

Research Assistant Professor, Department of Pharmacology

University of Vermont | Firestone 457 | Burlington (VT)-05401

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Immigration status: U.S. Permanent Resident

Google Scholar (<https://scholar.google.com/citations?user=PPPgCwsAAAAJ&hl=en>)**Education**

- 2018 Ph.D., Pharmaceutical Sciences *North Dakota State University, Fargo, ND*
Dissertation Title: "Regulation of Vascular Tone in Cerebral and Coronary Arteries by Apelin/APJ Receptor Mechanisms"
- 2016 Graduate Certification, Statistics *North Dakota State University, Fargo, ND*
- 2010 M.S., Pharmacology and Toxicology *NIPER, SAS Nagar-Mohali, India*
Thesis Title: "Genotoxicity and carcinogenicity biomarkers induction in response to DNA damage: Significance and correlation"
- 2007 Bachelor of Pharmacy *IPS Academy, Indore, India*

Research Training

- 2018- 2021 *Postdoctoral Associate/Fellow* *Dept. of Pharmacology, University of Vermont*
 Explored two aspects of neurovascular science: (1) endothelial dependent neurovascular coupling mechanisms in control of blood flow in the brain; and (2) role of penetrating arterioles in blood flow regulation in the brain. *Mentor: Dr. Mark T. Nelson.*
- 2013- 2018 *Ph.D. Candidate* *Dept. of Pharmaceutical Sciences, North Dakota State University*
 Evaluated apelin induced vascular effects in cerebral and coronary arteries.
Mentor: Dr. Stephen T. O'Rourke.
- 2008- 2010 *Graduate Research Scholar* *Dept. of Pharmacology & Toxicology, NIPER- SAS Nagar*
 Studied different biomarkers of genotoxicity and carcinogenicity to identify significance of and correction between these biomarkers. *Mentor: Dr. G. B. Jena.*
- 2011 *Research Intern* *IRCC School of Medicine, University of Torino, Italy*
 Studied functional role of semaphorin signaling in tumor progression and metastasis.
Mentor: Dr. Luca Tamagnone.
- 2006 *Summer Quality Control Intern* *Promed Laboratories, Indore, India*

Positions

- 2021- *Research Assistant Professor* *Dept. of Pharmacology, University of Vermont*
 Investigate neurovascular vascular coupling mechanisms in blood flow regulation in the brain and identify vascular functional deficits in Alzheimer's disease and related dementia.
- 2010- 13 *Senior Regulatory Affairs Executive* *Biocon Biopharmaceutics, Bangalore, India*
 Compiled and submitted application packages to the US-FDA and EU-EMA for monoclonal antibodies clinical trials.

Teaching Experience*University of Vermont*

- 2021- Instructor: PHRM 297: Pharmacology Research

2019- Lecturer: PHRM 290: Topics in Molecular and Cellular Pharmacology – Nitric Oxide and cGMP; Potassium channels; Vascular Function and Disease

North Dakota State University

2017- 2018 (Spring) Teaching Assistant: PHRM 580: Pharmacotherapy Capstone
2016- 2017 (Fall) Teaching Assistant: PSCI 614: Cardiovascular Pharmacodynamics
2015- 2016 (Spring) Teaching Assistant: PSCI 410: Pharmaceutical Biotechnology
2015 (Fall) Teaching Assistant: PSCI 613: Respiratory/GI Pharmacodynamics

Central India Institute of Pharmacy, Indore, India

2007- 2008 Instructor: Basic Pharmacology; Advanced Pharmaceutical Sciences

Student Mentoring Experience (UG: Undergraduate, M: Masters', PH: Pharm D)

Primary Mentor

2023- Lillian Hand ^{UG} University of Vermont
2021-22 Cate Lebsack ^{UG}, Eva Jessup ^{#UG}, Eleni Karabesini ^{UG},
Alex Dunstan ^{*UG}, Shirin Dravid ^{UG}, Maia Lineberry ^{UG} University of Vermont
2020 Perin Patel ^{UG}, Hannah Kenney ^M, Jessica Buchelly ^M University of Vermont
2019-20 Verastacy Maina ^{UG} University of Washington
2016-17 Samantha Meyers ^{PH} North Dakota State University

Recipients of *ASPET and # UVM FOUR Summer Research Fellowship 2022.

