society for Pharmacology and Experimental Therapeutics (ASPET)

## **HONORS AND AWARDS**

- 2022 Awarded tenure & promoted to full professor
- 2021 VCOM researcher of the year award
- 2015, 18&19 Golden apple award for excellence in teaching, sigma sigma phi VCOM
- 2010 UNMC-Unemed stimulus to expedite NMDAR drug discovery & patents process
- 2010 Annual performance stipend for extraordinary contribution to the project
- 2009 UNMC-Unemed new invention notification award
- 2009 Eli Lilly NMDA receptor drug discovery collaboration award
- 2007 UNMC annual postdoctoral travel award, Omaha, NE
- 2007 Max Planck Society short-term training fellowship, Germany
- 2005 The Royal Society International Exchange Researcher Award, UK
- 2001 PhD position through nationwide entrance examination for one seat at NIMHANS
- 2001 Best outgoing student during masters from JSS Department of Pharmacology
- 1995 Admitted for B.Pharmacy course through state-wide entrance examination

## **PROFESSIONAL SERVICE**

- 2020 – present Associate editor Journal of Alzheimer's Disease
- 2017 - present Invited to review NIH R-series grants

### **Ad-hoc reviewer**

- Science Direct
- Journal of Pharmacology and Experimental Therapeutics
- American Chemical Society
- Journal of Medicinal chemistry
- Journal of Clinical Medicine
- Journal of Biomedicine and Biotechnology
- Journal of Neurochemistry International
- PLOS One
- Neurotoxicity
- Molecules
- MDPI Cells
- Journal of Molecular Graphics and Modelling
- Journal of Biomolecular Structure and Dynamics

## **MENTORING ACTIVITIES**

### **Graduate student mentor**

- 2019 -2021, Co-chaired graduate student (Lina Kwapisz) dissertation committee  
Department of Biomedical Sciences and Pathobiology, VMCVM, Virginia Tech  
*Dissertation: Pharmacology of a Novel Biased Allosteric Modulator for NMDA Receptors*
- 2022- present, Co-chair graduate student (De'Yana Hines) dissertation committee  
School of Biomedical Engineering and Sciences, Virginia Tech  
*Dissertation: To identify the role of brain lymphatic systems in cranial osteopathic manipulative therapy on animals models of Alzheimer's disease.*

### **Undergraduate or post graduate student mentor**

*(students who worked >1000hrs in the lab are listed below, \*co-authored at least one publication)*

- Lucas Kane\* 07/2013 -07/2015, Computational modeling of NMDAR modulation binding sites
- Douglas Bledsoe\* 12/2015 -07/2018, Electrophys of novel NMDAR allosteric modulators.
- Caroline Campbell\* 10/2016 - 06/2017, Behavioral & biochem analysis of rat model of AD.
- Mike Mykins\* 06/2017 - 06/2018, Immunohistochemistry of AD rat brain tissue & analysis.
- Tyler Lucas\* 06/2017 -04/2019 Behavioral & immunoassays of AD rat brain tissue & analysis.
- Bryanna Vacca\* 06/2018 – 6/2019 Electrophysiology of novel NMDAR allosteric modulators.
- Tullia Johnston\* 07/2018 – 6/2019 Electrophysiology of novel NMDAR allosteric

modulators.

- Brittney Mehrkens\* 07/2019 – 1/2021, Biochem analysis of transgenic rat model of AD
- Patrick Rafael 09/2020 -7/2021 Primary neuron & astrocytes culture and immunoassays
- Alyssa Ingram 5/2021 -7/2022 Primary neuron culture and immunoassays
- Seth Boehringer\* 6/2021 –present, Electrophysiology of novel NMDAR allosteric modulators.
- Nakia Philip 7/2022 –present, Generating disease causing GRIN mutations and biochemistry

### **Research training for medical students**

*(VCOM students who made a significant contribution or \*co-authored a manuscript are listed below)*

- 2018 –19, one VCOM student. Anushri Wagner
- 2019-20, three VCOM students. Rehan Razzaq\*
- 2020-present, four VCOM students each academic year

