UNIVERSITY of MARYLAND
SCHOOL OF MEDICINE

Center for Shock, Trauma and Anesthesiology Research (STAR)

Research Faculty Profiles

2024 Edition
Baltimore, Maryland

Overview

STAR was established in 2009 as an organized research center (ORC) that included research within the R Adams Cowley Shock Trauma Center, the Department of Anesthesiology, and the Charles "Mac" Matthias National Study Center for Trauma and Emergency Medical Systems. Its multidisciplinary research programs focus on trauma, critical care, resuscitation, surgical outcomes, patient safety and injury prevention.

Mission Statement

The mission of the STAR is to establish a comprehensive research and education program specifically designed 1) to promote pre-clinical and clinical research that limit injury and improve patient outcomes related to trauma and critical care, 2) to facilitate research education and training, and 3) to provide leadership and service within the SOM, UMMS, the University of Maryland System, as well as to the broader research and patient community.

Our Vision

- To advance discovery and treatment in trauma and critical care through innovative research and training.
- To promote unique and effective research training opportunities within its fields of expertise.
- To provide leadership and eservice to enhance the missions of the SOM, UMMS and University of Maryland System- as well as to the broader research and patient support communities.

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Neeraj Badjatia, M.D., M.S.

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Research Interests

- **Neuro-Informatics in Critical Illness and Resuscitation (NICIR):** Our goal is to utilize machine learning techniques to analyze physiologic data from neuromonitoring devices and cardiorespiratory monitoring for a greater insight into the comprehensive physiological state of critically injured neurological patients.
- **Immune mediated malnutrition after subarachnoid hemorrhage:** Our studies have identified a time-dependent link between protein malnutrition and functional recovery after SAH. Results from a pilot study indicate favorable modulation of immune mediated malnutrition can be achieved with a regimen of high protein supplementation and NMES.
- **Targeted temperature management (TTM) and shivering:** I have worked with industry partners to develop innovative focused cooling methods to minimize the systemic impact of TTM. This work has been supported by the Department of Defense as well as Maryland Industry Partnerships (MIPS) program.

Recent Publications

1. Greer DM, Helbok R, **Badjatia N**, Ko SB, Guanci MM, Sheth KN; INTREPID Study Group. Fever Prevention in Patients With Acute Vascular Brain Injury: The INTREPID Randomized Clinical Trial. *JAMA*. 2024 Nov 12;332(18):1525-1534. PMID: 39320879.
2. Zhuo J, Raghavan P, Li J, Roys S, Njonkou Tchoquessi RL, Chen H, Wickwire EM, Parikh GY, Schwartzbauer GT, Grattan LM, Wang Z, Gullapalli RP, **Badjatia N**. Longitudinal assessment of glymphatic changes following mild traumatic brain injury: Insights from perivascular space burden and DTI-ALPS imaging. *Front Neurol*. 2024 Aug 7;15:1443496. PMID: 39170078.
3. Gusdon AM, Savarraj JPJ, Feng D, Starkman A, Li G, Bodanapally U, Zimmerman W, Ryan AS, Choi HA, **Badjatia N**. Identification of metabolites associated with preserved muscle volume after aneurysmal subarachnoid hemorrhage due to high protein supplementation and neuromuscular electrical stimulation. *Sci Rep.* 2024 Jul 2;14(1):15071. PMID: 38956192.
4. Yang S, Hu P, Kalpakis K, Burdette B, Chen H, Parikh G, Felix R, Podell J, **Badjatia N**. Utilizing ultra-early continuous physiologic data to develop automated measures of clinical severity in a traumatic brain injury population. *Sci Rep*. 2024 Mar 31;14(1):7618. PMID: 38556518.
5. Arnold S, Armahizer M, Torres LF, Tripathi H, Tandri H, Chang JJ, Choi HA, **Badjatia N**. Minimizing Shivering During Targeted Normothermia: Comparison Between Novel Transnasal and Surface Temperature-Modulating Devices. *Neurocrit Care*. 2023 Dec;39(3):639-645. Epub 2023 Jul 27. PMID: 37498457.
6. Podell J, Yang S, Miller S, Felix R, Tripathi H, Parikh G, Miller C, Chen H, Kuo YM, Lin CY, Hu P, **Badjatia N**. Rapid prediction of secondary neurologic decline after traumatic brain injury: a data analytic approach. *Sci Rep*. 2023 Jan 9;13(1):403. PMID: 36624110.

Konstantin G. Birukov, MD, PhD

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Research Interests

Dr. Birukov's laboratory is a part of the Lung Biology Program of which he is the director. This growing program currently includes collaborative studies between researchers from the Departments of Anesthesiology and Medicine but also develops programmatic links with the Departments of Radiology/Oncology, Surgery, and the Center for Advanced Sensor Technology at UMBC. Dr. Birukov's group works to better understand the pathologic mechanisms of development and resolution of vascular endothelial dysfunction and lung injury, the two key features of many life-threatening conditions including ARDS, shock/trauma, sepsis, and others.

Topics of Focus

- New roles of oxidized phospholipids in modulation of septic inflammation, coagulopathy, traumatic injury and age-related exacerbation of lung injury.
- Mechanochemical regulation of vascular permeability and inflammation; the role of pathologic mechanical stretch and substrate stiffness in endothelial pathobiology.
- Discovery of novel drug targets to enhance resolution and recovery of lung injury.
- Development and validation of new assays for express-detection of biomarkers of injury.
- Endothelial-microglia crosstalk in the pathogenesis of traumatic brain injury.

Recent Publications

1. Karki P, Li Y, Zhang CO, Ke Y, Promnares K, Birukova AA, Eggerman TL, Bocharov AV, **Birukov KG.** Amphipathic Helical Peptide L37pA Protects against Lung Vascular Endothelial Dysfunction Caused by Truncated Oxidized Phospholipids via Antagonism with CD36 Receptor. *Am. J. Resp. Cell Mol. Biol.* 2024 Jan;70(1):11-25. PMID: 37725486.
2. Kushwaha R, Li Y, Makarava N, Pandit NP, Molesworth K, **Birukov KG**, Baskakov IV. Reactive astrocytes associated with prion disease impair the blood brain barrier. *Neurobiol Dis.* 2023 Sep:185:106264. PMID: 37597815.
3. Ke Y, Karki P, Li Y, Promnares K, Zhang CO, Eggerman TL, Bocharov AV, Birukova AA, **Birukov KG**. Aging-Related Accumulation of Truncated Oxidized Phospholipids Augments Infectious Lung Injury and Endothelial Dysfunction via Cluster of Differentiation 36-Dependent Mechanism. *Cells.* 2023 Jul 26;12(15):1937. PMID: 37566016.
4. Karki P, Zhang CO, Promnares K, Li Y, Ke Y, Birukova AA, **Birukov KG**. Truncated oxidized phospholipids exacerbate endothelial dysfunction and lung injury caused by bacterial pathogens. *Cell Signal.* 2023 Sep:109:110804. PMID: 37437826.
5. Madenspacher JH, Morrell ED, McDonald JG, Thompson BM, Li Y, **Birukov KG**, Birukova AA, Stapleton RD, Alejo A, Karmaus PW, Meacham JM, Rai P, Mikacenic C, Wurfel MM, Fessler MB. 25-Hydroxycholesterol exacerbates vascular leak during acute lung injury. *JCI Insight.* 2023 Apr 10;8(7):e155448. PMID: 36821369.

Wei Chao, MD, PhD, FAHA

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Research Interests

My laboratory is a part of the Anesthesiology Translational Research Program (PIs: Wei Chao, Lin Zou, Brittney Williams). Funded by NIH for more than 20 years and DoD since 2017, we investigate the molecular and cellular mechanisms of sepsis, traumatic injury, and ischemic myocardial injury. We are particularly interested in the role of novel innate immune signaling in the pathogenesis of these critical illnesses. For these basic and translational studies, we use a combination of mouse genetics (transgenics and knockouts), physiology, biochemistry, immunology, and pharmacology. We are also interested in identifying novel prognostic biomarkers in sepsis and trauma. These clinical studies involve a multi-disciplinary team with complementary expertise in multi-omics, bioinformatics, statistical modeling, machine-learning, and clinical investigation in several medical centers across the country.

Recent Publications

1. Park C, Lei Z, Li Y, Ren B, He J, Huang H, Chen F, Li H, Brunner K, Zhu J, Jay SM, Williams B, **Chao W**, Wu J, Zou L. Extracellular vesicles in sepsis plasma mediate neuronal inflammation in the brain through miRNAs and innate immune signaling. J Neuroinflammation. 2024 Oct 7;21(1):252. PMID: 39375720.
2. Williams, B, Zou L, Pittet JF, **Chao W**. Sepsis-Induced Coagulopathy: A Comprehensive Narrative Review of Pathophysiology, Clinical Presentation, Diagnosis, and Management Strategies. Anesth Analg. 2024 April 1.138(4):696-711. PMID: 38324297.
3. Suen AO, Chen F, Wang S, Li Z, Zhu J, Yang Y, Conn O, Lopez K, Cui P, Wechsler L, Cross A, Fiskum G, Kozar R, Hu P, Miller C, Zou L, Williams B, **Chao W**. Extracellular RNA Sensing Mediates Inflammation and Organ Injury in a Murine Model of Polytrauma. *J Immunol*. 2023 Jun 15;210(12):1990-2000. PMID: 37133342.
4. Williams, B, Kozar, R; **Chao, W**. Emerging Role of Extracellular RNA in Innate Immunity, Sepsis, and Trauma (Review). *Shock.* 2023 Feb 1;59(2):190-199. PMID: 36730864.
5. Ding W, Fischer L, Chen Q, Li Z, Yang L, You Z, Hu K, Wu X, Zhou X, **Chao W,** Hu P, Dagnew TM, DuBreuil DM, Wang S, Xia S, Bao C, Zhu S, Chen L, Wang C, Wainger B, Jin P, Mao J, Feng G, Harnett MT, Shen S. Highly synchronized cortical circuit dynamics mediate spontaneous pain in mice. *J Clin Invest*. 2023. Mar 1;133(5):e166408. PMID: 36602876.
6. Huang H, Zhu J, Gu L, Hu J, Feng X, Huang W, Wang S, Yang Y, Cui P, Lin SH, Suen A, Shimada BK, Williams B, Kane MA, Ke Y, Zhang CO, Birukova AA, Birukov KG, **Chao W**, Zou L. TLR7 Mediates Acute Respiratory Distress Syndrome in Sepsis by Sensing Extracellular miR-146a. *Am J Respir Cell Mol Biol.* 2022 Sep; 67(3):375-388. PMID: 35679261. (Editorial Comments)
7. Wang S, Yang Y, Suen A, Zhu J, Williams B, Hu J, Chen F, Kozar R, Shen S, Li Z, Jeyaram A, Jay SM, Zou L, **Chao W.** Role of extracellular microRNA-146a-5p in host innate immunity and bacterial sepsis. *iScience*. 2021 Nov 13;24(12):103441. PMID: 34877498.

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Research Interests

My lab investigates the inflammatory mediators of secondary brain injury following traumatic brain injury (TBI) and brain hemorrhage. We employ a combination of molecular and behavioral experiments in animal models, along with advanced genomic techniques in human samples, to identify the mechanisms and potential druggable targets of secondary injury. Currently, the lab is particularly focused on the role of the choroid plexus as an immune beacon and transit point for neutrophils entering the brain after injury.

Recent Publications

1. Shim B*, **Ciryam P***†, Tosun C, Riccardo S, Tsymbalyuk N, Keledjian K, Gerzanich V, Simard JM†. RiboTag RNA Sequencing Identifies Local Tranlsation in HSP70 In Astrocyte Endfeet After Cerebral Ischemia. Submitted. *bioRxiv* [Preprint]. 2024 Oct 12:2024.10.08.617236. PMID: 39416227.
2. Simard JM, Tosun C, Tsymbalyuk O, Moyer M, Keledjian K, Tsymbalyuk N, Olaniran A, Evans M, Langbein J, Khan Z, Kreinbrink M, **Ciryam P**, Stokum JA, Jha R, Ksendzovsky A, Gerzanich V. A mouse model of temporal lobe contusion. *J Neurotrauma*. 2024 Oct 14. PMID: 39302058.
3. Simard JM, Wilhelmy B, Tsymbalyuk N, Shim B, Stokum JA, Evans M, Gaur A, Tosun C, Keledjian K, **Ciryam P**, Serra R, Gerzanich V. Brain Swelling versus Infarct Size: A Problematizing Review. *Brain Sci*. 2024 Feb 28;14(3):229. PMID: 38539619.
4. **Ciryam P**, Gerzanich V, Simard JM. IL-6 in traumatic brain injury: A Janus-faced payer in damage and repair. *J Neurotrauma*. 2023 Nov;40(21-22):2249-2269. PMID: 37166354.