Thesis/ Dissertation committees

2022 Noelle Cataldo ^{UG} University of Vermont

Research Funding

Current Research Funding

K99/R00- AG075175 07/15/2022 – 06/30/2027
NIH NIA Pathways of Independence Award Role: PI

This project will investigate the functional deficits in neurovascular coupling in Alzheimer's disease.

Completed Research Funding

856791 07/01/2021 – 07/15/2022[#]
AHA Career Development Award Role: PI

This project aimed to investigate the functional deficits in neurovascular coupling in Alzheimer's disease.

[#] Respectfully returned 2 years of funding support (2023-2024).

20POST35210155 01/01/2020 – 06/30/2021
AHA Postdoc Fellowship Role: Trainee

This project was aimed to study endothelial Ca²⁺ signals in penetrating arterioles control local blood flow in the brain. It received 0.11 percentile & 1.15 priority score in the study section review.

Early Career Research Award 07/01/2020 – 06/30/2021
Cardiovascular Research Institute, University of Vermont Role: PI

This project was designed to study brain capillary endothelial Ca²⁺ signals in regulation of cerebral blood flow in Alzheimer's disease.

Academic and Professional Honors

- 2023 CVRI Travel Award, University of Vermont to attend The Calcium and Cell Function Conference, Ireland
- 2023 Best Abstract Award, Cardiovascular Research Institute, University of Vermont
- 2022 Career Development Award, Cardiovascular Research Institute, University of Vermont
- 2022 CVRI Travel Award, University of Vermont to attend GRC-Calcium signaling
- 2021 First place, CVRI Viridis Montis Early Career Investigator Challenge in Cardiovascular Disease
- 2020 Career Development Award, Cardiovascular Research Institute, University of Vermont
- 2020 ASPET Postdoc Travel Award to attend Experimental Biology
- 2019 CVRI Travel Award, University of Vermont to attend FASEB SMC
- 2018 Third Place, ASPET-Cardiovascular Pharmacology Trainee Showcase, Experimental Biology
- 2018 ASPET Graduate Student Travel Award to attend Experimental Biology
- 2018 Finalist of NDSU 3 Minute Thesis (3 MT) Competition
- 2017 Love of Learning Award- Honor Society of Phi Kappa Phi
- 2017 Third place, Graduate Student Best Presentation Award Competition, ASPET- Cardiovascular Pharmacology Division, Experimental Biology, Chicago
- 2017 ASPET Steven E. Mayer Graduate Student Travel Award to attend Experimental Biology
- 2016-17 ASPET Washington Fellow
- 2016 NDSU Graduate School Travel Award to attend Mechanisms of vasodilatation
- 2016 Best Oral Presentation Award, 3rd Annual AAPS-NDSU Pharmaceutical Sciences symposium
- 2016 Dean's Scholarship, College of Health Professional NDSU
- 2016-17 ASPET mentoring network fellow: Coaching for career development
- 2016 NDSU Graduate School Travel Award to attend Experimental Biology
- 2015 Matilda B. Thompson Scholarship-Honor Society of Phi Kappa Phi
- 2015 Love of Learning award- Honor Society of Phi Kappa Phi
- 2015-16 PEO International Peace Scholarship
- 2008-10 Graduate research fellowship awarded by Ministry of Health and Family Welfare, India

Publications (* Co-first authors, ^ Corresponding author)