### **INSTITUTIONAL SERVICE**

- 2013 –present, interviewed 30-40 students each year for admission at VCOM
- 2013 –present, academic advisor for 12 medical students each year
- 2013 –present, poster judge for research day as needed
- 2015 -18 & 2022 Via wellness committee
- 2017 Multicultural or Diversity Committee faculty panel member
- 2020 – present, serve on faculty search committee as needed
- 2022- Institutional environmental and biosafety committee
- 2022 -Pharmacology curriculum oversight committee

### **GRANTS and CONTRACTS**

#### **Completed awards as PI or co-PI (co-investigator awards not listed)**

1. 2015, American Heart Association (AHA) Scientist Development Award, National, Identifying Molecular Determinants of Novel Drug Target in NMDA Receptor. \$308, 0000. Blaise Costa (PI - VCOM). Total \$308,000 for 2016-2020.
2. 2015, VCOM One Health, The role of tri-heteromeric (GluN1/2/3) NMDA receptors in stroke and its mitigation. Blaise Costa (PI-VCOM), Bradley Klein (CVM). About 13% requested amount was funded (\$5,835).
3. 2016, VCOM One Health, The role of tri-heteromeric (GluN1/2/3) NMDA receptors in stroke and its mitigation. Blaise Costa (VCOM co-PI) and Bradley Klein (CVM Co-PI). Total \$41,013.
4. 2016, VCOM REAP, Clearance of Brain Metabolic Waste in a Natural Animal Model of Alzheimer's disease by Cranial Osteopathic Manipulation. Blaise Costa (co-PI VCOM, Hope Tobey (VCOM), Gunnar Brolinson (VCOM) & Bradley Klein (CVM). Total \$45,000.
5. 2017, VCOM REAP, Clearance of Brain Metabolic Waste in a Natural Animal Model of Alzheimer's disease by Cranial Osteopathic Manipulation. Blaise Costa (co-PI VCOM, Hope Tobey (VCOM), Gunnar Brolinson (VCOM) & Bradley Klein (CVM). Total \$49,966.

6. 2017, VCOM One Health, The role of tri-heteromeric (GluN1/2/3) NMDA receptors in stroke and its mitigation. Blaise Costa (VCOM co-PI) and Bradley Klein (CVM Co-PI). Total \$42,500.
7. 2019, VCOM One Health, Mechanisms and Neuroprotective Effects of Triheteromeric NMDA Receptor Modulators. Blaise Costa (VCOM co-PI) and Bradley Klein (CVM Co-PI). Total \$49,994.
8. 2019, American Osteopathic Association (AOA), Clearance of Brain Metabolic Waste in a Natural Animal Model of Alzheimer's disease by Cranial Osteopathic Manipulation. Blaise Costa (co-PI VCOM, Hope Tobey (VCOM), Gunnar Brolinson (VCOM) & Bradley Klein (CVM). Total \$125,000.
9. 2020, VCOM One Health, Identification and Characterization of Mechanically Distinct Novel Anti-Viral Agents Blaise Costa (VCOM), Andrea Bertke (CVM). \$14,000. Funded. This was only ~16% of the requested fund (\$100,000).
10. 2020 VCOM –ICTAS, Pharmacological Characterization of NMDA Receptor Modulators Using Engineered Microenvironments Representing Brain Disorders Blaise Costa (VCOM) & Jenny Munson (VT BEAM). Total \$98,142.
11. 2022, VCOM-ICTAS, To define the pharmacology of agonist concentration biased NMDA receptors modulators. Blaise Costa (VCOM) and Dr.Pam VandeVord (VT BEAM). Total \$47,000