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Research Interests

My research focuses on the regulation of inflammatory mediators in septic and post-injury states, with particular emphasis on the role of statins in these conditions. Additionally, my work examines traumatic injuries resulting from interpersonal violence, measures of violence intensity, and trauma recidivism, with a focus on developing prevention strategies.

Recent Publications

1. Zhang AL, How R, **Efron DT**, Nigam R, Harfouche MN. To Drain or Not: Drainage Procedures Remain a Central Tenet of Management of Infected Collections in Acute Pancreatitis. *Am Surg.* 2024 Sep;90(9):2325-2327. Epub 2024 Apr 24. PMID: 38655580.
2. Sakran JV, Lunardi N, Mehta A, Ezzeddine HM, Chammas M, Fransman R, Byrne JP, Stevens K, **Efron D.** Increasing Injury Intensity among 6,500 Violent Deaths in the State of Maryland. *J Am Coll Surg.* 2024 Apr 1;238(4):710-717. Epub 2024 Mar 15. PMID: 38230851.
3. Harfouche MN, Nigam R, **Efron DT**, Diaz JJ. Surgical Stabilization of Rib Fractures in Severe Injury Is Not Associated With Worse Outcomes. *J Surg Res.* 2023 Apr;284:106-113. Epub 2022 Dec 21. PMID: 36563451.
4. He S, **Efron D**, Hicks CW. Primary aortoenteric fistula. J Vasc Surg Cases Innov Tech. 2019 Nov 22;5(4):538-539. PMID: 31867468.

Alan I. Faden, MD

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Research Interests

Alan I. Faden, M.D. is the David S. Brown Professor in Trauma in the Department of Anesthesiology. Dr. Faden's laboratory uses multi-disciplinary approaches- including molecular and cellular biology, transgenic animal modeling, behavior, single cell transcriptomics and epigenetics, and targeted pharmacologic and physiologic interventions- to examine the pathobiology of experimental brain and spinal cord injury and their treatment. Specific research focuses include neuroinflammation, ageing, brain-systemic interactions and epigenetics, as well as multifunctional drug treatment strategies for neurotrauma.

Recent Publications

1. Barrett JP, Aubrecht TG, Smith AC, Vaida M, Henry RJ, Doran SJ, **Faden AI**, Stoica BA. Molecular pathway changes associated with different post-conditioning exercise interventions after experimental TBI. *Journal of Neurotrauma.* PMCID: In Press.
2. Lei Z, Krishnamachary B, Khan NZ, Ji Y, Li Y, Li H, Brunner K, **Faden AI**, Jones JW, Wu J. Spinal cord injury disrupts plasma extracellular vesicles cargoes leading to neuroinflammation in the brain and neurological dysfunction in aged male mice. *Brain Behav Immun*. 2024 Aug. Epub 2024 Jul 8. PMID: 38986724.
3. Lei Z, Ritzel RM, Li Y, Li H, **Faden AI**, Wu J. Old age alters inflammation and autophagy signaling in the brain, leading to exacerbated neurological outcomes after spinal cord injury in male mice. *Brain Behav Immun*. 2024 Aug:120:439-451. Epub 2024 Jun 24. PMID: 38925420.
4. Yang WW, Matyas JJ, Li Y, Lee H, Lei Z, Renn CL, **Faden AI**, Dorsey SG, Wu J. Dissecting genetic mechanisms of differential locomotion, depression, and allodynia after spinal cord injury in three mouse strains. *Cells*. 2024 Apr 29;13(9):759. PMID: 38727295.
5. Henry RJ, Barrett JP, Vaida M, Khan NZ, Makarevich O, Ritzel RM, **Faden AI**, Stoica BA. Interaction of high-fat diet and brain trauma alters adipose tissue macrophages and brain microglia associated with exacerbated cognitive dysfunction. *J Neuroinflammation*. 2024 Apr 29;21(1):113. PMID: 38685031.
6. Ritzel RM, Li Y, Jiao Y, Doran SJ, Khan N, Henry RJ, Brunner K, Loane DJ, **Faden AI**, Szeto GL, Wu J. Bi-directional neuro-immune dysfunction after chronic experimental brain injury. *J Neuroinflammation*. 2024 Apr 5;21(1):83. PMID: 38581043.
7. Li Y, Khan N, Ritzel RM, Lei Z, Allen S, **Faden AI**, Wu J. Sexually dimorphic extracellular vesicle responses after chronic spinal cord injury are associated with neuroinflammation and neurodegeneration in the aged brain. *J Neuroinflammation*. 2023 Aug 31;20(1):197. PMID: 37653491.
8. Ritzel RM, Li Y, Jiao Y, Lei Z, Doran SJ, He J, Shahror RA, Henry RJ, Khan R, Tan C, Liu S, Stoica BA, **Faden AI**, Szeto G, Loane DJ, Wu J. Brain injury accelerates the onset of a reversible age-related microglial phenotype associated with inflammatory neurodegeneration. *Sci Adv*. 2023 Mar 10;9(10). PMID: 36888713.

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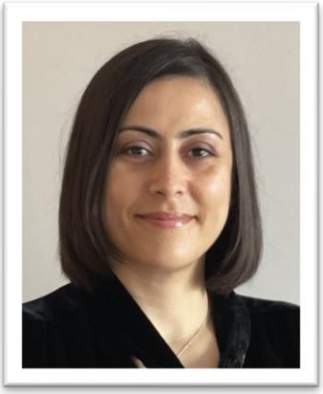
Research Interests

The primary goal of my research is to coordinate, develop, and lead efforts to advance the science of aeromedical critical care, combining regional applications with a global perspective, through the cultivation of a versatile and robust research methodology. I have secondary research interests in critical care regionalization/organization, patient safety, trauma anesthesiology, and advanced monitoring for the critically ill. My clinical work in the areas of emergency medicine, anesthesiology, and critical care medicine has helped me develop several hypotheses. In both civilian and military settings worldwide, aeromedical transport has been understood as an integral component of trauma systems, but the evidence for how to best use this expensive and limited resource is often lacking. Prior work has resulted in multiple landmark publications, resulting in the highest secondary co-citation count in the world in the area of helicopter emergency medical services systems research (Peng C et al, Medicine 2022).

Recent Publications

1. Parrino C, **Galvagno SM Jr.** Aeromedical Transport for Critically Ill Patients. *Crit Care Clin*. 2024 Jul;40(3):481-495. doi: 10.1016/j.ccc.2024.03.004. Epub 2024 Apr 23. PMID: 38796222.
2. Schoenfeld D, Thomas CE, McCartin MP, Blumen IJ, **Galvagno SM Jr**, Thomas SH. Natural Experiment Outcomes Studies in Rotor Wing Air Medical Transport: Systematic Review and Meta-Analysis of Before-and-After and Helicopter-Unavailable Publications From 1970 to 2022. *Air Med J.* 2024 Mar-Apr;43(2):124-132. doi: 10.1016/j.amj.2023.11.005. Epub 2023 Dec 5. PMID: 38490775.
3. Fritz CL, Thomas SA, **Galvagno SM Jr**, Thomas SH. Survival Benefit of Helicopter Scene Response for Patients with an Injury Severity Score of at Least Nine: A Systematic Review and Meta-Analysis. *Prehosp Emerg Care.* 2024;28(6):841-850. doi: 10.1080/10903127.2023.2232453. Epub 2023 Jul 18. PMID: 37406174.
4. **Galvagno SM Jr**, Sikorski R, Hirshon JM, Floccare D, Stephens C, Beecher D, Thomas S. Helicopter emergency medical services for adults with major trauma. *Cochrane Database Syst Rev.* 2015 Dec 15;2015(12):CD009228. doi: 10.1002/14651858.CD009228.pub3. PMID:26671262.



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Research Interests

My research focuses on improving outcomes in geriatric trauma care, with an emphasis on older adults experiencing traumatic brain injuries and mild trauma. I investigate patient-reported outcomes, the use of VR-based rehabilitation for mild TBI, and the impact of pre-existing dementia on recovery after traumatic injury. My goal is to develop evidence-based, patient-centered interventions that enhance recovery and improve quality of life for older adults navigating the challenges of post-trauma recovery.

Recent Publications

1. **Ghneim MH**, Broderick M, Stein DM. Dementia and Depression Among Older Adults Following Traumatic Brain Injury. *Adv Neurobiol.* 2024:42:99-118. PMID: 39432039.
2. **Ghneim MH**, Broderick M, Stein DM. Sleep-Wake Disorders Among Older Adults Following Traumatic Brain Injury. *Adv Neurobiol.* 2024:42:85-98. PMID: 39432038.
3. **Ghneim MH**, Stein DM. Age-related disparities in older adults in trauma. *Surgery.* 2024 Dec;176(6):1771-1773. PMID: 39317516.
4. **Ghneim MH,** O'Connor JV, Scalea TM. Damage control thoracic surgery: What you need to know. *J Trauma Acute Care Surg*. 2024 Oct 8. Epub ahead of print. PMID: 39375907.
5. **Ghneim M**, Stein DM. Management of traumatic brain injury in older adults: What you need to know. *J Trauma Acute Care Surg*. 2023 Nov;95(5):780-789. Epub 2023 Aug 17. PMID: 37590010.
6. **Ghneim M**, Kufera J, Zhang A, Penaloza-Villalobos L, Swentek L, Watras J, Smith A, Hahn A, Rodriguez Mederos D, Dickhudt TJ, Laverick P, Cunningham K, Norwood S, Fernandez L, Jacobson LE, Williams JM, Lottenberg L, Azar F, Shillinglaw W, Slivinski A, Nahmias J, Donnelly M, Bala M, Egodage T, Zhu C, Udekwu PO, Norton H, Dunn JA, Baer R, McBride K, Santos AP, Shrestha K, Metzner CJ, Murphy JM, Schroeppel TJ, Stillman Z, O'Connor R, Johnson D, Berry C, Ratner M, Reynolds JK, Humphrey M, Scott M, Hickman ZL, Twelker K, Legister C, Glass NE, Siebenburgen C, Palmer B, Semon GR, Lieser M, McDonald H, Bugaev N, LeClair MJ, Stein D; Brain vs. Bone Study Group. Does lower extremity fracture fixation technique influence neurologic outcomes in patients with traumatic brain injury? The EAST Brain vs. Bone multicenter trial. *J Trauma Acute Care Surg*. 2023 Oct;95(4):516-523. Epub 2023 Jun 19. PMID: 37335182.
7. Hosseinpour H, El-Qawaqzeh K, Magnotti LJ, Bhogadi SK, **Ghneim M**, Nelson A, Spencer AL, Colosimo C, Anand T, Ditillo M, Joseph B. The unexpected paradox of geriatric traumatic brain injury outcomes: Uncovering racial and ethnic disparities. *Am J Surg.* 2023 Aug;226(2):271-277. PMID: 37230872.

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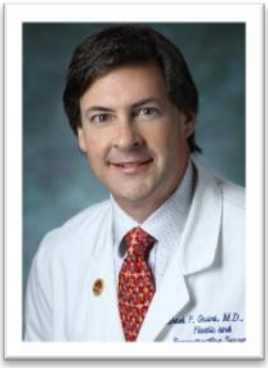
Research Interests

My research interests include understanding the factors that may exacerbate or ameliorate the effects of traumatic brain injury (TBI) on neurologic structure and function. To this end, my lab is focused on characterizing and developing tools for investigating ferret TBI models, given that the structure of the ferret brain more closely resembles the human brain than popular rodent models. Our primary area of concentration is on military-relevant injuries, including combined under-vehicle blast and impact TBI as well as TBI + hemorrhagic shock. Ongoing research sponsored by the U.S. Air Force has shown that exposure to low air pressure (hypobaria—modeling air travel) worsens neurologic outcomes after TBI, particularly in the case of repeated exposures. This will inform guidelines for the safe transport of TBI patients.