Peer-Reviewed Research Articles

- K. Freeman*, A. Sackheim*, **A. Mughal***, G. Ebner, G. Hennig, W. Lockette, M. T. Nelson (2023). Pathogenic soluble tau peptide disrupts endothelial calcium signaling and vasodilation in the brain microvasculature. *bioRxiv*, 2023.08. 08.552492.
- K. J. Wahlberg, **A. Mughal**, Z. Li, M. J. Cipolla, M. Cushman, J. N. Flyer (2022). The Impact of a Mentored Preclinical Cardiovascular Summer Research Fellowship on Medical Student Scholarship and Career Trajectory. *BMJ Open* 12 (9), e059629.
- M. Sancho*, N. R. Klug*, **A. Mughal**, M. Koide, S. H. dela Cruz, T. J. Heppner, A. D. Bonev, D. Hill-Eubanks, M. T. Nelson (2022). Adenosine Activates ATP-sensitive K⁺ Channels in Endothelial Cells and Pericytes in CNS Capillaries. *Science Signaling* 15 (727): eab15405.
- C. Jorgensen, S. Vedachalam, F. Sancheznieto, M. A. Astore, **A. Mughal**, M. L. Lay, A. Bankston, H. Singh (2022). Tracking Policy Implications of the COVID-19 Pandemic and Related Executive Actions on a Sampling of Foreign-born Early Career Researchers in the U.S. *OSF Preprints*.
- T. A. Longden*, **A. Mughal ***, G. W. Hennig*, O. F. Harraz, B. Shui, F. K. Lee, J. C. Lee, S. Reining, M. I. Kotlikoff, E. Kostensis, G. M. König, D. Hill-Eubanks, M. T. Nelson (2021). Local IP₃ receptor-mediated Ca²⁺ signals compound to direct blood flow in brain capillaries. *Science Advances* 7: eabh0101.

- **A. Mughal**, K. J. Wahlberg, Z. Li, J. N. Flyer, N. C. Olson, M. Cushman (2021). Impact of an Institutional Grant Award on Early Career Investigator Applicants and Peer Reviewers. *Research and Practice in Thrombosis and Haemostasis* 5: e12555.
- **A. Mughal**, C. Sun, and S. T. O'Rourke (2021). Apelin does not impair coronary artery relaxation mediated by nitric oxide-induced activation of BK_{Ca} channels. *Frontiers in Pharmacology* 12:1358.
- **A. Mughal***, O.F. Harraz*, A. Gonzales, D. Hill Eubanks, M.T. Nelson (2021). PIP2 improves cerebral blood flow in a mouse model of Alzheimer's disease. *Function* 2: zqab010.
[This manuscript was selected for a Cover Image and an editorial perspective \(Function 3: zqab017\).](#)
- P. Thakore, M. G. Alvarado, S. Ali, **A. Mughal**, P. W. Pires, E. Yamasaki, H. A. T. Pritchard, B. E. Isakson, C. H. Tran, S. Earley (2021). Brain Endothelial Cell TRPA1 Channels Initiate Neurovascular Coupling. *eLife* 10: e63040.
- **A. Mughal**, A. M. Sackheim, M. Sancho, T. A. Longden, W. Lockette, M. T. Nelson, K. Freeman (2020). Impaired capillary-to-arteriolar electrical signaling after traumatic brain injury. *Journal of Cerebral Blood Flow and Metabolism* 41: 1313-1327.
- **A. Mughal**, C. Sun, and S. T. O'Rourke (2020). Apelin Inhibits an Endothelium-Derived Hyperpolarizing Factor-Like Pathway in Rat Cerebral Arteries. *Peptides* 132: 170350.
- **A. Mughal**, C. Sun, and S. T. O'Rourke (2018). Apelin Causes Endothelium Dependent Relaxation in Isolated Coronary Arteries via Nitric Oxide Dependent Pathways. *Journal of Pharmacology and Experimental Therapeutics* 366(2): 265-273.
- **A. Mughal**, C. Sun, and S. T. O'Rourke (2018). Apelin Reduces Nitric Oxide-Induced Relaxation of Cerebral Arteries by Inhibiting Activation of Large Conductance, Calcium-Activated K Channels. *Journal of Cardiovascular Pharmacology* 71: 223-232.
- **A. Mughal**, A. Vikram, S. Kushwaha and G. B. Jena (2011). Simultaneous Use of Erythropoietin and Prior-bleeding Enhances Sensitivity of Peripheral Blood Micronucleus Assay. *Mutagenesis* 26(2):331-338.
- **A. Mughal**, A. Vikram, P. Ramarao and G. B. Jena (2010). Micronucleus and Comet Assay in the Peripheral Blood of Juvenile Rat: Establishment of Assay Feasibility, Time of Sampling and the Induction of DNA Damage. *Mutation Research* 700:86-94.