#### Active Awards as PI or MPI

- 1 R15 AT010789-01A1 **Costa (PI)** 07/01/2021 – 06/30/2024  
Sponsor: National Institutes of Health, National Center For Complementary and Alternative Medicine  
**To identify the role of brain lymphatic systems in cranial osteopathic manipulative therapy on animals models of Alzheimer's disease.**  
PI: Costa  
Total award: \$480,000  
Award-receiving institution: VCOM
- Internal seed grant, **Costa & VandeVord (MPI)** 7/1/2023 – 6/30/2024  
Sponsor: Virginia Tech ICTAS & VCOM REAP  
**To Study Traumatic Brain Injury Induced Oscillation of Glutamate Pendulum & Chemical Clamps to Hold.**  
MPI: Costa & VandeVord  
Total award: \$80,000

#### PUBLICATIONS

##### Patents on Experimental Therapeutic Agents (*US Patents and Trademark Office*)

1. 2018, Biased NMDA Receptor Modulators and uses thereof. [PCT/US2019/061308](#). Role: Inventor
2. 2012, Novel positive and negative allosteric aromatic ring modulators for composition of matter and methods of use. International publication number: [WO2012/019106](#). Role: Co-inventor

##### Peer-Reviewed Journal Articles

- Boehringer SC, Johnston TV, Kwapisz LC, VandeVord PJ, **Costa BM**. CNS4 causes subtype-specific changes in agonist efficacy and reversal potential of permeant cations in NMDA receptors. *Pharmacol*

*Res Perspect.* 2023 Jun;11(3):e01107. doi: 10.1002/prp2.1107. PMID: 37283007; PMCID: PMC10245146.

- **Costa BM**, Kwapisz LC, Mehrkens B, Bledsoe DN, Vacca BN, Johnston TV, Razzaq R, Manickam D, Klein BG. A glutamate concentration-biased allosteric modulator potentiates NMDA-induced ion influx in neurons. *Pharmacol Res Perspect.* 2021 Oct;9(5):e00859. doi: 10.1002/prp2.859. PubMed PMID: 34476911; PubMed Central PMCID: PMC8413904.
- **Costa BM**. NMDA receptor modulation and severe acute respiratory syndrome treatment. *F1000Res.* 2021;10. doi: 10.12688/f1000research.73897.1. eCollection 2021. PubMed PMID: 36544563; PubMed Central PMCID: PMC9745209.
- France G, Volianskis R, Ingram R, Bannister N, Rothärmel R, Irvine MW, Fang G, Burnell ES, Sapkota K, **Costa BM**, Chopra DA, Dravid SM, Michael-Titus AT, Monaghan DT, Georgiou J, Bortolotto ZA, Jane DE, Collingridge GL, Volianskis A. Differential regulation of STP, LTP and LTD by structurally diverse NMDA receptor subunit-specific positive allosteric modulators. *Neuropharmacology.* 2021 Oct 19;:108840. doi: 10.1016/j.neuropharm.2021.108840. [Epub ahead of print] PubMed PMID: 34678377.
- Anandkrishnan R, Tobey H, Nguyen S, Sandoval O, Klein BG, **Costa BM**. Cranial manipulation affects cholinergic pathway gene expression in aged rats. *J Osteopath Med.* 2022 Jan 10;122(2):95-103. doi: 10.1515/jom-2021-0183. PMID: 34995434.
- Tobey H, Lucas T, Paul S, Berr S, Mehrkens B, Brolinson PG, Klein B, **Costa BM** Mechanoceutics Alters Alzheimer's Disease Phenotypes in Transgenic Rats: A Pilot Study. *J Alzheimers Dis.* 2020;74(2):421-427. doi: 10.3233/JAD-191071. PubMed PMID: 32039851.
- Bledsoe D, Vacca B, Laube B, Klein BG, **Costa B**. Ligand binding domain interface: A tipping point for pharmacological agents binding with GluN1/2A subunit containing NMDA receptors. *Eur J Pharmacol.* 2019 Feb 5;844:216-224. PubMed PMID: 30553788.
- Tobey H, Lucas T, Bledsoe D, Mykins M, Campbell C, Berr S, Sasser T, Helm R, Brolinson PG, Klein B, **Costa BM** Effect of Cranial Osteopathic Manipulation on Aged Rat Model of Alzheimer's Disease. *J American Osteopathic Association* 2019 Oct 15. doi: 10.7556/jaoa.2019.121. PMID: 31613309.
- Irvine MW, Fang G, Sapkota K, Burnell ES, Volianskis A, **Costa BM**, Culley G, Collingridge GL, Monaghan DT, Jane DE. Investigation of the structural requirements for N-methyl-D-aspartate receptor positive and negative allosteric modulators based on 2-naphthoic acid. *Eur J Med Chem.* 2019 Feb 15;164:471-498. PubMed PMID:30622023.
- Bledsoe D, Tamer C, Mesic I, Madry C, Klein BG, Laube B, **Costa BM**. Positive Modulatory Interactions of NMDA Receptor GluN1/2B Ligand Binding Domains Attenuate Antagonists Activity. *Front Pharmacol.* 2017 May 9;8:229. doi:10.3389/fphar.2017.00229. eCollection 2017. PubMed PMID: 28536523
- Kane LT, **Costa BM**. Identification of Novel Allosteric Modulator Binding Sites in NMDA Receptors: A Molecular Modeling Study. *J Mol Graph Model,* 2015.61:p.204-213

