Curriculum Vitae
Rashad Hussain, PhD
Associate Professor
Department of Neurosurgery
Medicine Institute for Neuroscience Discovery (UM-MIND)
University of Maryland School of Medicine
Baltimore, MD

Date 10-02-2025

Contact Information

Business Address:	Building HSF3; Office 9171 670 W Baltimore Street, Baltimore, MD 21201
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Foreign Languages:	English (Fluent) Urdu (Native) French (Proficient)

Education

1999-2001 B. Sc. Chemistry, Botany, Zoology, Punjab University, Pakistan

2001-2003 M. Sc. Zoology (Reproductive Physiology), PMAS Arid Agriculture University, Rawalpindi, Pakistan

2003-2007 Non-Degree Affiliation, Research Fellow, PMAS Arid Agriculture University/Pakistan Agriculture Research Council, Islamabad, Pakistan

2007-2011 Ph.D Neurosciences (Signaling and Integrated Networks in Neuroscience) Université Paris-Saclay, France

Post Graduate Education and Training

2011-2012 Post-doctoral Fellow/ Visiting Researcher, Biopathologie de la Myéline, Neuroprotection, Université de Strasbourg, France

2012-2013 Post-doctoral fellow Neural Sciences, Temple University, Philadelphia, PA

2013-2017 Post-doctoral fellow Cell and Developmental Biology University of Colorado, Denver, CO

Employment History

Academic Appointments

2006-2007	Zoologist, Zoological Survey, Islamabad, Ministry of Environment, Islamabad, Pakistan
2011-2012	Assistant Professor, Neuroendocrinology, Quaid-i-Azam University, Islamabad, Pakistan
2017-2024	Assistant Professor, Department of Neurology, University of Rochester, NY
2024-2025	Associate Professor, Department of Neurology, University of Rochester, NY
2025-Present	Associate Professor, Department of Neurosurgery, University of Maryland School of Medicine, Baltimore, MD

Other Employment (*paid* employment)

2003-2006	Research Associate, Department of Zoology, PMAS Arid Agriculture University/Pakistan Agriculture Research Council, Islamabad, Pakistan

Honors and Awards

2007-2011	Ph.D. with Distinction (Tres honorable, Most Honorable, Highest Ph.D. grade that exists in French Universities).
2007-2011	Ph. D Fellowship, Neuroscience, Higher Education Commission of Pakistan/ Université Paris-Saclay, France.
2024	Top Scoring Abstract, International Neurotrauma Society Meeting, Potentiating glymphatic drainage minimizes post-traumatic cerebral oedema, (Sept 5, 2024), Cambridge University, Cambridge, UK.

Professional Society Memberships

2003-present	Life Fellow, Zoological Society of Pakistan
2010-Present	Fellow, Society for Neuroscience
2010-2013	Fellow, British Society for Neuroendocrinology
2014-Present,	Fellow, American Society for Neurochemistry
2017-Present	Fellow, National Neurotrauma Society
2023-Present	Fellow, New York Academy of Sciences

2025-Present	Fellow, Alzheimer’s Association International Society to Advance Alzheimer’s Research and Treatment (ISTAART)
2025-Present	Fellow, North American Vascular Biology Organization (NAVBO)
2025-Present	Fellow, American Academy of Neurology (AAN)

Administrative Service

2013–2017	Activity Planning Committee Member, Post Doctoral Association, University of Colorado, Denver, CO
2017-2019	Lab Manager (Nedergaard Lab), Center for Translational Neuromedicne, University of Rochester, NY
2017–Present	Grant Reviewer, Stichting Alzheimer Onderzoek – Fondation Recherche Alzheimer, KU Leuven, Belgium
2017-Present	Ph. D Thesis Committee Member; 3 Students; University of Sargodah, University of Faisalabad, University of Rochester, NY
2023-Present	Project Director and Co-ordinator, MPI-Initiative, Linking particulate matter exposure, glymphatic clearance, and Alzheimer’s disease-related pathology. National Institute of Health, Bethesda, MD
2023-Present	Reviewer, Neurotrauma Abstract Selection Committee and scoring the top abstract for award and oral presentation. National Neurotrauma Society
2024–Present	Subject Expert (EX2024D1084895), European Commission, Brussels, Belgium
2024–Present	Member, Chronic Dysfunction and Integrative Neurodegeneration (CDIN, ad hoc) Study Section, National Institute of Health, Bethesda, MD
2024–Present	Member, Ultrafine Particulate Matter in ADRD (ZAG1 ZIJ-8, ad hoc) Study Section, National Institute of Health, Bethesda, MD
2024–Present	Member, Neuroimmune and Neuroinflammation in Neurodegenerative Disorders (ad hoc) Study Section, National Institute of Health, Bethesda, MD