In Preparations

- **A. Mughal**, T. J. Heppner, G. W. Hennig, M. T. Nelson. Electro-calcium coupling in the brain endothelium: A higher-order mechanism for controlling cerebral blood flow.
- **A. Mughal**, G. W. Hennig, T. A. Longden, M. T. Nelson. Characterization and function of brain arteriolar endothelial Ca²⁺ signals.

Reviews and Commentaries

- **A. Mughal**[^], M. T. Nelson, D. Hill-Eubanks (2023). The post-arteriole transitional zone: A specialized capillary region that regulates blood flow distribution within the CNS microvasculature. *Journal of Physiology* 601.5: 889-901 (Invited review).
- **A. Mughal**, S. T. O'Rourke (2018). Vascular Effects of Apelin: Mechanisms and Therapeutic Potential. *Pharmacology and Therapeutics* 190:139-147.
- **A. Mughal**, D. Kumar, A. Vikram (2015). Anti-cancer and Metabolic Effects of Thiazolidinediones: Relative Influence of PPAR γ and IGF-1 Signaling. *European Journal of Pharmacology* 768:217-225.
- G. B. Jena, P. Trivedi, **A. Mughal**[^] (2009). The Application of the Principles of Good Laboratory Practice (GLP) in Regulatory Toxicity Studies. *Current Research & Information on Pharmaceutical Sciences* 10:25-28.
- **A. Mughal**, C. Paronis, M. Hernandez (2018). Overview of ASPET Daily Datablitz. *Pharmacologist* 10 (2): 89.