Recent Publications

1. **Goodfellow, M. J**., Medina, J. A., Proctor, J. L., Xu, S., Gullapalli, R. P., Rangghran, P., Miller, C., Vesselinov, A., & Fiskum, G. (2022). Combined Traumatic Brain Injury and Hemorrhagic Shock in Ferrets Leads to Structural, Neurochemical, and Functional Impairments. *Journal of Neurotrauma*. 2022 Oct;39(19-20):1442-1452. https://doi.org/10.1089/neu.2022.0102. PMID: 35481784.
2. Tchantchou, F., Miller, C., **Goodfellow, M**., Puche, A., & Fiskum, G. (2021). Hypobaria-Induced Oxidative Stress Facilitates Homocysteine Transsulfuration and Promotes Glutathione Oxidation in Rats with Mild Traumatic Brain Injury. *Journal of Central Nervous System Disease*. 2021 Jan 31:13:1179573520988193. https://doi.org/10.1177/1179573520988193. PMID: 33597815.
3. Tchantchou, F., **Goodfellow, M**., Li, F., Ramsue, L., Miller, C., Puche, A., & Fiskum, G. (2021). Hyperhomocysteinemia-Induced Oxidative Stress Exacerbates Cortical Traumatic Brain Injury Outcomes in Rats. *Cellular and Molecular Neurobiology*. 2021 Apr;41(3):487-503. https://doi.org/10.1007/s10571-020-00866-7. PMID: 32405706.
4. **Goodfellow, M. J.**, Borcar, A., Proctor, J. L., Greco, T., Rosenthal, R. E., & Fiskum, G. (2020). Transcriptional activation of antioxidant gene expression by Nrf2 protects against mitochondrial dysfunction and neuronal death associated with acute and chronic neurodegeneration. *Experimental Neurology*. 2020 Jun:328:113247. https://doi.org/10.1016/j.expneurol.2020.113247. PMID: 32061629.



Michael P. Grant, MD, PhD, FACS

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Research Interests

Dr. Grant currently serves as the Paul N. Manson Distinguished Professor of Plastic Surgery and Director of Plastic and Reconstructive Surgery at the Shock Trauma Center/UMMS. As a dual-trained Plastic Surgeon and Ophthalmologist, his clinical practice and research focus on making craniofacial reconstructive procedures safer and more predictable for patients. Specifically, his research interests include digital solutions for complex reconstruction, such as virtual/pre-operative planning, intraoperative navigation and imaging, and patient-specific implants. Additionally, he has a strong interest in tissue engineering to address complex composite facial defects involving bone, soft tissue, and mucous membranes.

Recent Publications

1. Malla A, Hassan B, Er S, Liang F, Ptak T, Manson PN, **Grant MP**. Traumatic Brain Injury and Its Association With Orbital Fracture Characteristics and Repair. *J Craniofac Surg*. 2024 Jun 28. PMID: 38940595.
2. Hassan B, Yoon J, Elegbede A, Merbs SL, Liang F, Miller NR, Manson PN, **Grant MP**. The Association Between Craniofacial Fracture Patterns and Traumatic Optic Neuropathy. *J Craniofac Surg*. 2024 Mar 27. Online ahead of print. PMID: 38534175.
3. Hassan B, Hricz N, Er S, Yoon J, Resnick E, Liang F, Yang R, Manson PN, **Grant MP**. Development and validation of a risk calculator for postoperative diplopia following orbital fracture repair in adults. *Sci Rep*. 2024 Feb 13;14(1):3654. PMID: 38351033.
4. Singh S, Zhou Y, Farris AL, Whitehead EC, Nyberg EL, O'Sullivan AN, Zhang NY, Rindone AN, Achebe CC, Zbijewski W, Grundy W, Garlick D, Jackson ND, Kraitchman D, Izzi JM, Lopez J, **Grant MP**, Grayson WL. Geometric Mismatch Promotes Anatomic Repair in Periorbital Bony Defects in Skeletally Mature Yucatan Minipigs. *Adv Healthc Mater*. 2023 Nov;12(29):e2301944. Epub 2023 Aug 17. PMID: 37565378.
5. Reddy SK, Colakoglu S, Yoon JS, Bhoopalam M, Merbs SL, Manson PN, **Grant MP**. Treatment of Persistent Post-traumatic Diplopia - An Algorithmic Approach to Patient Stratification and Operative Management. *Craniomaxillofac Trauma Reconstr*. 2023 Jun;16(2):89-93. Epub 2022 Mar 26. PMID: 37222975.

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Research Interests

My primary research interests include critical care triage and resource allocation, with a focus on the impact of the Critical Care Resuscitation Unit on patient flow and outcomes. Additionally, I have published research on ECMO, critical care ultrasonography and echocardiography, and pulmonary embolism.

Recent Publications

1. Niles E, **Haase DJ**, Tran Q, Gerding JA, Esposito E, Dahi S, Galvagno SM Jr, Boswell K, Rector R, Pearce R, Abdel-Wahab M, Singh A, Pirzada S, Tabatabai A, Powell EK. Triage of V-V ECMO referrals for COVID-19 respiratory failure. *Artif Organs*. 2024 Jun;48(6):665-674. PMID: 38551363.
2. Cardona S, Downing J, Wittig M, **Haase DJ**, Powell E, Dahi S, Pasrija C, Tran Q. Venoarterial extracorporeal membrane oxygenation with or without advanced intervention for massive pulmonary embolism. *Perfusion*. 2024 May;39(4):665-674. PMID: 37246150.
3. Austin SE, Galvagno SM, Podell JE, Teeter WA, Kundi R, **Haase DJ**, Taylor BS, Betzold R, Stein DM, Scalea TM, Powell EK. Veno-venous Extracorporeal Membrane Oxygenation in Patients with Traumatic Brain Injuries and Severe Respiratory Failure: A Single-Center Retrospective Analysis. *J Trauma and Acute Care Surg.* 2024 Feb 1;96(2):332-339. PMID: 37828680.
4. Powell EK, Lankford AS, Ghneim M, Rabin J, **Haase DJ**, Dahi S, Deatrick KB, Krause E, Bittle G, Galvagno SM, Scalea T, Tabatabai A. Decreased PRESET-Score Corresponds with Improved Survival in COVID-19 Veno-venous Extracorporeal Membrane Oxygenation. *Perfusion*. 2023 Nov;38(8):1623-1630. PMID: 36114156.
5. Powell EK, Krause E, Esposito E, Lankford A, Levine A, Young BAC, **Haase DJ**, Tabatabai A, Taylor BS, Scalea TM, Galvagno SM Jr. Time from Infiltrate on Chest Radiograph to Venovenous Extracorporeal Membrane Oxygenation in COVID-19 Affects Mortality. *ASAIO J*. 2023 Jan 1;69(1):23-30. PMID: 36007188.

Nader Habashi, MD

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Research Interests

My primary research interests include mechanical ventilation, lung physiology, pulmonary fibrosis, organ donation, and mitochondrial energetics.

Recent Publications

1. **Habashi N**, Andrews P, Bates J, Camporota L, Nieman G. Time Controlled Adaptive Ventilation/Airway Pressure Release Ventilation Can be Used Effectively in Patients With or at High Risk of Acute Respiratory Distress Syndrome "Time is the Soul of the World" Pythagoras. *Crit Care Med*. 2024 Sep 1;52(9):1458-1467. Epub 2023 Aug 24. PMID: 37615521.
2. Camporota L, Rose L, Andrews P, Nieman G, **Habashi N**. Airway pressure release ventilation for lung protection in acute respiratory distress syndrome: an alternative way to recruit the lungs. *Curr Opin Crit Care*. 2024 Feb1;30(1):76-84. PMID: 38085878.
3. Al-Khalisy H, Nieman G, Kollisch-Singule M, Andrews P, Camporot L, Shiber J, Manougian T, Satalin J, Blair S, Ghosh A, Herrmann J, Kaczka D, Gaver D, Bates J, **Habashi N**. Time-Controlled Adaptive Ventilation (TCAV): a personalized strategy for lung protection. *British Med Journal Respiratory Research*. 2024 Jan 18;25(1):37. PMID: 38238778.
4. Nieman G, Kaczka D, Andrews P, Ghosh A, Al-Khalisy H, Camporota L, Satalin J, Herrmann J, **Habashi N**. First Stabilize and then Gradually Recruit: A Paradigm Shift in Protective Mechanical Ventilation for Acute Lung Injury. *J Clin Med.* 2023 Jul 12;12(14):4633. PMID: 37510748.

Melike Harfouche, MD

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Research Interests

My primary research interests include acute and chronic pancreatitis, hemorrhage control, pelvic fracture management, REBOA, and violence prevention.

Recent Publications

1. Zhang AL, How R, Efron DT, Nigam R, **Harfouche MN**. To Drain or Not: Drainage Procedures Remain a Central Tenet of Management of Infected Collections in Acute Pancreatitis. *Am Surg*. 2024 Sep;90(9):2325-2327. Epub 2024 Apr 24. PMID: 38655580.
2. Puppalla P, Pick C, Graves J, **Harfouche M**. Youth Violence Does not Discriminate: Inclusive Violence Prevention Support Services Focused on Counseling and Peer Support are Essential for Youth and Young Adults. *Am Surg*. 2024 Aug;90(8):2014-2019. Epub 2024 Apr 1. PMID: 38557219.
3. Dhillon NK, **Harfouche MN**, DuBose JJ, Kozar RA, Scalea TM. Size of Splenic Subcapsular Hematoma Is Associated With Varying Outcomes of Nonoperative Management. *Am Surg*. 2024 Aug;90(8):2070-2072. Epub 2024 Mar 29. PMID: 38553793.
4. **Harfouche MN**, Kundi R, Scalea TM. Response to the letter to the editor for our article entitled "A pseudo-dilemma: Are we over-diagnosing and over-treating traumatic splenic intraparenchymal pseudoaneurysms?". *J Trauma Acute Care Surg*. 2024 Jul 1;97(1):e8-e9. Epub 2024 Apr 16. PMID: 38622768.
5. Dhillon NK, **Harfouche MN**, DuBose JJ, Kundi R, Kozar RA, Scalea TM. Out with the old, in with the new? The revised AAST grading schema better predicts splenic salvage but not splenectomy. *Am J Surg*. 2024 Jun 13;:115800. PMID: 38906747.
6. Rao AS, Scalea TM, Feliciano DV, **Harfouche MN**. More Harm Than Good: It is Time to Reconsider Prophylactic Fasciotomy in Lower-Extremity Vascular Injury. *Am Surg*. 2024 Apr 8;:31348241244629. [Epub ahead of print] PMID: 38590003.

Reney A. Henderson, MD

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Research Interest

My research interest is mainly focused on the improvement of patient blood management. Clinically, I am a cardiothoracic anesthesiologist where allogeneic transfusion rates are high. With blood conservation techniques such as acute normovolemic hemodilution, viscoelastic guided transfusion, factor concentrate administration, and alternative blood substitutes bloodless cardiac surgery can be achieved. I have utilized coagulation assessments to monitor the effects of novel agents in clinical and pre-clinical studies. I look to study further allogeneic blood transfusion and its effects on endothelial cell function and its impact on renal function. I also look to study emerging factor replacements and hemostasis monitors for their clinical application.

I am also interested in valvular and left/right ventricular assessment by transesophageal echocardiography. With the improvement in 3D technology, we will be able to determine the operative planning and overall outcomes prior to intervention.

Recent Publications

1. Tanaka KA, **Henderson RA**, Williams B. Heparin-induced thrombocytopenia and cardiac surgery: can we do it all with cangrelor? *A&A Practice*. 2019 Nov 1;13(9):366. PMID: 31567127.
2. Tanaka KA, Bharadwaj S, Hasan S, Judd M, Abuelkasem E, **Henderson RA** et al. Elevated fibrinogen, von Willebrand factor, and Factor VIII confer resistance to dilutional coagulopathy and activated protein C in normal pregnant women. *British Journal of Anaesthesia*. 2019 Jun;122(6):751-759. PMID: 30916034.
3. **Henderson RA**, Mazzeffi MA, Strauss ER, Williams B, Wipfli C, Dawood M et al. Impact of intraoperative high-volume autologous blood collection on allogeneic transfusion during and after cardiac surgery: a propensity score-matched analysis. *Transfusion*. 2019 Jun;59(6):2023-2029. PMID: 30882929.
4. **Henderson RA**, Chow JH, Tanaka KA. A bridge to bloodless surgery: use of hemoglobin-based oxygen carrier for anemia treatment and autologous blood preservation during redo pulmonic valve replacement. *Journal Of Cardiothoracic and Vascular Anesthesia*. 2019 Jul;33(7):1973-1976. PMID: 30529178.
5. Abuelkasem E, Mazzeffi MA, **Henderson RA**, Wipfli C, Monroe A, Strauss ER et al. Clinical impact of protamine titration-based heparin neutralization in patients undergoing coronary bypass grafting surgery. *Journal Of Cardiothoracic and Vascular Anesthesia*. 2019 Aug;33(8):2153-2160. PMID: 30737123.