- Irvine MW, Fang G, Eaves R, Mayo-Martin MB, Burnell ES, **Costa BM** et al. Synthesis of a Series of Novel 3,9-Disubstituted Phenanthrenes as Analogues of Known N-Methyl-D-aspartate Receptor Allosteric Modulators. *Synthesis*, 2015 March 19; 47(11):1593.
- Gautam V, Trinidad JC, Rimerman RA, **Costa BM**, Burlingame AL, Monaghan DT. Nedd4 is a specific E3 ubiquitin ligase for the NMDA receptor subunit GluN2D. *Neuropharmacology*. 2013 Nov; 74:96-107.
- Collingridge GL, Volianskis A, Bannister N, France G, Hanna L, Mercier M, Tidball P, Fang G, Irvine MW, **Costa BM**, Monaghan DT, Bortolotto ZA, Molnár E, Lodge D, Jane DE. The NMDA receptor as a target for cognitive enhancement. *Neuropharmacology*. 2013 Jan; 64:13-26.
- **Costa BM**, Yao H, Yang L, Buch S. Role of Endoplasmic Reticulum (ER) Stress in Cocaine-Induced Microglial Cell Death. *J Neuroimmune Pharmacol*. 2013 Jun; 8(3):705-14.
- Irvine MW, **Costa BM**<sup>‡</sup>, Volianskis A, Fang G, Ceolin L, Collingridge GL, Monaghan DT, Jane DE. Coumarin-3-carboxylic acid derivatives as potentiators and inhibitors of recombinant and native N-methyl-D-aspartate receptors. *Neurochem Int*. 2012 Sep; 61(4):593-600. <sup>‡</sup> - equally contributed as first author
- **Costa BM**, Irvine MW, Fang G, Eaves RJ, Mayo-Martin MB, Laube B, Jane DE, Monaghan DT. Structure-activity relationships for allosteric NMDA receptor inhibitors based on 2-naphthoic acid. *Neuropharmacology*. 2012 Mar; 62(4):1730-6.
- Irvine MW, **Costa BM**<sup>‡</sup>, Dlaboga D, Culley GR, Hulse R, Scholefield CL, Atlason P, Fang G, Eaves R, Morley R, Mayo-Martin MB, Amici M, Bortolotto ZA, Donaldson L, Collingridge GL, Molnár E, Monaghan DT, Jane DE. Piperazine-2,3-dicarboxylic acid derivatives as dual antagonists of NMDA and GluK1-containing kainate receptors. *J Med Chem*. 2012 Jan 12; 55(1):327-41. <sup>‡</sup> - equally contributed as first author
- Buch S, Yao H, Guo M, Mori T, **Costa B**, Singh V, Seth P, Wang J, Su TP. Cocaine and HIV-1 interplay in CNS: cellular and molecular mechanisms. *Curr HIV Res*. 2012 Jul; 10(5):425-8.
- Monaghan DT, Irvine MW, **Costa BM**, Fang G, Jane DE. Pharmacological modulation of NMDA receptor activity and the advent of negative and positive allosteric modulators. *Neurochem Int*. 2012 Sep; 61(4):581-92.
- **Costa BM**, Irvine MW, Fang G, Eaves RJ, Mayo-Martin MB, Skifter DA, Jane DE, Monaghan DT. A novel family of negative and positive allosteric modulators of NMDA receptors. *J Pharmacol Exp Ther*. 2010 Dec; 335(3):614-21.
- \***Costa BM**, Feng B, Tsintsadze TS, Morley RM, Irvine MW, Tsintsadze V, Lozovaya NA, Jane DE, Monaghan DT. N-methyl-D-aspartate (NMDA) receptor NR2 subunit selectivity of a series of novel piperazine-2,3-dicarboxylate derivatives: preferential blockade of extrasynaptic NMDA receptors in the rat hippocampal CA3-CA1 synapse. *J Pharmacol Exp Ther*. 2009 Nov; 331(2):618-26. \*- corresponding author