Abstracts

- **A. Mughal**, T. Heppner, G. Hennig, M. T. Nelson (2023). Electro-Calcium coupling in the brain endothelium resolves capillary stalls. *FASEB 'The Calcium and Cell Function Conference'*.
- A. Sackheim*, **A. Mughal***, G. Ebner, G. Hennig, W. Lockette, M. T. Nelson, K. Freeman (2023). Perivascular tau disrupts the endothelial-dependent vasodilation in the brain microcirculation. *Shock meeting*.
- **A. Mughal**, T. Heppner, G. Hennig, M. T. Nelson (2022). Electro-Calcium signaling in the brain endothelium: A higher order mechanism to control cerebral blood flow. *GRC-Calcium signaling*.
- K. J. Wahlberg, **A. Mughal**, Z. Li, M. J. Cipolla, M. Cushman, J. N. Flyer (2021). The Impact of a Mentored Preclinical Cardiovascular Summer Research Fellowship on Medical Student Scholarship and Career Trajectory. *American College of Cardiology*.
- KJ Wahlberg, **A Mughal**, Z Li, M Cushman, JN Flyer (2021). The Impact of a Preclinical Medical Student Mentored Summer Research Experience in Cardiovascular Disease on Scholarship and Career Trajectory – A Six-Year Report. *UVM Teaching Academy Snow Season Retreat*.
- **A. Mughal**, T. A. Longden, G. Hennig, M.T. Nelson (2020). Endothelial Ca²⁺ signals in Penetrating Arterioles Control Local Blood Flow in the Brain. *FASEB Journal*: 34.s1.04433.
- **A. Mughal**, T. A. Longden, G. Hennig, M. T. Nelson (2019). Sensory Stimulation-evoked Brain Endothelial Calcium Activity Regulates Cerebral Blood Flow during Functional Hyperemia. *FASEB Smooth Muscle Conference*.
- O.F. Harraz, N. R. Klug, **A. Mughal**, M.T. Nelson (2019). Piezo1 channels are mechanosensors in brain capillaries. *FASEB Smooth Muscle Conference*.
- K. Freeman, T. Longden, **A. Mughal**, M. Boucher, A. Sackheim, S. Russell, G. Hennig, W. Lockette and M. T. Nelson (2019). Traumatic Brain Injury Impairs Cerebral Blood Flow Regulation Through Disruption of Inside-out Signaling Between Capillaries and Upstream Arterioles. *Shock meeting*.
- S.T. O'Rourke, **A. Mughal**, C. Sun (2019). Apelin Impairs Endothelium-Derived Hyperpolarizing Factor (EDHF)-Induced Relaxation of Cerebral Arteries by Inhibiting BK_{Ca} Channels in Vascular Smooth Muscle. *Stroke*, 50: AWP543.
- **A. Mughal**, T. A. Longden, G. Hennig, M.T. Nelson (2018). Sensory Stimulation-evoked Brain Endothelial Calcium Activity is Regulated by TRPV4 and G_qPCR Signaling. *University of Vermont-Pharmacology Retreat*.
- **A. Mughal**, C. Sun and S. T. O'Rourke (2016). Apelin Alters Vasomotor Tone in Cerebral Arteries by Inhibiting Endothelium-Dependent Relaxations that are Mediated by Activation of Large Conductance, Calcium-Activated K (BK_{Ca}) Channels. *FASEB Journal*, 31(1):672.1
- S. T. O'Rourke, **A. Mughal**, M. Sane (2016). Apelin Causes Endothelium-Dependent Relaxation of Rat coronary, but Not Cerebral Arteries. *Physiology*.
- **A. Mughal**, M. Sane, C. Sun and S. T. O'Rourke (2016). Decreased Role for BK_{Ca} Channels in Endothelium-Dependent Relaxation of Nitrate Tolerant Coronary Arteries. *FASEB Journal*, 30(1):940.5
- **A. Mughal**, M. Sane, C. Sun and S. O'Rourke (2015). Decreased Role for BK_{Ca} Channels in Endothelium-Dependent Relaxation of Nitrate Tolerant Coronary Arteries. *AAPS-NDSU Symposium*.
- M. Sane, **A. Mughal**, C. Sun and S. T. O'Rourke (2015). Increased Role for Large Conductance, Calcium-activated K channels (BK_{Ca}) in Endothelium-Dependent Relaxation of Nitrate Tolerant Mesenteric Arteries. *FASEB Journal*, 29(1): 627.8
- **A. Mughal**, A. Vikram and G. B. Jena (2010). Correlation of DNA damage in the Peripheral Blood of Juvenile Rat: Assay Sensitivity and Mechanism. *Annual Conference of EMSI*.

Invited Lectures/Seminars

- 2023 University of Texas, Department of Neurobiology and Anatomy
2023 University of Virginia, Cardiovascular Research Center
2023 Emerging Leaders in Neuroscience, Brain and Mind Research Institute, Cornell University
2023 BRENDA-Leducq Virtual Seminar
2023 Brain and Brain PET 2023, Brisbane, Australia
2023 National Institute of Health, NINDS- Stroke Branch
2023 NAVBO Webinar Series
2023 University of Vermont, Department of Molecular Physiology and Biophysics
2023 Tulane University, Department of Pharmacology
2023 Oregon Health and Science University, Biology of Neurodegeneration interest group
2023 University of Vermont, Department of Neuroscience
2022 22nd International Vascular Biology Meeting
2022 University of Virginia, Department of Neuroscience
2022 Gordon Research Conference-Calcium signaling
2021 Interpreting BOLD signals
2021 Vermont Center for Cardiovascular and Brain Health Annual Symposium.
2021 CVRI Viridis Montis Early Career Investigator Challenge in Cardiovascular Disease.
Cardiovascular Research Institute of Vermont
2018 Babasaheb Bhimrao Ambedkar University, Lucknow, India
2018 University of Vermont-Pharmacology Retreat
2018 Experimental Biology - Cardiovascular Pharmacology Young Trainee Showcase
2017 AHA Scientific Sessions. Circulation, 136: A16601
2017 Mechanisms of Vasodilatation 12th International Symposium, Mayo Clinic, Rochester, MN.
Journal of Vascular research, 53 (1):11
2016 Third Annual AAPS-NDSU Pharmaceutical Sciences symposium, NDSU