Institutional Service

2018-2025	Member, UCAR protocol Amendment Committee, Center for Translational Neuromedicine, University of Rochester, NY
2018–2025	Radiation Safety Officer, University of Rochester, NY
2019–2025	Pilot Grant Review Program, Del Monte Institute of Neuroscience, University of Rochester, NY
2025-Present	Member, Ph. D Thesis Committee, Department of Environmental Sciences, University of Rochester, NY

National Service

2023-Present	Project Director and Co-ordinator, MPI-Initiative, Linking particulate matter exposure, glymphatic clearance, and Alzheimer's disease-related pathology. National Institute of Health, Bethesda, MD
2023-Present	Reviewer, Neurotrauma Conference Abstract Selection Committee and scoring the top abstract for award and oral presentation.
2024	Member, Chronic Dysfunction and Integrative Neurodegeneration (CDIN, ad hoc) Study Section, National Institute of Health, Bethesda, MD
2024	Member, Ultrafine Particulate Matter in ADRD (ZAG1 ZIJ-8, ad hoc) Study Section, National Institute of Health, Bethesda, MD
2024–Present	Member, Neuroimmune and Neuroinflammation in Neurodegenerative Disorders (ad hoc) Study Section, National Institute of Health, Bethesda, MD

Reviewer (ad hoc):

2014-Present	Pakistan Journal of Zoology (Reviewed Articles: 2)
2022-Present	Frontiers in Neurology, Section; Neurotrauma, (Reviewed Articles: 1)
2022-Present	Frontiers in Aging Neuroscience: Section; Alzheimer's Disease and Related Dementias, (Reviewed Articles: 1)
2023-Present	Acta Neuropathologica Communications, (Reviewed Articles: 1)
2024-Present	Quantitative Imaging in Medicine and Surgery, (Reviewed Articles: 1)
2024-Present	Neural Regeneration Research, (Reviewed Articles: 1)
2024-Present	Journal of Advance Research, (Reviewed Articles: 1)
2023-Present	Molecular Neurobiology, (Reviewed Articles: 1)
2024-Present	European Journal of Pharmacology, (Reviewed Articles: 1)
2023-Present	Brain Stimulation, (Reviewed Articles: 1)
2024-Present	Molecular Psychiatry, (Reviewed Articles: 1)
2025-Present	Neurobiology of Disease, (Reviewed Articles: 1)
2024-Present	Lancet Neurology, (Reviewed Articles: 1)

International Service

2017–Present	Grant Reviewer, Stichting Alzheimer Onderzoek – Fondation Recherche Alzheimer, KU Leuven, Belgium
2024–Present	Subject Expert for Grant Review (EX2024D1084895), European Commission, Brussels, Belgium

Teaching Service

Undergraduate Student Teaching [or Mentoring, or Advising]

2013	Assistant Professor, Quaid-i-Azam University (QAU), Islamabad, Pakistan Foundational courses, 25-30 Masters/Ph. D Student/Course; 2 courses, 6hrs/week, each over 16-week Semester
2017–2025	Center for Translational Neuromedicine, University of Rochester, NY Research-based independent study courses: 19 BS/MS/Ph. D students, courses; 4 courses, 10hrs/week/student/course over 16-week Semester

<u>Graduate / Post-Graduate Teaching / Mentoring / Advising</u>

2015	Ph.D. Thesis Committee Member (External Reviewer) University of Sargodha, Pakistan
2025	PTH 509 – Cell Biology of Disease (University of Rochester, NY) 1 lecture/year, 1-credit hrs., 15 MS students/course
2017–2019	Mini Medical School Lecture Series, University of Rochester, NY Annual summer lecture, 1-credit hrs, 20–25 pre-medical students
2019	Ph.D. Thesis Committee Member (External Supervisor), Government College University, Faisalabad, Pakistan
2021	Ph.D. Rotation Mentor, Neuroscience Program University of Rochester, NY 1 rotation student, 6-week period, ~4–6 hours/week
2025-Present	Ph.D. Thesis Committee Member (External Reviewer) Quarterly Meetings; Thesis research progress MSFS Toxicology Research Program, Department of Environmental Medicine University of Rochester School of Medicine and Dentistry, NY

Research Activities

The objective of my work is to understand the cellular and molecular mechanisms underlying different neurological disorders. The current research interests can be summarized as:

- Understanding of glia function in health and disease in the central nervous system in the context of glymphatic system; a brain metabolite clearance pathway
- Assessment of key cellular and molecular mechanisms involved in progenitor cell regeneration
- System level analysis of body's innate homeostatic pathways and possible implication in recovery from neurodegenerative particular TBI and AD/ADRD.