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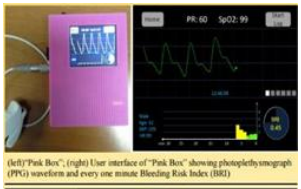
Research Interests

Clinical Informatics and Analytical Research Group are composed of research faculty; Professor and Intern Chairman of Anesthesiology, Samual Galvagno, Professor; Peter Hu, Professor; Shiming Yang, Professor Emeritus; Colin Mackenzie, 2-4 medical students, and residents; and 4-8 PhD students in computer science and engineering in our lab. Our research is focused on developing machine learning-based predictive algorithms for near and long-term patient outcomes based on the continuous vital signs from the field to in-hospital resuscitation, the intensive care unit bedside. Our research has been continuously funded by DARPA, DoD (USAF, Naval Research, US Army, and Veterans Administration). In the past, we also were funded by NIH/NLM, NSF, NASA, AHRQ, and industry. Specifically, we have developed and tested a Bleeding Risk Index (BRI) Monitor for a minute-by-minute analysis of continuous photoplethysmograph (PPG) waveform (shown in the figure to the right). This monitor could be used for predicting future transfusion needs in the field. We also developed an ICU Viewer, which takes real-time patient monitor data and provides an at-a-glance view for the units (SICU, NTCC, MTCC) or an individual bed view for up to 7 days (shown in the figure to the right). Currently, we have 6 extramural funded projects with over $12 million in funding.



(left)"Pink Box", (right) User interface of "Pink Box" showing photoplethysmograph (PPG) waveform and every one minute Bleeding Risk Index (BRI)

Screenshot of ICU viewer showing SICU-17 vital signs 2-day trajectory

Recent Publications

1. Chow JH, Richards JE, Galvagno SM, Coleman PJ, Lankford AS, Hendrix C, Dunitz J, Ibrahim I, Ghneim M, Tanaka KA, Scalea TM, Mazzeffi MA, **Hu P**. The Algorithm Examining the Risk of Massive Transfusion (ALERT) Score Accurately Predicts Massive Transfusion at the Scene of Injury and on Arrival to the Trauma Bay: A Retrospective Analysis. *Shock*. 2021 Oct 1;56(4):529-536. PMID: 34524267.

2. Yang S, Mackenzie CF, Rock P, Lin C, Floccare D, Scalea T, Stumpf F, Winans C, Galvagno S, Miller C, Stein D, **Hu PF**. Comparison of massive and emergency transfusion prediction scoring systems after trauma with a new Bleeding Risk Index score applied in-flight. *J Trauma Acute Care Surg*. 2021 Feb 1;90(2):268-273. PMID: 33502145.

3. Galvagno SM Jr, Sikorski RA, Floccare DJ, Rock P, Mazzeffi MA, DuBose JJ, Scalea TM, Miller C, Richards JE, O'Connor JV, Mackenzie CF, **Hu P**. Prehospital Point of Care Testing for the Early Detection of Shock and Prediction of Lifesaving Interventions. *Shock.* 2020 May 21. PMID: 32453248.

4. Yang S, Stansbury LG, Rock P, Scalea T, **Hu PF**. Linking Big Data and Prediction Strategies: Tools, Pitfalls, and Lessons Learned. *Crit Care Med*. 2019 Jun;47(6):840-848. PMID: 30920408.

5. Tisherman SA, **Hu FM.** Can we stop patients from "falling off the cliff"? *Resuscitation*. 2019 Jun; 139:363-364. Epub 2019 Apr 24. PMID: 31028825.

Kartik Kaushik, PhD

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Research Interests

My research interests focus on developing methodologies and tools to improve public health by minimizing the negative externalities of transportation. This includes enhancing roadway safety to reduce fatalities and injuries from crashes, addressing the effects of pollution, noise, and traffic congestion, and mitigating the metabolic disorders associated with sedentary lifestyles driven by autocentric development. I am particularly interested in studying the impact of land use, urban planning, and the integration of transportation modes on human behavior, including travel habits, transport choices, and issues such as impaired driving, speeding, aggression, mode selection, and trip chaining.

Recent Publications

1. R Vesselinov, **K Kaushik**, JA Kufera, KM Auman. How to Create a Composite Equity Indicator for Transportation Safety. 2024 Jan. View Article.
2. N Raghuraman (1), **K Kaushik**. Influence of Mobility Restrictions on Transmission of COVID-19 in the state of Maryland -- the USA. *arXiv*:2109.12219. 2021 Dec. View Article.
3. DM Pandit, **K Kaushik**, C Cirillo. Coupling National Performance Management Research Data Set and the Highway Performance Monitoring System Datasets on a Geospatial Level. *Sage Journals*. 2019 Apr. View Article.
4. **K Kaushik**, C Cirillo, F Bastin. On Modelling Human Population Characteristics with Copulas. *ScienceDirect.* 2019 Jan. View Article.
5. **K Kaushik**, E Wood, J Gonder. Coupled Approximation of U.S. Driving Speed and Volume Statistics using Spatial Conflation and Temporal Disaggregation. *Sage Journals*. 2018 Sep. View Article.

Rosemary Kozar, MD, PhD

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Research Interests

My active laboratory research focuses on endothelial dysfunction and therapeutics aimed at mitigating shock-induced endotheliopathy and coagulopathy. We conduct human studies, utilize animal models of hemorrhagic shock, and employ various in-vitro approaches to explore the underlying mechanisms and identify potential treatment targets.

Recent Publications

1. Jiang D, Houck KL, Murdiyarso L, Higgins H, Rhoads N, Romero SK, **Kozar R**, Nascimbene A, Gernsheimer TB, Sanchez ZAC, Ramasubramanian AK, Adili R, Dong JF. RBCs regulate platelet function and hemostasis under shear conditions through biophysical and biochemical means. *Blood*. 2024 Oct 3;144(14):1521-1531. PMID: 38985835.
2. Richards JE, Yang S, **Kozar RA**, Scalea TM, Hu P. A machine learning-based Coagulation Risk Index predicts acute traumatic coagulopathy in bleeding trauma patients. *J Trauma Acute Care Surg*. 2024 Sep 27. Epub ahead of print. PMID: 39330762.
3. Teeter W, Neal MD, Brown JB, MacLeod JBA, Vesselinov R, **Kozar RA**. TRAUMA-INDUCED COAGULOPATHY: PREVALENCE AND ASSOCIATION WITH MORTALITY PERSIST 20 YEARS LATER. *Shock*. 2024 Sep 1;62(3):380-385. Epub 2024 Jun 24. PMID: 38920139.
4. Zeineddin A, Wu F, Cao S, Corash L, Pati S, **Kozar RA**. Immediate use cryoprecipitate products provide lasting organ protection in a rodent model of trauma/hemorrhagic shock and prolonged hypotensive resuscitation. *J Trauma Acute Care Surg*. 2023 Oct 1;95(4):529-534. Epub 2023 Jun 14. PMID: 37314745.
5. Cardenas JC, Dong JF, **Kozar RA**. Injury-induced endotheliopathy: What you need to know. *J Trauma Acute Care Surg*. 2023 Oct 1;95(4):454-463. Epub 2023 Jun 12. PMID: 37314417.
6. Wu F, Dorman B, Zeineddin A, **Kozar RA**. Fibrinogen Inhibits Metalloproteinase-9 Activation and Syndecan-1 Cleavage to Protect Lung Function in ApoE Null Mice After Hemorrhagic Shock. *J Surg Res.* 2023 Aug;288:208-214. Epub 2023 Apr 4. PMID: 37023568.
7. Williams B, **Kozar R**, Chao W. EMERGING ROLE OF EXTRACELLULAR RNA IN INNATE IMMUNITY, SEPSIS, AND TRAUMA. *Shock*. 2023 Feb 1;59(2):190-199. PMID: 36730864.

Tibor Kristian, PhD

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Research Interests

Research activity in my lab can be divided into two major projects: 1) the role of cell-type-specific mitochondrial dynamics in acute brain injury; (2) disturbed NAD^+ metabolism and its contribution to the cell death mechanism in neurodegenerative disease. Our recent studies, which utilize transgenic animals expressing cell-type specific mitochondria-targeted fluorescent markers in the brain, show that mitochondria in neurons and astrocytes differentially respond to stress conditions. We first reported that the mitochondria in cells destined to die are not able to re-fuse and regain their pre-insult morphology and functions (Owens et al. 2015) and that both neuronal and astrocytic mitochondria are damaged by excitotoxic insult during ischemic conditions.

It is well established that massive degradation of NAD^+ can significantly compromise cell survival. Recently, we reported that administering nicotinamide mononucleotide (NMN), a precursor for NAD^+ synthesis, inhibits NAD^+ degradation and leads to dramatic protection against ischemic brain injury (Park et al. 2016). We recently revealed that NMN affects several downstream targets that promote the survival of brain cells following pathologic stress (Klimova et al. 2019). We are now characterizing the mechanism of NMN neuroprotection by determining the post-translational modifications of proteins controlling mitochondrial dynamics (Klimova et al. 2020).

Recent Publications

1. Waddell J, Khatoon R, **Kristian T.** Cellular and Mitochondrial NAD Homeostasis in Health and Disease. *Cells*. 2023 May 6;12(9):1329. doi: 10.3390/cells12091329. PMID: 37174729.
2. Klimova N, Adam Fearnow, Long A, **Kristian T.** NAD+ precursor modulates post-ischemic mitochondrial fragmentation and reactive oxygen species generation via SIRT3 dependent mechanism. *Exp Neurol.* 2020 Mar; 325:113144. PMID: 31837320.
3. Klimova N, Long A, **Kristian T.** Significance of mitochondrial protein post-translational modifications in pathophysiology of brain injury. *Transl Stroke Res*. 2018 Jun;9(3):223-237. PMID: 28936802.
4. Long A, Park JH, Klimova N, Fowler CB, Loane DJ, **Kristian T**. CD38 knockout mice show significant protection against ischemic brain damage despite high level poly-ADP-ribosylation. *Neurochem Res*. 2017 Jan;42(1):283-293. PMID: 27518087.
5. Park JH, Long A, Owens K, **Kristian T**. Nicotinamide mononucleotide inhibits post-ischemic NAD+ degradation and dramatically ameliorates brain damage following global cerebral ischemia. *Neurobiol Dis*. 2016 Nov:95:102-10. PMID: 27425894.

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Research Interests

My research interests focus on the treatment of vascular trauma using open and endovascular techniques as well as vascular surgical training paradigms and their relevance to trauma care.