- Delev D, Pavlova A, Heinz S, **Costa BM**, Chandra T, Poetsch B, Seifried E, Oldenburg J. Modelling and expression studies of two novel mutations causing factor V deficiency. *Thromb Haemost.* 2008 Nov;100(5):766-72.
- **Costa BM**, Sowdhamini R, Pradhan N. Comparative analysis of different competitive antagonists interaction with NR2A and NR2B subunits of N-methyl-D-aspartate (NMDA) ionotropic glutamate receptor. *J Mol Model.* 2005 Nov;11(6):489-502. doi: 10.1007/s00894-005-0258-5. Epub 2005 Jun 1. PubMed PMID: 15928921.
- **Costa BM**, Bhattacharyya D, Sowdhamini R, Pradhan N. Structural consequences of D481N/K483Q mutation at glycine binding site of NMDA ionotropic glutamate receptors: a molecular dynamics study. *J Biomol Struct Dyn.* 2005 Feb;22(4):399-410. doi: 10.1080/07391102.2005.10507012. PubMed PMID: 15588104.
- **Costa BM**, Sowdhamini R, Rao MR, Pradhan N. Evolutionary trace analysis of ionotropic glutamate receptor sequences and modeling the interactions of agonists with different NMDA receptor subunits. *J Mol Model.* 2004 Dec;10(5-6):305-16. doi: 10.1007/s00894-004-0196-7. Epub 2004 Oct 22. PubMed PMID: 15597199.

PubMed key: <https://www.ncbi.nlm.nih.gov/myncbi/18II7wm0VP5/bibliography/public/>

### **Non-Peer reviewed publications**

- Registering 18FDG/PET Mouse and AMYViD/PET-CT Rat Studies to Brain VOI Atlases  
This article is available at the [Bruker website](#).

### **PUBLISHED ABSTRACTS**

- Presented more than 100 abstracts at local, national or international meetings in the past 20 years

### **ORAL PRESENTATIONS**

- Routinely give talks at local, state and national level meetings, seminars and conferences.

### **SYSTEM INNOVATION AND QUALITY IMPROVEMENT ACTIVITIES**

- 2018 - Collaboration with the University of Virginia Radiology & Medical Imaging Center, developed protocol to quantify amyloid-beta plaques in rat model of Alzheimer's disease (AD).
- This protocol is widely used to perform Amyvid (Florbetapir F<sup>18</sup>) PET imaging in rat models of AD. See non peer-reviewed publication section for more details.

### **EXTRACURRICULAR ACTIVITIES**

- 2023 Blacksburg draper mile run (5m58s)
- 2021-23 Hokie half marathon (13.1 miles, best 106min) VCOM runners representative
- 2018-19, Played in NRU retired soccer players' team. Won championship in Spring 2019
- 2017 Assistant coach for NRU U10 girls rec soccer team
- 2017 American Red Cross blood donor
- 2014 Runner-up in Virginia Tech annual badminton tournament -doubles