- Study of environmental toxicants and their contribution to developing AD/ADRD, and more importantly, exploring the mechanism of disease development at system, cellular and molecular levels.

Grant Support

Active Grants or Contracts

09/01/23 - 08/31/28

MPI, Contact PI and Project Director, 30%
"Linking particulate matter exposure, glymphatic clearance, and Alzheimer's disease-related pathology."
National Institutes of Health (NIH), R01NS130663-01
Annual Direct Costs: $499,000
Total Costs: $3,649,365
Indirect Cost Rate: 54%
Other PIs/Subcontracts: Alison Elder and Uschi Graham Labs ($1,499,746)

07/01/24 - 06/30/27

PI, 30%
"Mechanistic insight into the airborne hazards exposure-related development of neurological disorders."
Department of Defense (DOD), Toxic Exposures Research Program 2023, TX230328
Annual Direct Costs: $406,550
Total Costs (Hussain Lab): $1,829,300
Indirect Cost Rate: 54%

Pending Grants or Contracts

09/01/25-08/01/30

PI, 30%
"Investigating structural and functional changes in glymphatic/lymphatic vessels in response to TBI and subsequent development of AD/ADRD."
National Institutes of Health (NIH)-NINDS, 1R01-000000-00
Annual Direct Costs: $499,000
Total Costs: $3,736,657

Completed Grants or Contracts

7/1/22-6/30/25	PI, 35% "Can improvement of sleep and glymphatic function reduce the risk of developing Alzheimer's disease-related dementia (ADRD) after traumatic brain injury?" DOD PRARP AZ210110 Annual Direct Costs: $166,300 Total Costs: $750,525
07/01/07-06/30/10	Research Fellow, 100% (PIs: Michael Schumacher, Said Ghandour) "Neurosteroids: in myelination and remyelination of CNS" European Association of Leukodystrophies (ELA) Total Direct Costs: Not specified Role: Led laboratory experiments examining the effects of neurosteroids on oligodendrocyte development and CNS remyelination using rodent models.
01/9/13-01/9/16	Postdoctoral Fellow, 100% (PI: Wendy B. Macklin) "Role of Integrin linked kinase in CNS myelination" National Multiple Sclerosis Society (NMSS) Total Direct Costs: $617,036 Role: Conducted mechanistic studies on integrin-linked kinase pathways during developmental and regenerative myelination.
9/1/14-5/31/19	Co-Investigator, 15% (PIs: Maiken Nedergaard, Helene Benveniste) "Glymphatic function in a transgenic rat model of Alzheimer's disease" NIH/NIA R01AG048769 Annual Direct Costs: $286,488 Role: Oversaw in vivo imaging and behavioral assays assessing glymphatic transport dysfunction in mice.
9/15/16-9/14/19	Co-Investigator, 15% (PI: Maiken Nedergaard) "Is Failure of Glymphatic Tau Clearance a Critical Pathophysiological Event in CTE?" DOD/Army W81XWH-16-1-0555 Total Direct Costs: $769,000 Role: Led neuroimaging and tissue analyses focused on tau accumulation and glymphatic transport in TBI-CTE rodent models.
9/30/16-6/30/21	Co-Investigator, 10% (PIs: Maiken Nedergaard, Helene Benveniste) "Para-Vascular Basis of Small Vessel Disease"

NIH R01NS100366
Annual Direct Costs: $334,484
Role; Contributed to histopathological validation of glymphatic dysfunction.

09/01/18-08/01/23 Co-Investigator, 10% (PIs: Maiken Nedergaard, Jiandi Wan)
"Capillary hyperemia in white matter: Novel mechanistic insight and effect of hypertension and aging"
NIH RF1NS110049
Total Direct Costs: $2,337,347
Role: Assisted in studies exploring white matter disorders in health and brain injury.

09/01/17-03/01/22 Co-Investigator, 10% (PI: Maiken Nedergaard)
"Age and AD related bottlenecks in glymphatic-lymphatic waste transport"
NIH RF1AG057575
Total Direct Costs: $2,163,987
Role: Participated in studies examining clearance inefficiencies and their relationship to cognitive decline in aging.

03/11/17-08/31/21 Co-Investigator, 10% (PIs: Helene Benveniste, Maiken Nedergaard, Allen R. Tannenbaum, William Van Nostrand)
"Characterizing the glymphatic peri-vascular connectome and its disruption in AD"
NIH RF1AG053991
Total Direct Costs: $2,728,756
Role: Helped in quantitative analysis of glymphatic pathways and interpretation of disruption in AD.