Recent Publications

1. Vassy WM, Beckett A, Dennis B, Duchesne J, **Kundi R**, Nguyen J, Spalding MC, Moore EE; AAST Multi-Institutional Trials Committee. Partial Occlusion, Less AKI: An Aorta Registry Analysis of pREBOA-Pro. *Shock.* 2025 Jan 1;63(1):33-35. PMID: 39671549.
2. **Kundi R**, Dhillon NK, Ley EJ, Scalea TM. Integrated vascular training may not prepare graduates to care for vascular trauma patients. *J Trauma Acute Care Surg*. 2024 Nov 29. Epub ahead of print. PMID: 39621434.
3. Powell EK, Reynolds T, Webb JK, **Kundi R**, Keville M, Anderson DH, Matta AE, Juhasz S, Taylor BS, Galvagno S, Scalea TM. Validation of a Training Model for Austere Veno-Venous Extracorporeal Membrane Oxygenation Cannulation and Management. *J Spec Oper Med.* 2024 Dec 14:0505-7RMI. PMID: 39621009.
4. Moore EE, Curi M, Namias N, **Kundi R**, Lum YW, Fox CJ, Rajani RR, Rasmussen TE, Sokolov O, Niklason LE, Khondker Z, Parikh SJ; CLN-PRO-V005 Investigators and the CLN-PRO-V017 Investigators. Bioengineered Human Arteries for the Repair of Vascular Injuries. *JAMA Surg.* 2024 Nov 20:e244893. PMID: 39565635.
5. Spivak H, Rao A, Haase D, Galvagno S, **Kundi R**, O'Connor J, Stein D, Scalea T, Powell E. Broadening indications: A descriptive and comparative in-depth analysis of venovenous extracorporeal membrane oxygenation outcomes in trauma and nontrauma patients. *J Trauma Acute Care Surg.* 2024 Nov 18. PMID: 39560952.
6. Niles E, **Kundi R**, Scalea T, Keville M, Galvagno SM, Anderson D, Rao A, Webb J, Peiffer M, Reynolds T, Cantu J, Powell EK. Anticoagulation Can Be Held in Traumatically Injured Patients on Veno-Venous Extracorporeal Membrane Oxygenation Support. *ASAIO J.* 2024 Jul 8. PMID: 38968145.
7. Dhillon NK, Harfouche MN, DuBose JJ, **Kundi R**, Kozar RA, Scalea TM. Out with the old, in with the new? The revised AAST grading schema better predicts splenic salvage but not splenectomy. *Am J Surg*. 2024 Dec; 238:115800. PMID: 38906747.
8. Meyer CH, Beckett A, Dennis BM, Duchesne J, **Kundi R**, Pandya U, Lawless R, Moore E, Spalding C, Vassy WM, Nguyen J; AAST AORTA Study Group. pREBOA vs ER-REBOA: Impact on Blood Utilization and Resuscitation Requirements: A Pilot Analysis. J Trauma Acute Care Surg. 2024 May 20. PMID: 38781026.

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Research Interests

Autophagy is a catabolic process mediating the turnover of bulk cytoplasmic constituents including organelles and protein aggregates in a lysosome-dependent manner. It is necessary for cellular homeostasis and protects organisms from a variety of diseases, including neurodegeneration and aging. Accumulation of autophagosomes has been observed following traumatic brain injury (TBI) and spinal cord injury (SCI), but its mechanisms and function in those contexts remain unknown. We use in vivo and in vitro models to examine the role of autophagy after TBI and SCI, and to delineate the molecular mechanisms involved. Our data demonstrate that although autophagosomes accumulate in the brain and spinal cord after TBI and SCI, respectively, autophagic degradation cannot proceed to completion. In neurons, this block of autophagy is caused by phospholipase-mediated lysosomal membrane damage and contributes to neuronal cell death. Inhibition of autophagy is also observed in activated microglia and infiltrating macrophages and may contribute to neuroinflammation. We are currently investigating the effects of TBI-induced perturbation in brain lipid homeostasis on microglial and macrophage autophagy and assessing the contribution of the autophagy-lysosomal pathway to delayed development of neurodegeneration and dementia after TBI. Additionally, we are using in vitro models, including human induced pluripotent stem (iPS) cells, to examine the function and mechanisms of USP24, a novel gene associated with Parkinson's disease (PD). Our long-term goal is to define novel target molecules and pathways for safe and effective modulation of autophagy as a treatment against neurodegeneration induced by both acute (trauma) and chronic (neurodegenerative diseases) causes.

Recent Publications

1. Hegdekar N, **Lipinski MM** and Sarkar C. N-acetyl-L-leucine treatment attenuates neuronal cell death and suppresses neuroinflammation after traumatic brain injury in mice. *Sci Reports*. 2021 Apr 29;11(1):9249. PMID: 33927281.
2. Sarkar C, Jones JW, Hegdekar N, Thayer JA, Kumar A, Faden AI, Kane MA and **Lipinski MM**. PLA2G4A/cPLA2 mediated lysosomal membrane damage leads to inhibition of autophagy and neurodegeneration after brain trauma. *Autophagy*. 2020 Mar;16(3):466-485. PMID: 31238788.
3. Thayer JA, Awad O, Hegdekar N, Sarkar C, Tesfay H, Burt C, Feldman RA and **Lipinski MM**. The PARK10 gene USP24 is a negative regulator of autophagy and ULK1 protein stability. *Autophagy*. 2020 Jan;16(1):140-153. PMID: 30957634.
4. Li Y, Jones JW, Choi HMC, Sarkar C, Kane MA, Koh EY, **Lipinski MM**[#] and Wu J[#]. cPLA2 activation contributes to lysosomal defects leading to impairment of autophagy after spinal cord injury. *Cell Death Disease*. 2019; Jul 11:10(7):531. PMID: 31296844. [#]co-senior authors.
5. Liu S, Li Y, Choi HMC, Sarkar C, Koh EY, Wu J and **Lipinski MM**. Lysosomal damage after spinal cord injury causes accumulation of RIPK1 and RIPK3 proteins and potentiation of necroptosis. *Cell Death Disease*. 2018 May 1; 9(5):476. PMID: 29686269.

Nicholas A. Morris, MD, FAAN, FNCS

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Research Interests

My research interests include novel strategies, such as simulation, to educate and assess clinicians, innovations to improve in-hospital responses to patients with cardiac arrest, pain management after acute brain injury, and addressing disparities in acute neurological care delivery.

Recent Publications

1. **Morris NA**, Simard JM, Chaturvedi, S. Surgical Management for Primary Intracerebral Hemorrhage. *Neurology*. 2024 Aug 27;103(4):e209714. PMID: 39074339.
2. Pergakis MB, Ali AA, Chang WT, Neustein B, Albin C, Aysenne A, Tisherman SA, **Morris NA**. Smartphone Use in the Management of Neurological Emergencies: A Simulation-based Study. *Neurocrit Care*. 2024 May 21. Online ahead of print. PMID: 38773041.
3. Alvarado-Dyer R, Saleh Velez FG, Kamdar HA, Niznick N, Carroll E, Castillo-Pinto C, Parasram M, Kelly D, Goswami S, Ehntholt MS, Dangayach N, Babi MA, Ramadan R, Lazaridis C, Albin CSW, **Morris NA**. Curriculum Innovations: A Social Media-Based Educational Curriculum Improves Knowledge for Trainees in Neurocritical Care: Results of a Stratified Randomized Study. *Neurology Education*. 2023 Aug 2;2(3):e200087. eCollection 2023 Sep 25. PMID: 39359712.
4. **Morris NA**, Wang Y, Felix RB, Rao A, Arnold S, Khalid M, Armahizer MJ, Murthi SB, Colloca L. Adjunctive virtual reality pain relief following traumatic injury: a proof-of-concept, within-person randomized trial. *Pain*. 2023 Sep;164(9):2122-2129. PMID: 37079851.
5. Kalasapudi L, Williamson S, Shipper AG, Motta M, Esenwa C, Otite F, Chaturvedi S, **Morris, NA**. A scoping review of racial, ethnic, and sex disparities in the diagnosis and management of hemorrhagic stroke. *Neurology*. 2023 Jul;101(3):e267-e276. PMID: 37202159.
6. **Morris NA**, Couperus C, Dezman Z, Rubinson L, Friedrich R, Gurmu S, Lemkin D. Feasibility of Accelerated Code Team Activation with Call Button Triggered Smartphone Notification. *Resuscitation*. 2023 Jun:187:109752. Epub 2023 Feb 25. PMID: 36842677.

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Research Interests

My primary research interests include transthoracic echocardiography (TTE) and point-of-care ultrasound (POCUS), which have led to collaborations with the School of Computer Science to develop augmented and virtual reality applications for medical use. We recently received a grant from the State of Maryland to establish the Maryland Blended Reality Center (MBRC). A key focus of the MBRC is the development of virtual reality (VR) technologies to mitigate pain perception and reduce opioid use in acute traumatic pain. The MBRC is equipped with advanced resources, including six VR headsets, the ability to record 3D video, and the capability to reconstruct footage into immersive virtual environments.

Recent Publications

1. Morris NA, Wang Y, Felix RB, Rao A, Arnold S, Khalid M, Armahizer MJ, **Murthi SB**, Colloca L. Adjunctive virtual reality pain relief after traumatic injury: a proof-of-concept within-person randomized trial. *Pain*. 2023 Sep 1;164(9):2122-2129. Epub 2023 Apr 19. PMID: 37079851.
2. Colloca L, Taj A, Massalee R, Haycock NR, Murray RS, Wang Y, McDaniel E, Scalea TM, Fouche-Weber Y, **Murthi S**. Educational Intervention for Management of Acute Trauma Pain: A Proof-of-Concept Study in Post-surgical Trauma Patients. *Front Psychiatry*. 2022 Jul 4;13:853745. PMID: 35859610.
3. Beams R, Brown E, Cheng WC, Joyner JS, Kim AS, Kontson K, Amiras D, Baeuerle T, Greenleaf W, Grossmann RJ, Gupta A, Hamilton C, Hua H, Huynh TT, Leuze C, **Murthi SB**, Penczek J, Silva J, Spiegel B, Varshney A, Badano A. Evaluation Challenges for the Application of Extended Reality Devices in Medicine. *J Digit Imaging.* 2022 Oct;35(5):1409-1418. Epub 2022 Apr 25. PMID: 35469355.
4. Felix RB, Rao A, Khalid M, Wang Y, Colloca L, **Murthi SB**, Morris NA. Adjunctive virtual reality pain relief following traumatic injury: protocol for a randomised within-subjects clinical trial. *BMJ Open*. 2021 Nov 30;11(11):e056030. PMID: 34848527.

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Research Interests

The primary focus of my research is improvement in clinical outcomes in patients having cardiac surgery. I have worked in collaboration with other anesthesiologists and cardiac surgical colleagues on perioperative clinical management of patients during cardiac surgery. Areas of interest include blood coagulation management, anesthetic management for high-risk procedures and prevention of cardiac surgery-associated acute kidney injury.

Over the last 5 years, I have been actively involved in the development of a long-term survival model in orthotopic cardiac xenotransplantation in primates. These efforts have led to the achievement of reliable medium-term survival in baboons that have undergone cardiac xenotransplantation using a genetically modified pig heart. Our experience in the lab led to two recent successful genetically modified pig to human orthotopic cardiac xenotransplants at the University of Maryland School of Medicine.

Recent Publications

1. Strauss ER, **Odonkor PN**, Williams B, Choi S, Mueller J, Taylor B, Shah A, Goerlich CE, Mohiuddin MM, Griffith BP. Intraoperative Management of an Orthotopic Porcine-to-Human Cardiac Xenotransplant. *Ann Thorac Surg*. 2023 Mar;115(3):784-786. PMID: 36621667.
2. Silverman H, **Odonkor P**. Reevaluating the Ethical Issues in Porcine-to-Human Heart Xenotransplantation. *Hastings Center Report*. 2022 Sep;52(5):32-42. PMID: 36226875.
3. Mohiuddin MM, Goerlich CE, Singh AK, Zhang T, Tatarov I, Lewis B, Sentz F, Hershfeld A, Braileanu G, **Odonkor P,** Strauss E, Williams B, Burke A, Hittman J, Bhutta A, Tabatabai A, Gupta A, Vaught T, Sorrells L, Kuravi K, Dandro A, Eyestone W, KaczOrowski DJ, Ayares D, Griffith BP. Progressive Genetic Modifications of Porcine Cardiac Xenografts Extend Survival to 9 Months. *Xenotransplantation*. 2022 May;29(3):e12744. PMID: 35357044.
4. **Odonkor P**, Strauss E, Williams B. Ethical considerations during a pioneering surgical procedure: porcine cardiac xenotransplantation. *Br J Hosp Med (Lond)*. 2022 Jun 2;83(6):1-7. PMID: 35787171.
5. Smith Bergbower EA, **Odonkor PN**. Con: Acute Normovolemic Hemodilution Should not be used in Infective Endocarditis. *J Cardiothorac Vasc Anesth*. 2022 Aug;36(8 Pt A):2815-2818. PMID: 35501262.
6. Shah A, Goerlich CE, Pasrijah C, Hirsch J, Fisher S, **Odonkor P**, Strauss E, Ayares D, Mohiuddin M, Griffith BP. Anatomical Differences Between Human and Pig Hearts and Their Relevance for Cardiac Xenotransplantation Surgical Technique. *JACC Case Rep*. 2022 Jul 7;4(16):1049-1052. PMID: 36062051.