Research Conferences/Symposia

- 2023 CVRI Media Training Workshop *Role: Moderator/Chair*
2022 IVBM 'Heterogeneity of Vascular and Immune Cells' *Role: Chair*
2022 CVRI Viridis Montis Early Career Investigator Challenge *Role: Moderator/Chair*
2021 Cardiometabolic Diseases: At the Crossroads of Adipose Tissue and Cardiac Health,
Experimental Biology (Re-scheduled from 2020 due to the pandemic) *Role: Chair*
2018 ASPET Inaugural Datablitz Session, Experimental Biology *Role: Moderator*
2016 3rd Annual AAPS-NDSU Pharmaceutical Sciences symposium *Role: Chair*

Professional Outreach and Service

- Member:* American Society of Pharmacology and Experimental Therapeutics (ASPET)
American Heart Association (AHA)
North American Vascular Biology Organization (NAVBO)
American Physiological Society (APS)
American Association of Pharmaceutical Scientists (AAPS) (2013-2016)
Honor Society of Phi Kappa Phi
- Manuscript Reviewer:* American Journal of Physiology- Heart & Circulatory Physiology, Function,
eLife, Scientific Reports, Journal of Cerebral Blood Flow and Metabolism
Clinical Pharmacology: Advances and Applications, Molecules, Medicine

Cancer Cell International, Journal of Cardiovascular Toxicology, Seminars in Cancer Biology, BMC (Cancer, Molecular & Cell Biology), Lipids in Health and Disease, Frontiers in Genetics/ Frontiers in Oncology

Editorial Boards:

BMC Research Notes
Translational Medicine Communications

Reviewer Board:

Frontiers in Physiology

Grant Reviewer:

AHA Career Development Award (2022-)
AHA Postdoctoral and Predoctoral Fellowship (2022-)
AHA Transformation Project Award (2022)
CVRI Early Career Research Award (2019-)

Ad-hoc Reviewer:

ASPET SURF Program and Early Career Travel Awards

Institutional Committees:

CVRI Early Career Advisory Committee, University of Vermont (2019-)
Inclusivity Committee, College of Health Professionals, NDSU (2014- 2018)
Award Committee, College of Health Professionals, NDSU (2017- 2018)
President, Phi Kappa Phi Student chapter, NDSU (2015- 2016)
Historian, Phi Kappa Phi Student chapter, NDSU (2014- 2015)
Chair, AAPS student chapter, NDSU (2016-2017)

Society Committee:

APS Program Committee (2023-)
eLife Early Career Community Ambassador (2019- 2020)
ASPET Cardiovascular Pharmacology Committee (2016-)
ASPET Program Committee (2018-2021)
ASPET Young Scientist Committee (2016-2021)
Phi Kappa Phi Council of Students (2016-2018)

Advanced Courses and Trainings

- 2022 Compassionate Leadership, University of Vermont Continuing Education
- 2020 Focus of Peer Review, Nature Masterclass Certificate, Nature Research
- 2015 Masters of Success, Leadership Program Certificate, North Dakota State University
- 2014 International graduate teaching assistant, North Dakota State University
- 2014 Online Certification-DNA Structure to Therapy, Iversity (Germany)
- 2009 Online Certification-Intellectual Property, World Intellectual Property Organization (Switzerland)