08/01/18-07/01/21 Co-Investigator, 10% (PI: Maiken Nedergaard)
"Alexander disease: mechanisms, modifiers, and therapeutics"
NIH P01HD076892
Annual Direct Costs: $376,635
Total Direct Costs: Approx. $1,129,905
Role: Helped in assessing sleep and glymphatic impairment in Alexander disease.

11/1/20-12/31/21 Co-Investigator, 5% (PIs: Steven Goldman, Maiken Nedergaard, Laura Lewis, Amar Sahay)
"Glial mechanisms by which sleep preserves cognitive function and plasticity in aging"
Simons Foundation 811237
Annual Direct Costs: $208,333
Total Direct Costs: $416,666

Role: Helped in writing and contributed to sleep studies linking age-related cognitive preservation and glymphatic regulation.

Patents, Inventions and Copyrights

2012 Regine Sitruk-Ware, New York, (US); Michael Maria Helmut, Schumacher, Kremlin-Bicetre (FR); Abdelmouman Ghoumari, Antony (FR); Said Ghandour, Strasbourg (FR): **Rashad Hussain**, Denver, CO (US); Bartosz Bielecki, Kremlin-Bicetre (FR). Myelin regeneration with androgens. World Intellectual Property Organization (WIPO), WO 2012/129365 A1. Date Sept 27, 2012

2016 Regine Sitruk-Ware, New York, (US); Michael Maria Helmut, Schumacher, Kremlin-Bicetre (FR); Abdelmouman Ghoumari, Antony (FR); Said Ghandour, Strasbourg (FR): **Rashad Hussain**, Denver, CO (US); Bartosz Bielecki, Kremlin-Bicetre (FR). Myelin regeneration with androgens. United States Patent US9,364,488 B2, Date: June 14, 2016,

2024 Steven A. Goldman, **Rashad Hussain**, and Maiken Nedergaard, 2023. Noradrenergic antagonism as a means of increasing glymphatic efflux for the treatment for acute traumatic brain injury. U.S. Provisional Patent Application No. 63/517,677 (full Application Submitted).

Publications

Peer-reviewed Journal Articles

1. **Hussain R**, Nematullah, Akhter S. Effect of season on average number of culturable oocytes recovered from cattle and buffalo ovaries. Pak J Zool. 2005;37(4):281-83.
2. **Hussain R**, Ullah N, Akhter S. In vitro maturation and vitrification of cattle and buffalo oocytes. Int J Biol Biotech. 2005;2:110-116.
3. Khan AA, Mian A, **Hussain R**. Investigations on the use of poison baits and fumigants against Indian crested porcupine (Hystrix indica). Pak J Sci Ind Res Biol Sci. 2006;49:418-422.
4. Khan AA, Mian A, **Hussain R**. A delivery system for carbon monoxide fumigation of Indian crested porcupine, Hystrix indica, den using two-ingredient cartridge. Pak J Zool. 2011;43 (4);727-732
5. **Hussain R**, El-Etr M, Gaci O, Rakotomamonjy J, Macklin WB, Kumar N, et al. Progesterone and nestorone facilitate axon remyelination: a role for progesterone receptors. Endocrinology. 2011;152(10):3820-31.
6. Schumacher M, **Hussain R**, Gago N, Oudinet JP, Ghoumari A. Progesterone synthesis in the nervous system: implications for myelination and myelin repair. Front Neurosci. 2012;6:18737.