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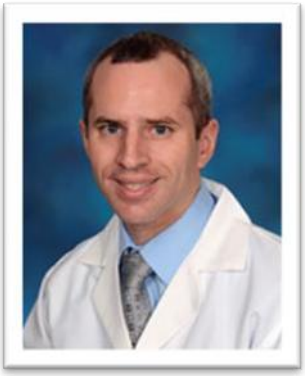
Research Interests

My career has focused on integrating clinical neurology and critical care medicine. My research aims to identify biomarkers during the resuscitation phase of acute brain injuries that serve as determinants of lesion repair, functional restoration, and recovery of consciousness.

Recent Publications

1. Zimmerman W, Pergakis M, Ahmad G, Morris NA, Podell J, Chang WT, Motta M, Chen H, Jindal G, Bodanapally U, Simard JM, Badjatia N, **Parikh GY**. Iodine-based dual-energy CT after mechanical thrombectomy predicts secondary neurologic decline from cerebral edema after severe stroke. *Neurocritical Care*. 2024 Oct 24. PMID: 39448427.
2. Manners J, Jusuf E, **Parikh GY**, Gasior M, Vaitkevicius H, Morris NA. Super Refractory Status Epilepticus Improved After Emergency Use of Ganaxolone: *Case Report. The Neurohospitalist*. 2024 Jul;14(3):327-331. Epub 2024 Feb 20. PMID: 38895012.
3. Siddiqui H, **Parikh G**, Doub JB. Bacterial Aggregation in Cerebral Spinal Fluid: The Extent it Occurs and the Clinical Ramifications. *Current Microbiology*. 2024 Jul;81(7):205. PMID: 38831167.
4. Woodward MR, Wells CL, Arnold S, Dorman F, Ahmed Z, Morris NA, Ciryam P, Podell JE, Chang WT, Zimmerman WD, Motta M, Butt B, Pergakis MB, Labib M, Wang TI, Edlow BL, Badjatia N, Braun R, **Parikh GY**. Behavioral Assessment With the Coma Recovery Scale—Revised Is Safe and Feasible in Critically Ill Patients With Disorders of Consciousness. *Critical Care Explorations*. 2024 Jun 24;6(7):e1101. PMID: 38912722.
5. Podell JE, Moffet EW, Bodanapally UK, Pajoumand M, Silva LM, Hu P, Chen LK, Morris NA, **Parikh G**, Schwartzbauer GT, Aarabi B, Badjatia N. Magnetic Resonance Imaging Lesions Associated With Paroxysmal Sympathetic Hyperactivity After Traumatic Brain Injury. *Neurotrauma Reports*. 2024 Apr 1;5(1):317-329. View Article.



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Research Interests

Limiting damage to mitochondria, the primary energy-generating organelles of the cell is crucial for neuroprotection. My laboratory studies basic subcellular mechanisms that govern neuroinflammation and cell death in neurodegenerative disorders, with a focus on mitochondrial bioenergetics. My active projects study the roles of mitochondrial structural and functional remodeling in pro-inflammatory microglial activation, how this neuroinflammatory response exacerbates neuronal injury, and translational strategies for targeting metabolism to promote brain recovery following traumatic brain injury, neonatal hypoxic-ischemic encephalopathy, and in Alzheimer's disease-related dementias. We have pioneered the development and implementation of two novel applications of Seahorse Bioscience Extracellular Flux Technology, a real-time assessment of mitochondrial respiration within permeabilized brain cells and from whole brain tissue slices, expanding the ways in which mitochondrial function can be studied in cells of the central nervous system.

Recent Publications

1. Strogulski NR, Portela LV, **Polster BM**, Loane DJ. Fundamental Neurochemistry Review: Microglial immunometabolism in traumatic brain injury. *J Neurochem*. Oct 2023; 167(2),129-153. PMID: 37759406.
2. Jaber SM, Ge SX, Milstein JL, VanRyzin JW, Waddell J, **Polster BM**. Idebenone Has Distinct Effects on Mitochondrial Respiration in Cortical Astrocytes Compared to Cortical Neurons Due to Differential NQO1 Activity. *J Neurosci*. June 2020; 40(23), 4609-4619. PMID: 32350039.
3. Jaber SM, Yadava N, **Polster BM**. Mapping Mitochondrial Respiratory Chain Deficiencies by Respirometry: Beyond the Mito Stress Test. *Exp Neurol*. June 2020; 328, 113282. PMID: 32165258.
4. Jaber SM, Bordt EA, Bhatt NM, Lewis DM, Gerecht S, Fiskum G, **Polster BM**. Sex differences in the mitochondrial bioenergetics of astrocytes but not microglia at a physiologically relevant brain oxygen tension. *Neurochem Int.* 2018 Jul; 117:82-90. PMID: 28888963.
5. Bordt EA, Clerc P, Roelofs BA, Saladino AJ, Tretter L, Adam-Vizi V, Cherok E, Khalil A, Yadava N, Ge SX, Francis TC, Kennedy NW, Picton LK, Kumar T, Uppuluri S, Miller AM, Itoh K, Karbowski M, Sesaki H, Hill RB, **Polster BM**. The Putative Drp1 Inhibitor mdivi-1 is a reversible mitochondrial complex I inhibitor that modulates reactive oxygen species. *Dev Cell.* 2017 Mar 27; 40(6): 583-594.e6. PMID: 28350990.

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Research Interests

My research focuses on the development of advanced preclinical capabilities for the care of injured warfighters, as well as database studies on the use of advanced critical care concepts in treating critically ill and injured patients. Specifically, I am interested in utilizing extracorporeal support in novel ways to stabilize and resuscitate bleeding patients, as well as to provide prolonged critical care for injured patients in casualty care settings. Much of this research is conducted at the Air Force Research Laboratory-affiliated Advanced Resuscitation in Combat Casualty Care (ARC3) laboratory at the University of Maryland (https://www.medschool.umaryland.edu/arc3/), with findings transitioned into operational environments to test new devices, biologics, and knowledge products.

Recent Publications

1. Niles E, Kundi R, Scalea T, Keville M, Galvagno SM, Anderson D, Rao A, Webb J, Peiffer M, Reynolds T, Cantu J, **Powell EK**. Anticoagulation Can Be Held in Traumatically Injured Patients on Veno-Venous Extracorporeal Membrane Oxygenation Support. *ASAIO J*. 2024 Jul 8. PMID: 38968145.
2. **Powell E**, Keller AP, Galvagno SM, Jr. Advanced Critical Care Techniques in the Field. *Crit Care Clin*. 2024 Jul;40(3):463-480. Epub 20240417. PMID: 38796221.
3. Niles E, Haase DJ, Tran Q, Gerding JA, Esposito E, Dahi S, Galvagno SM, Boswell K, Rector R, Pearce R, Abdel-Wahab M, Singh A, Pirzada S, Tabatabai A, **Powell EK**. Triage of V-V ECMO referrals for COVID-19 respiratory failure. *Artif Organs*. 2024 Jun;48(6):665-674. PMID: 38551363.
4. Gottula AL, Qi M, Lane BH, Shaw CR, Gorder K, **Powell E**, Danielson K, Ciullo A, Johnson NJ, Tonna JE, Hinckley WR, Koshoffer A, Al-Araji R, Bartos J, Benoit J, Hsu CH. Prehospital Ground and Helicopter-Based Extracorporeal Cardiopulmonary Resuscitation (ECPR) Reduce Barriers to ECPR: A GIS Model. *Prehosp Emerg Care*. 2024 May 31:1-9. PMID: 38739864.
5. **Powell EK**, Betzold R, Kundi R, Anderson D, Haase D, Keville M, Galvagno S. Derivation of a Procedural Performance Checklist for Bifemoral Veno-Venous Extracorporeal Membrane Oxygenation Cannula Placement in Operational Environments. *J Spec Oper Med*. 2024 Mar 13:Y177-KRQV. PMID: 38278770.
6. Niles E, Maldarelli M, Hamera J, Lankford A, Galvagno SM, Menne A, Boswell K, Rector R, Haase DJ, Tabatabai A, **Powell EK**. Cannula associated deep vein thromboses in COVID-19 patients supported with VV ECMO. *J Vasc Access*. 2024 Jan 3:11297298231220114. PMID: 38166433.
7. **Powell EK**, Johnson GA, Teeter W, Mursch D, Broski J, Kolokythas C, et al. Actual vs Expected Survival With the Use of the Molecular Adsorbent Recirculating System for Acute Liver Failure. *CHEST Critical Care*. 2024;2(1). doi: https://doi.org/10.1016/j.chstcc.2023.100041.

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Research Interests

My research focuses on developing novel methods of resuscitation and improving organ preservation. Specific areas of interest include enhancing the assessment and management strategies for traumatic aortic injury, utilizing normothermic Ex-Vivo Lung Perfusion (EVLP) to increase lung transplant donor availability, and applying mechanical support to improve outcomes for patients in severe cardiogenic shock and respiratory failure. Additionally, my engineering background enables me to collaborate effectively with our bioengineering colleagues in designing and developing advanced devices for resuscitation and mechanical support in cases of end-organ failure.

Recent Publications

1. Shah A, Stachnik S, Leibowitz JL, Ramadan L, Ejimogu J, Singireddy S, Naselsky W, Grazioli A, **Rabin J**, Wu ZJ, Griffith BP. Non-intensive care unit feasibility for ambulatory veno-venous extracorporeal membrane oxygenation patients. *Perfusion*. 2024 Nov 23:2676591241302959. PMID: 39579011.
2. Lee R, Helmy S, Cardona J, Zhao D, Rector R, **Rabin J**, Mazzeffi M, Cho SM, Parikh G, Morris NA, Khan I. Neurosurgical Procedures in Patients Requiring Extracorporeal Membrane Oxygenation. *Crit Care Explor*. 2024 Oct 21;6(10):e1166. PMID: 39440348.
3. Raja KM, Plazak M, **Rabin J**, Shah A, Grabenstein I, Rao A, Bathula A, Stachnick S, Massey HT, Zapata D, Taylor B, Grazioli A. Hypoalbuminemia is a predictor of mortality in patients with cardiogenic shock requiring veno-arterial extracorporeal membrane oxygenation. *Perfusion*. 2024 Oct 4:2676591241288793. PMID: 39365267.
4. Grazioli A, **Rabin J**, Rector RP, Wu ZJ, Burke AP, Sharifai N, Shah A, Taylor BS, Gladwin MT. Venoarterial Extracorporeal Membrane Oxygenation Therapy in Patients with Sickle Cell Disease: Case Series and Review for Intensive Care Physicians. *J Intensive Care Med.* 2024 Aug 14:8850666241260605. PMID: 39140386.
5. Pelekhaty S, Gessler J, Dante S, Rector N, Galvagno S, Stachnik S, **Rabin J**, Tabatabai A. Nutrition and outcomes in venovenous extracorporeal membrane oxygenation: An observational cohort study. *Nutr Clin Pract*. 2024 Feb 20. PMID: 38375866.
6. Stein SR, Ramelli SC, Grazioli A, Chung JY, Singh M, Yinda CK, Winkler CW, Sun J, Dickey JM, Ylaya K, Ko SH, Platt AP, Burbelo PD, Quezado M, Pittaluga S, Purcell M, Munster VJ, Belinky F, Ramos-Benitez MJ, Boritz EA, Lach IA, Herr DL, **Rabin J**, Saharia KK, Madathil RJ, Tabatabai A, Soherwardi S, McCurdy MT, NIH COVID-19 Autopsy Consortium, Peterson KE, Cohen JI, deWit E, Vannella KM, Hewitt SM, Kleiner DE & Chertow DS. SARS-CoV-2 infection and persistence throughout the human body and brain at autopsy. *Nature*. 2022 Dec;612(7941):758-763. PMID: 36517603.

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Research Interests

My research focuses on 1) mechanisms resulting in and treatment of acute lung injury; 2) weakness in patients with critical illnesses; 3) identification of genetic determinants of infectious and vascular occlusive complications in patients who undergo surgical procedures, and the use of genetic information to develop tools to identify patients at risk of infectious or thrombotic complications and that allow perioperative physicians to tailor therapy to potentially treat or prevent these complications; 4) prevention of delirium after surgery and prevention of delirium in Intensive care unit patients; 5) medical informatics and "big data" in anesthesiology and critical-care; and 6) machine learning and use of vital signs to predict changes in patient status or for life-saving interventions.

Recent Publications

1. Richards JE, Scalea TM, Mazzeffi MA, **Rock P**, Galvagno SM. Does Lactate affect the association of early hypoglycemia and multiple organ failure in severely injured blunt trauma patients? *Anesth Analg.* 2018 Mar;126(3):904-910. PMID: 29283920.
2. Mazzeffi M, Jonna S, Blanco N, Mavrothalassitis O, Odekwu O, Fontaine M, **Rock P**, Tanaka K, Thom K. Intraoperative red blood cell transfusion, delayed graft function, and infection after kidney transplant: An observational cohort study. *J Anesth.* 2018 Jun; 32(3):368-374. PMID: 29557528.
3. Mazzeffi M, Abuelkasem E, Drucker C, Kalsi R, Toursavadkohi S, Harris D, **Rock P**, Tanaka K, Taylor B, Crawford R. Contemporary single-center experience with prophylactic cerebrospinal fluid drainage for thoracic endovascular aortic repair in patients at high risk for ischemic spinal cord injury. *J Cardiothorac Vasc Anesth.* 2018 Apr; 32(2):883-889. PMID:29291967.
4. Deiner S, Luo X, Lin HM, Sessler DI, Saager L, Sieber FE, Lee HB, Sano M, and the Dexlirium Writing Group, Jankowski C, Bergese SD, Candiotti K, Flaherty JH, Arora H, Shander A, **Rock P**. Intraoperative infusion of dexmedetomidine for prevention of postoperative delirium and cognitive dysfunction in elderly patients undergoing major elective noncardiac surgery: A randomized clinical trial. *JAMA Surg*. 2017 Aug 16; 152(8): e171505. PMID: 28593326.
5. Hu PF, Yang S, Li HC, Stansbury LG, Yang F, Hagegeorge G, Miller C, **Rock P**, Stein DM, Mackenzie CF. Reliable collection of real-time patient physiologic data from less reliable networks: A "monitor of monitors" system (MoMs). *J Med Syst.* 2017 Jan; 41(1):3. PMID: 27817131.

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Research Interests

My research interest is focused on understanding the role and function of lipids and cellular organelles in neurodegeneration and neuroinflammation in traumatic brain injury (TBI) and age-associated neurodegenerative diseases. My recent study indicated that the abundance of etherphospholipids, an ether bond containing glycerophospholipids is dysregulated in the mouse cortices after TBI. Etherphospholipids are major components of cellular membrane and play an important role in cellular signaling via their structural impact on the formation and function of lipid rafts. Their synthesis is regulated by the concerted functions of peroxisomes and endoplasmic reticulum. My study shows that etherphospholipids dysregulation after TBI is at least in part caused by the impairment of peroxisomal function. Peroxisomes play an important role in maintaining cellular lipid and redox homeostasis which are disrupted after TBI. Currently, my research is aimed to elucidate its role and function in the pathophysiology of TBI and to develop novel treatment strategy to attenuate neurodegeneration and neuroinflammation after TBI by restoring its function in the injured brain.

Recent Publications

1. Ji Y, Morel Y, Tran AQ, Lipinski MM, **Sarkar C**, Jones JW. Development and evaluation of a liquid chromatography-tandem mass spectrometry method for simultaneous measurement of toxic aldehydes from brain tissue. *J Chromatogr B Analyt Technol Biomed Life Sci*. 2024 Jul 15:1242:124208. PMID: 38880056.
2. **Sarkar C***, Lipinski MM*. Autophagy in neuroinflammation after traumatic brain injury. *Neural Regen Res.* 2024 May;19(5):951-952. PMID: 37862184. (*Corresponding authors).
3. **Sarkar C***, Lipinski MM. Glycerophospholipid dysregulation after traumatic brain injury. *Neurochem Int.* 2024 May:175:105701. PMID: 38428503. (*Corresponding author).
4. **Sarkar C**, Lipinski MM. Role and function of cPLA2 in CNS trauma and age-associated neurodegenerative diseases. *Phospholipases in Physiology and Pathology*. Chapter 7, 103-117. 2023. https://doi.org/10.1016/B978-0-443-21800-2.00015-4
5. Hegdekar N, **Sarkar C**, Bustos S, Ritzel RM, Hanscom M, Ravishankar P, Philkana D, Wu J, Loane DJ, Lipinski MM. Inhibition of autophagy in microglia and macrophages exacerbates innate immune responses and worsens brain injury outcomes. *Autophagy.* 2023 Jul;19(7):2026-2044. PMID: 36652438.
6. Mubariz F, Saadin A, Lingenfelter N, **Sarkar C**, Banerji A, Lipinski MM, Awad O. Deregulation of mTORC1-TFEB axis in human iPSC model of GBA1-associated Parkinson's disease. *Front Neurosci*. 2023 Jun 2:17:1152503. PMID: 37332877.

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Research Interests

My research interests include damage control, operative approaches to trauma, ECMO, complex liver injuries, and REBOA (Resuscitative Endovascular Balloon Occlusion of the Aorta).

Recent Publications

1. Kundi R, Dhillon NK, Ley EJ, **Scalea TM**. Integrated vascular training may not prepare graduates to care for vascular trauma patients. *J Trauma Acute Care Surg*. 2024 Nov 29. Epub ahead of print. PMID: 39621434.
2. Spivak H, Rao A, Haase D, Galvagno S, Kundi R, O'Connor J, Stein D, **Scalea T**, Powell E. Broadening indications: A descriptive and comparative in-depth analysis of venovenous extracorporeal membrane oxygenation outcomes in trauma and nontrauma patients. *J Trauma Acute Care Surg*. 2024 Nov 18. Epub ahead of print. PMID: 39560952.
3. Vasquez M, Dhillon NK, Feliciano DV, **Scalea TM**. The fallacy of a roadmap computed tomography after an abdominal gunshot wound: A road that leads to nowhere. *J Trauma Acute Care Surg.* 2024 Nov 1;97(5):785-790. Epub 2024 May 28. PMID: 39443840.
4. Ghneim MH, O'Connor JV, **Scalea TM.** Damage control thoracic surgery: What you need to know. *J Trauma Acute Care Surg*. 2024 Oct 8. PMID: 39375907.
5. Richards JE, Yang S, Kozar RA, **Scalea TM**, Hu P. A machine learning-based Coagulation Risk Index predicts acute traumatic coagulopathy in bleeding trauma patients. *J Trauma Acute Care Surg*. 2024 Sep 27. PMID: 39330762.
6. Walker PF, Galvagno SM, Sachdeva A, Feliciano DV, **Scalea TM**, O'Connor JV. Operative Management of Aerodigestive Injuries: Improved Survival Over two Decades. *Am Surg*. 2023 Dec;89(12):5982-5987. Epub 2023 Jun 7. PMID: 37283249.
7. Powell EK, Johnson GA, Teeter W, Mursch D, Broski J, Kolokythas C, Andersen KB, Gaasch S, Stein DM, **Scalea TM**, Galvagno SM. Actual versus expected survival with the use of the molecular adsorbent recirculating system (MARS) for acute liver failure. *CHEST Critical Care*. December 2023. 2(26):100041. doi: https://doi.org/10.1016/j.chstcc.2023.100041.

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Research Interests

My research focuses on hospital-acquired infections complicating traumatic injuries and critical illnesses, as well as strategies to prevent the spread of drug-resistant infections in hospitalized patients. I am also interested in leveraging hospital-acquired infection surveillance measures to enhance the quality and safety of patient care.

Recent Publications

1. Leekha S, Robinson GL, Jacob JT, Fridkin S, Shane A, Sick-Samuels A, Milstone AM, Nair R, Perencevigh E, Puig-Asensio M, Kobayashi T, Mayer J, Lewis J, Bleasdale S, Wenzler E, Mena, Lora AJ, Baghbadi J, **Schrank GM**, et al. CDC Prevention Epicenters Program. Evaluation of hospital-onset bacteraemia and fungaemia in the USA as a potential healthcare quality measure: a cross-sectional study. *BMJ Qual Saf* Epub 2024 Jul 22;33(8):487-498. PMID: 38782579.
2. The Prep-IT Investigators, **Schrank GM**, et al. Skin Antisepsis before Surgical Fixation of Extremity Fractures. *N Eng J Med.* 2024 Feb 1, 390 (5)409-420. PMID:38294973.
3. Heil EL, Kaur H, Atalla A, Basappa S, Mathew M, Seung H, Johnson JK, **Schrank GM**. Comparison of Adjuvant Clindamycin vs Linezolid for Severe Invasive Group A Streptococcus Skin and Soft Tissue Infections. *Open Forum Inf Dis.* 2023 Nov 24;10(12):ofad588. PMID: 38149106.
4. **Schrank GM**, Snyder GM, Leekha S. Hospital-onset bacteremia and fungemia: examining healthcare-associated infections prevention through a wider lens. *Antimicro Steward Healthc Epidemiolo.* 2023 Nov 8 3 (1) :e198. PMID: 38028924.
5. Salasky VR, Chowdhury SH, Chen LK, Almeida E, Kong X, Armahizer M, Pajoumand M, **Schrank GM**, Rabinowitz RP, Schwartzbauer G, Hu P, Badjatia N, Podell JE. Overlapping Physiologic Signs of Sepsis and Paroxysmal Sympathetic Hyperactivity After Traumatic Brain Injury: Exploring A Clinical Conundrum. *Neurocrit Care.* 2024 Jun;40(3):1006-1012. Epub 2023 Oct 26. PMID: 37884690.
6. **Schrank GM**, Harris-Williams M, Schivone K, Lusby MC, Dove C, Leekha S. Evaluation of an antigen -test-based strategy to reduce duration of transmission-based precautions for severe acute respiratory coronavirus 2 (SARS-CoV-2) infection in hospitalized patients. *Infect Control Hosp Epidemiol*. 2024 Jan;45(1):114-116. Epub 2023 Aug 4. PMID: 37539701.
7. **Schrank GM**, Branch-Elliman W, Leekha S, Baghdadi J, Pineles L, Harris AD, Morgan DJ. Perceptions of Health Care-Associated Infection Metrics by Infection Control Experts. *JAMA Netw Open*. 2023 Apr 3;6(4):e238952. PMID: 37074719.

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Research Interests

My research interests focus on the surgical and medical optimization of neurotrauma patients. I serve as the local PI or Co-PI for several multisite research trials, including ARCTIC and IN-TWIN for spinal cord injury, and BOOST-3 for traumatic brain injury (TBI). Recently, I have become increasingly interested in the application of Blended Reality and AI to neurotrauma solutions. For example, we are exploring anatomic and surgical navigation using the latest innovative hardware and software developed by our collaborative team. Additionally, we are analyzing neurosurgical procedures by combining augmented reality (AR) and AI algorithms to optimize patient outcomes.