7. **Hussain R**, Ghoumari AM, Bielecki B, Steibel J, Boehm N, Liere P, et al. The neural androgen receptor: a therapeutic target for myelin repair in chronic demyelination. Brain. 2013;136(Pt 1):132-146.
8. Khan AA, Mian A, **Hussain R**. Deterioration impact of Indian crested porcupine, Hystrix indica, on irrigated forest plantations in Punjab. Pak J Zool. 2014;46(6):1691-1696.
9. Abi Ghanem C, Degerny C, **Hussain R**, Liere P, Pianos A, Tourpin S, et al. Long-lasting masculinizing effects of postnatal androgens on myelin governed by the brain androgen receptor. PLoS Genet. 2017;13(11):e1007049.
10. Ohtake Y, Kong W, **Hussain R**, Horiuchi M, Tremblay ML, Ganea D, et al. Protein tyrosine phosphatase regulates autoimmune encephalomyelitis development. Brain Behav Immun. 2017;65:111-124.
11. **Hussain R**, Macklin WB. Integrin linked kinase (ILK) deletion disrupts oligodendrocyte development by altering cell cycle. J Neurosci. 2017;37(8):2113-6.
12. Lundgaard I, Wang W, Eberhardt A, Vinitsky HS, Reeves BC, Peng S, Lou N, **Hussain R**, Nedergaard M. Beneficial effects of low alcohol exposure, but adverse effects of high alcohol intake on glymphatic function. Sci Rep. 2018;8(1):2246.
13. **Hussain R**, Zubair H, Pursell S, Shahab M. Neurodegenerative diseases: regenerative mechanisms and novel therapeutic approaches. Brain Sci. 2018;8(9):177.
14. Hussain G, Wang J, Rasul A, Anwar H, Qasim M, Zafar S, Aziz N, Razzaq A, **Hussain R**, and Aguilar J. Current status of therapeutic approaches against peripheral nerve injuries: a detailed story from injury to recovery. Int J Biol Sci. 2020;16(1):116-134.
15. Ghoumari AM, Abi Ghanem C, Asbelaoui N, Schumacher M, **Hussain R.** Roles of progesterone, testosterone and their nuclear receptors in central nervous system myelination and remyelination. Int J Mol Sci. 2020;21(9):3163.
16. Zubair H, Shamas S, Ullah H, Nabi G, Huma T, Ullah R, **Hussain R**, Shahab M. Morphometric and myelin basic protein expression changes in arcuate nucleus kisspeptin neurons underlie activation of hypothalamic pituitary gonadal-axis in monkeys (Macaca mulatta) during the breeding season. Endocr Res. 2022;47(3-4):113-123.
17. Pla V, Bork P, Harnpramukkul A, Olveda G, Ladron-de-Guevara A, Giannetto MJ, **Hussain R**, Wang W, Kelley DH, and Hablitz LM. A real-time in vivo clearance assay for quantification of glymphatic efflux. Cell Rep. 2022;40(1):111.
18. **Hussain R**, Graham U, Elder A, Nedergaard M. Air pollution, glymphatic failure and Alzheimer disease? Trends Neurosci. 2023;46(11):901-911.
19. **Hussain R**, Tithof J, Wang W, Cheetham-West A, Song W, Peng W, et al. Potentiating glymphatic drainage minimizes post-traumatic cerebral edema. Nature. 2023;623(7984):992-1000.

20. Sun Q, Peng S, Xu Q, Weikop P, **Hussain R**, Song W, et al. Enhancing glymphatic fluid transport by pan-adrenergic blockade suppresses epileptogenesis. Nat Commun. 2024;15:9600.
21. **Hussain R**, Nedergaard M. Managing noradrenaline after traumatic brain injury. Clin Transl Med. 2024;14(1).

Submitted or In-Revision Peer-reviewed Journal Articles

22. **Hussain R**, Hathaway H, Macklin WB. Deletion of integrin linked kinase in neural progenitor cells disturbs neuronal/glia balance during early spinal cord development. J Neurosci. In revision.
23. **Hussain R**, Lundgaard I, Notaro G, Ahmed M, Sun Q, Waikar Y, et al. Combined pan-adrenergic and CCR5 inhibition restores glymphatic function, sleep architecture, and functional recovery after traumatic brain injury. J Clin Invest. In review 2025.

Abstracts and/or Proceedings

1. **Hussain R**, Ghoumari A, El-Etr M, Bielecki B, Schumacher M, Ghandour S. Myelin repair after chronic demyelination: Sexual dimorphism and testosterone. Presented at: 2nd ELA Research Foundation Congress; 2009 Jun 26-27; Luxembourg.
2. Ghoumari A, **Hussain R**, El-Etr M, Sitruk-Ware R, Schumacher M. Progestins induce myelination and remyelination in slice cultures of murine cerebellum. Presented at: 39th Annual Meeting of Society for Neuroscience; 2009 Nov 13-17; Chicago, IL, USA.
3. **Hussain R**, Ghoumari A, Schumacher M, Ghandour S. Myelin repair with testosterone and its metabolites in two well-established animal models of demyelination. Presented at: 7th International Congress of Neuroendocrinology; 2010 Jul 11-15; Rouen, France.
4. **Hussain R**, Chouchane M, Fouchier AD, Schumacher M, Ghoumari A. Sexual dimorphism of oligodendrocytes: in vivo and in vitro studies. Presented at: 41st Annual Meeting of Society for Neuroscience; 2011 Nov 12-16; Washington, DC, USA.
5. **Hussain R**, Macklin WB. Inhibition of ILK affects oligodendrocyte differentiation in oligodendrocyte primary culture. Presented at: RMRNG Chapter of the Society for Neuroscience Annual Meeting; 2014 May 1; University of Colorado, Denver, CO, USA.
6. **Hussain R**, Macklin WB. Integrin linked kinase (ILK) deletion reduces commitment to oligodendrocyte lineage. Presented at: Annual Meeting of Society for Neurochemistry; 2015 Mar 14-18; Atlanta, GA, USA.
7. **Hussain R**, Macklin WB. Integrin linked kinase (ILK) deletion disrupts oligodendrocyte development by altering cell cycle. Presented at: Society for Neuroscience Annual Meeting; 2016 Nov 12-16; San Diego, CA, USA.
8. **Hussain R**, Macklin WB. Deletion of integrin linked kinase in neural progenitor cells disturbs neuron/glia balance during early spinal cord development.

Presented at: Society for Neuroscience Annual Meeting; 2017 Nov 11-15; Washington, DC, USA.

9. **Hussain R**, Wang W, Nedergaard M. Amelioration of glymphatic pathway is critical for long term recovery from traumatic brain injury. Presented at: Annual Meeting of National Neurotrauma Society; 2018 Aug 11-16; Toronto, Canada.
10. **Hussain R**, Wang W, Nedergaard M. Early address of post-traumatic glymphatic insufficiency reduces neuronal/glial cell death and tissue damages. Presented at: Annual Meeting of National Neurotrauma Society; 2019 Jun 29-Jul 3; Pittsburgh, PA, USA.
11. **Hussain R**, Tithof J, Wang W, Hirase H, Kelley DH, Castorena-Gonzalez JA, et al. Improving glymphatic/lymphatic drainage eliminates post-traumatic brain edema. To be presented at: Society for Neuroscience Annual Meeting; 2023 Nov 11-15; Washington, DC, USA.
12. Graham U, Oberdörster G, Rogers R, Dozier A, Primer D, Pinto J, **Hussain R**, et al. A transfer learning approach utilizing high-resolution TEM for assessing the impact of inhaled environmental metal nanoparticles in the CNS. Presented at: Pollution and Health Research Symposium; 2024 Nov 21; University of Rochester, Rochester, NY, USA.
13. Enos J, Chalupa D, Gonzalez A, Eggleston K, Hussain R, Elder A. Inflammation and tissue burden produced by copper ultrafine particle inhalation. Presented at: Air Pollution and Health Research Symposium; 2024 Nov 21; University of Rochester, Rochester, NY, USA.

Major Invited Speeches

Local/Regional

1. Neural androgen receptors and remyelination, (Feb 11, 2013), **Invitation by Shuxin Li**, (Professor), Center for Neural Development and Repair, Temple University, Philadelphia, PA
2. Role of Androgens in Remyelination of Central Nervous System, (Oct. 10, 2013). Department of Cell and Developmental Biology (CDB). **Invitation by: Dr. Wendy Macklin** (Professor and Chairperson, CDB), University of Colorado, Denver, CO
3. Human Neural Stem Cells Induce Functional Myelination in Mice with Severe Dysmyelination (March 11, 2014), **Glia Journal Club, Macklin Lab**, Cell and Developmental Biology, University of Colorado, Denver, CO
4. Role of Integrin linked kinase (ILK) in oligodendrocyte growth dynamics and myelination, (April 24, 2014), **Annual Update. Cell and Developmental Biology**, University of Colorado, Denver, CO
5. Motor skill learning requires active central myelination, (Dec 9, 2014), **Glia Journal Club, Macklin Lab, Cell and Developmental Biology**, University of Colorado, Denver, CO
6. Integrin linked kinase (ILK) role in oligodendrocyte growth dynamics and myelination, (May 8, 2015), **Annual Update. Cell and Developmental Biology**, University of Colorado, Denver, CO

7. Oligodendrocyte precursors migrate along vasculature in the developing nervous system, (April 11, 2015), **Glia Journal Club, Macklin Lab**, Cell and Developmental Biology, University of Colorado, Denver, CO
8. Vital Implications of Glymphatic Clearance in Neurotrauma and Environmental Influences, (Jan 25, 2024), **Invitation by: Dr. Paige Lawrence** (Professor and Chair, Department of Environmental Medicine), University of Rochester School of Medicine, NY
9. Miniature two-photon microscopy; a great tool to resolve unsolved questions and implications in our field of research (March 21, 2025). **Annual Talk; Department of Neurology and Center for Translational Neuromedicine**, University of Rochester, NY

<u>National/International</u>

10. Integrin linked kinase (ILK) deletion disrupts oligodendrocyte development by altering cell cycle. (July 21, 2016), Department of Molecular and Human Genetics, **Invitation by: Dr. Andy Groves** (Professor and Vivian L. Smith Endowed Chair in Neuroscience), Baylor College of Medicine, Houston, TX
11. Signaling mechanism in oligodendrocyte precursor cells leading to efficient myelination, (July 29, 2016), **Invitation by Dr. Mustafa Sahin** (Professor and Director, Translational Neuroscience Center, Boston Children's Hospital), Harvard Medical School, Boston, MA
12. Oligodendrocyte growth and myelination is disturbed with ILK deletion, (Nov 17, 2024), **Invitation by Dr. Paul Methews** (Associate Professor, Neurology) University of California Los Angeles/The Los Angeles Biomedical Research Institute, Torrance, CA
13. Deletion of Integrin Linked Kinase in neural progenitor cells disturbs neuron/glia balance during early spinal cord development, (Jan 19, 2017), **Invitation by Dr. Ian Duncan** (Professor, Department of Medical Sciences), University of Wisonsin-Madison, WI
14. First Meeting: Is failure of glymphatic tau clearance a critical pathophysiological event in CTE? (Dec. 8, 2017), **U.S. Army Medical Research and Materiel Command, Congressionally Directed Medical Research Programs**, Peer Reviewed Alzheimer’s Research Program (PRARP), Fort Detrick, MD
15. Implication of the Glymphatic System in Recovery from TBI, (Oct 12, 2018), **Invitation by Dr. Dianne Langford** (Professor Neural Sciences, Lewis Katz School of Medicine), Traumatic Brain Injury & Protection Research Symposium, Temple University, Philadelphia, PA
16. Second Meeting: Is failure of glymphatic tau clearance a critical pathophysiological event in CTE? (Aug. 27, 2018), **U.S. Army Medical Research and Materiel Command, Congressionally Directed Medical Research Programs**, Peer Reviewed Alzheimer’s Research Program (PRARP), Fort Detrick, MD
17. Traumatic brain injury: the role of noradrenergic inhibition and glymphatic clearance (July 12, 2022), **Invitation by: Dr. Regina Armstrong** (Professor and

Chair, Department of Anatomy, Physiology and Genetics), Uniformed Services University of the Health Sciences, Bethesda, MD

18. Traumatic brain injury: the role of noradrenergic inhibition and glymphatic clearance, (Nov 17, 2022), **Invitation by Dr. Douglas L. Rosene** (Professor, Anatomy & Neurobiology), Department of Anatomy and Neurobiology, Boston, MA
19. Glymphatic drainage down regulate cerebral edema, (April 11, 2024), **Invitation by Multidisciplinary University Research Initiatives (MURI) Program**, Bethesda, MD
20. tDCS facilitates the peri-vascular flow of CSF and its rapid efflux via cervical lymphatic vessels, (Aug 3, 2024), **Invitation by Dr. Marom Bikson** (Professor, Department of Biomedical Engineering) City College of New York, NY
21. Sleep Disturbance and Glymphatic Impairment: Uncovering the Missing Link Between Air Particulate Matter Exposure and Alzheimer's Disease, (Nov. 21, 2024), **Invitation by Dr. Alison Elder** (Associate Professor and Director, Rochester EHSC Inhalation Exposure Facility), Department of Environmental Medicine, University of Rochester, NY
22. Glymphatic Dysregulation, Cerebral Edema, and Sleep: Mechanistic Insights into Recovery from Traumatic Brain Injury", (Feb. 13, 2025), **Invitation by Dr. Todd Golde** (Professor and Director, Center for Neurodegenerative Diseases), Emory University School of Medicine, Atlanta, GA
23. Glymphatic Restoration as a Therapeutic Strategy to Accelerate Recovery Following Traumatic Brain Injury (May 5-6, 2025). **Invitation by John Walsif, Program Organizer, Plenary Lecture and Pannel Discussion**, 15th Traumatic Brain Injury Meeting, Boston, MA
24. Glymphatic System Dysfunction in Neurological Disorders: Implications for Brain Injury and Alzheimer's Disease (March 19, 2025), **Invitation by Dr. Richard Gonzalez and Mashkoor Choudhry**, Burn & Shock Trauma Research Institute (BSTRI), Loyola University Chicago, IL
25. Restoring Glymphatic Function After TBI Resolves Neuroinflammation and Brain Edema (May 15, 2025). **Invitation by Dr. Nilufer Ertekin-Taner,** Department of Neuroscience, Alzheimer's Disease Research Center, Mayo Clinic, AZ
26. Cervical lymphatic vessels function as a key regulatory bottleneck for glymphatic fluid drainage in health and brain injury (June 17, 2025). **Invitation by Lemole Center for Integrated Lymphatics Research,** Department of Cardiovascular Sciences, Temple University, Philadelphia, PA
27. Glymphatic flow impairment after TBI is accompanied with pathophysiological changes in the cerebrovasculature (Aug. 2, 2025). Invitation by Vincent Tutino, ICS 2025. 21st Interdiciplinary Cerebrovascular Symposium. Jacobs School of Medicine and Biomedical Sciences, University of Buffalo, NY
28. Early address of glymphatic impairment helps in post-traumatic sensory-motor and cognitive recoveries in mice, (Oct 23, 2019), **Invitation by Dr. Michael Schumacher** (Professor, Senior Director of Research, Head of Research Unit U 1195), Diseases and Hormones of the Nervous System, Inserm & University Paris-Saclay, Paris, France.

29. Disruption of Glymphatic Circulation in Neurotrauma and Environmental Risk Factors, (Feb. 22, 2024), **Invitation by: Dr. Kauser Abdullah Malik**, President, Pakistan Academy of Sciences, Islamabad, Pakistan.
30. Glymphatic Flow Impairment in Neurotrauma, (March 1, 2024), **Invitation by: Dr. Shamim Akhter** (Professor and Dean, Biological Sciences), Department of Zoology, Wildlife and Fisheries, PMAS Arid University, Rawalpindi, Pakistan.
31. Mechanistic insights into Lymphatic Dysfunction: Imaging, and Biomarker Exploration, (May 21, 2024), **Invitation/Acceptance by Dr. Kimberley Steele**, ARPA-H LIGHT Program Manager, The Advanced Research Projects Agency for Health (ARPA-H), Philadelphia, PA
32. Adrenergic Regulation of Glymphatic Flow: Therapeutic Implications for Edema Resolution after Traumatic Brain Injury, (June 20, 2024), **Invitation by: Dr. Mariam Treggiari** (Professor and Vice Chair, Department of Anesthesiology), Duke University, Durham, NC
33. Potentiating glymphatic drainage minimizes post-traumatic cerebral oedema, (Sept 5, 2024), **Invitation/Acceptance by Dr. Adel Helmy** (Associate Professor, Neurosurgery), International Neurotrauma Society Meeting, Cambridge University, Cambridge, UK.
34. Deciphering Glymphatic Flow in Traumatic Brain Injury and Alzheimer's Disease, (Sept 11, 2024), **Invitation by Dr. Michael Schumacher** (Professor, Senior Director of Research), L'Institut National de la Santé et de la Recherche Médicale (INSERM)-U1195/Universite Paris Saclay, Paris, France
35. Unraveling Glymphatic Impairment in Traumatic Brain Injury and Alzheimer's Disease, (Sept 16, 2024), **Invitation by Dr. Adnan Siddiqui** (Professor and Vice Chair), Department of Neurosurgery, University of Buffalo, NY
36. Current Understanding About Glymphatic Flow in Stroke, SAH and TBI, (Dec. 4, 2024), **Invitation by Dr. Paul Bhogal,** Barts Research and Advanced Interventional Neuroradiology (BRAIN), London, UK
37. Glymphatic Insufficiency in TBI and Alzheimer's Disease, (Dec. 5, 2024), **Invitation by Dr. Laura-Adela Harsan,** ICube - Engineering science, computer science and imaging lab, University of Strasbourg, France.
38. Brain fluid flow/Glymphatic Dynamics in Health and Traumatic Brain Injury, (Feb. 28, 2025), **Invitation by Nanjing Institute of Translational Medicine**, College of Future Technology, Peking University, China
39. Glymphatic dysfunction in traumatic brain injury; Implications for therapeutic strategies (Plenary/Keynote lecture; April 22, 2025). **Invitation by Dr. A. R. Shakoori, President; Zoological Society of Pakistan, Director, School of Biological Sciences,** Punjab University Lahore, Pakistan
40. **Mini-Symposium Proposal (Accepted)**, Restoring Glymphatic Flow After TBI Normalizes Sleep Patterns, Annual Meeting of Society for Neuroscience 2025 (to be held in San Diego, Nov 15-19, 2025), CA
41. Venous diseases and glymphatics (Session Chair): Jason Davies, Rashad Hussain, Josh Geiger (to be held Aug 2, 2025). 21st Interdisciplinary Cerebrovascular Symposium. Jacobs School of Medicine and Biomedical Sciences, University of Buffalo, NY