Recent Publications

1. Zhuo J, Raghavan P, Jiang L, Roys S, Tchoquessi RLN, Chen H, Wickwire EM, Parikh GY, **Schwartzbauer GT**, Grattan LM, Wang Z, Gullapalli RP, Badjatia N. Longitudinal Assessment of Glymphatic Changes Following Mild Traumatic Brain Injury: Insights from PVS burden and DTI-ALPS Imaging. *medRxiv* [Preprint]. 2024 Jun 2:2024.06.01.24307927. Update in: *Front Neurol.* 2024 Aug 07;15:1443496. PMID: 38854000.
2. Serra R, Wilhelmy B, Chen C, Oliver JD, Stokum JA, Bodanapally UK, Simard JM, **Schwartzbauer G**, Aarabi B. Acute Development of Traumatic Intracranial Aneurysms After Civilian Gunshot Wounds to the Head. *J Neurotrauma.* 2024 Aug;41(15-16):1871-1882. PMID: 38308472.
3. Olexa J, Shear B, Han N, Sharma A, Trang A, Kim K, **Schwartzbauer G**, Ludwig S, Sansur C. Feasibility of a novel augmented reality overlay for cervical screw placement in phantom spine models. *Asian Spine J*. 2024 Jun;18(3):372-379. PMID: 38764227.
4. Salasky VR, Chowdhury SH, Chen LK, Almeida E, Kong X, Armahizer M, Pajoumand M, Schrank GM, Rabinowitz RP, **Schwartzbauer G**, Hu P, Badjatia N, Podell JE. Overlapping Physiologic Signs of Sepsis and Paroxysmal Sympathetic Hyperactivity After Traumatic Brain Injury: Exploring A Clinical Conundrum. *Neurocrit Care.* 2024 Jun;40(3):1006-1012. PMID: 37884690.
5. Olexa J, Trang A, Chryssikos T, **Schwartzbauer G**, Aarabi B. Technical report: clinical feasibility of augmented reality-navigated chronic subdural hematoma evacuation. *J Surg Case Rep*. 2024 May 28;2024(5). PMID: 38812573.
6. Kim KT, Panagos M, Hentschel M, Sharma A, Han N, Chryssikos T, **Schwartzbauer G**, Crandall KM, Sansur CA. Midpoint of C7 Lateral Mass Serves as an Accurate Reference Point for the Placement of T1 Pedicle Screws: An Anatomic Study. *Oper Neurosurg (Hagerstown).* 2024 Mar 1;26(3):323-329. PMID: 37832024.
7. Olexa J, Trang A, Cohen J, Kim K, Rakovec M, Saadon J, Sansur C, Woodworth G, **Schwartzbauer G**, Cherian J. The Apple Vision Pro as a Neurosurgical Planning Tool: A Case Report. *Cureus.* 2024 Feb 14;16(2):e54205. PMID: 38496193.
8. Olexa J, Walek KW, Flessner R, Trang A, Stokum J, Chen C, Sharma A, Oliver J, Solomon D, Kim KT, Serra R, Ahmed AK, Wilhelmy B, Chryssikos T, Cannarsa G, Crandall K, Sansur C, **Schwartzbauer G**. The Neurosurgeon's Dilemma-Do Antiplatelet/Anticoagulant Medications Increase the Risk of Catheter-Associated Hemorrhage in External Ventricular Drain Placement? *World Neurosurg*. 2024 Feb;182:e611-e623. PMID: 38061544.

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Research Interests

I lead one of the busiest 24/7 emergency hyperbaric chambers in the U.S. and serve as the site Principal Investigator for the Hyperbaric Oxygen Brain Injury Trial (HOBIT), one of the nation's top-enrolling sites. My research focuses on the therapeutic applications of hyperbaric oxygen for various conditions and its impact on physiological processes. As a strong advocate for gender equity in Emergency Medicine, I have conducted studies on workforce diversity, compensation disparities, and recognition gaps. Through collaborative research and mentorship, I strive to advance the fields of Emergency and Hyperbaric Medicine.

Recent Publications

1. Salkar, N, Fang, A, Lall, M, White M, Bond, M, Agrawal, P, **Sethuraman K**. Where Are They Now? Attrition Rates of EM Residency Graduates by Gender. *Annals of Emergency Medicine*. 2024 Nov 13:S0196-0644(24)01112-0. PMID: 39545879.
2. **Sethuraman K**, Tom M, Chew KW, Romero-Casilla J, Hardy K. Quantification of referrals received at two emergency-capable hyperbaric medicine centers. *Undersea Hyperb Med*. 2024 Second Quarter;51(2):97-100. PMID: 38985145.
3. Moses RA, Hunter AE, Brandes ER, Zhang Z, Rees JR, Peacock JL, Bihrle W 3rd, **Sethuraman K**, Weaver LK, Buckey JC Jr. Patient-Reported Outcome Measures Following Hyperbaric Oxygen Therapy for Radiation Cystitis: Early Results From the Multicenter Registry for Hyperbaric Oxygen Therapy. *J Urol*. 2024 Jun;211(6):765-774. Epub 2024 Apr 4. PMID: 38573938.
4. St Peter D, Na D, **Sethuraman K**, Mathews MK, Li AS. Hyperbaric oxygen therapy for central retinal artery occlusion: Visual acuity and time to treatment. *Undersea Hyperb Med*. 2023 Third Quarter;50(3):253-264. PMID: 37708058.
5. **Sethuraman K**, Thom SR. Hyperbaric oxygen should be used for carbon monoxide poisoning. *Br J Clin Pharmacol*. 2023 Mar;89(3):939-941. Epub 2022 Dec 1. PMID: 36457237.
6. **Sethuraman KN,** Smolin R, Henry S. Is There a Place for Hyperbaric Oxygen Therapy? *Adv Surg.* 2022 Sep;56(1):169-204. PMID: 36096567.
7. Linden JA, Baird J, Madsen TE, Rounds K, Lall MD, Raukar NP, Fang A, Lin M, **Sethuraman K**, Dobiesz VA. Diversity of leadership in academic emergency medicine: Are we making progress? *Am J Emerg Med*. 2022 Jul;57:6-13. Epub 2022 Apr 14. PMID: 35462120.
8. Fang AC, Chekijian SA, Zeidan AJ, Choo EK, **Sethuraman KN**. National Awards and Female Emergency Physicians in the United States: Is the "Recognition Gap" Closing? *J Emerg Med.* 2021 Nov;61(5):540-549. doi: 10.1016/j.jemermed.2021.07.009. Epub 2021 Aug 4. PMID: 34364703.

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Research Interests

My research interests focus on traumatic brain injury, hemorrhagic shock, geriatric injury, and functional outcomes following traumatic injury. I have a particular interest in patient-centered outcomes research.

Recent Publications

1. Tesoriero R, Coimbra R, Biffl WL, Burlew CC, Croft CA, Fox C, Hartwell JL, Keric N, Lorenzo M, Martin MJ, Magee GA, Moore LJ, Privette AR, Schellenberg M, Schuster KM, Weinberg JA, **Stein DM**. Adult emergency resuscitative thoracotomy: A Western Trauma Association clinical decisions algorithm. *J Trauma Acute Care Surg.* 2024 Oct 25. PMID: 39451159.
2. Ghneim MH, **Stein DM.** Age-related disparities in older adults in trauma. *Surgery*. 2024 Sep 23:S0039-6060(24)00674-3. Epub ahead of print. PMID: 39317516.
3. O'Hara NN, **Stein DM**, Haut ER, Breazeale S, Frey KP, Slobogean GP, Firoozabadi R, Castillo R, O'Toole RV. Venous thromboembolism prophylaxis prescribing patterns for patients with orthopedic trauma: a clinical vignette survey. *Trauma Surg Acute Care Open*. 2024 Sep 3;9(1):e001511. PMID: 39296601.
4. Kelley W, Zreik K, Gergen A, Williams J, Jacobson LE, Nahmias J, Tatar A, Murry J, Grigorian A, Ong A, **Stein DM**, Scalea TM, Lauerman MH. Early Pharmacologic Therapy in Patients With Blunt Cerebrovascular Injury and TBI: Is it Safe and Effective? An EAST Multicenter Study. *Am Surg*. 2024 Jun;90(6):1330-1337. PMID: 38253324.
5. Haac BE, O'Hara NN, Haut ER, Manson TT, Slobogean GP, O'Toole RV, **Stein DM**. Venous thromboembolism testing practices after orthopaedic trauma: prophylaxis regimen does not influence testing patterns. *OTA Int.* 2024 Apr 15;7(2):e331. PMID: 38623266.
6. Bulger EM, Bixby PJ, Price MA, Villarreal CL, Moreno AN, Herrera-Escobar JP, Bailey JA, Brasel KJ, Cooper ZR, Costantini TW, Gibran NS, Groner JI, Joseph BA, Newgard CD, **Stein DM**. An Executive Summary of the National Trauma Research Action Plan (NTRAP). *J Trauma Acute Care Surg.* 2024 Mar 25. PMID: 38523118.
7. Meizoso JP, Byrne J, Ho VP, Neal MD, **Stein DM**, Haut ER. Advanced and alternative research methods for the acute care surgeon scientist. *Trauma Surg Acute Care Open*. 2024 Feb 21;9(1):e001320. PMID: 38390469.
8. O'Hara NN, Frey KP, **Stein DM**, Levy JF, Slobogean GP, Castillo R, Firoozabadi R, Karunakar MA, Gary JL, Obremskey WT, Seymour RB, Cuschieri J, Mullins CD, O'Toole RV; METRC. Effect of Aspirin Versus Low-Molecular-Weight Heparin Thromboprophylaxis on Medication Satisfaction and Out-of-Pocket Costs: A Secondary Analysis of a Randomized Clinical Trial. *J Bone Joint Surg Am*. 2024 Feb 21. PMID: 38381842.
9. Appelbaum RD, Newcomb A, Joseph K, Hennessy M, Fortin P, Bixby PJ, Prentiss S, McConnell-Hill A, Flayter R, Price MA, Dicker R, Kozar R, Haut ER, **Stein DM**. Community of trauma care partnering with stakeholders to improve injury outcomes: focus group analysis. *Trauma Surg Acute Care Open*. 2024 Feb 8;9(1):e001274. PMID: 38347894.

Bogdan Stoica, MD

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Research Interests

The main focus of my research is to understand the molecular mechanisms of neuronal cell death and neuroinflammation after central nervous system trauma. My studies are based on the hypothesis that brain trauma initiates multiple maladaptive mechanisms (secondary injury) that lead to improper activation of neuronal cell death pathways and/or prevent efficient activation of neuronal repair mechanisms. Thus, neurons that receive a survivable injury are unnecessarily removed and/or fail to undergo effective repair/regeneration. An important driver of these changes is injury-induced dysregulation of microglia responses that shift the microglia post-injury reactive states toward specific persistent pro-inflammatory phenotypes resulting in secondary neurotoxicity.

Areas of special interest include: 1) the modulation of secondary injury mechanisms by microRNAs, a group of regulatory non-coding small RNA molecules following experimental traumatic brain injury (TBI); our recent data suggest that injury-induced changes in specific microRNAs are key to the activation of neuronal cell death pathways and ultimately to neuronal cell loss after TBI; and 2) the transcriptomic changes and their epigenetic underpinning that drive the molecular and cellular secondary injury processes.

By identifying the injury-induced molecular dysfunctions we can design optimal therapeutic approaches that will shift microglia activation toward neurorestorative phenotypes to increase neuronal survival and recovery after brain trauma, thus improving neurological deficits.

Recent Publications

1. Barrett JP, Aubrecht TG, Smith A, Vaida M, Henry RJ, Doran SJ, Faden AI, **Stoica BA**. Molecular Pathway Changes Associated with Different Post-Conditioning Exercise Interventions After Experimental TBI. *J Neurotrauma.* 2024 Aug 21. doi: 10.1089/neu.2024.0120; PMID: 39078326.
2. Henry RJ, Barrett JP, Vaida M, Khan NZ, Makarevich O, Ritzel RM, Faden AI, **Stoica BA.** Interaction of high-fat diet and brain trauma alters adipose tissue macrophages and brain microglia associated with exacerbated cognitive dysfunction. *J Neuroinflammation*. 2024 Apr 29;21(1):113.; PMID: 38685031.
3. Sabirzhanov B, Makarevich O, Barrett J, Jackson IL, Faden AI, **Stoica BA**. Down-Regulation of miR-23a-3p Mediates Irradiation-Induced Neuronal Apoptosis. *Int J Mol Sci.* 21(10). 2020 May 24;21(10):3695. PMID: 32456284.
4. Sabirzhanov B, Makarevich O, Barrett JP, Jackson IL, Glaser EP, Faden AI, **Stoica BA**. Irradiation-Induced Upregulation of miR-711 Inhibits DNA Repair and Promotes Neurodegeneration Pathways. *Int J Mol Sci.* 2020 Jul 23;21(15):5239. PMID: 32718090.
5. Makarevich O, Sabirzhanov B, Aubrecht TG, Glaser EP, Polster BM, Henry RJ, Faden AI, **Stoica BA**. Mithramycin selectively attenuates DNA-damage-induced neuronal cell death. *Cell Death Dis*. 2020 Jul 27;11(7):587. PMID: 32719328.

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Research Interests

I am a dual board-certified Emergency Medicine and Critical Care physician serving as an intensivist at the University of Maryland Shock Trauma Center, specifically in the Multi-Trauma Critical Care ICU and the Critical Care Resuscitation Unit. As an academic critical care physician, my expertise spans critical care, endovascular and extracorporeal resuscitation, informatics, and machine learning. My passion lies at the intersection of medicine, technology, and research, focusing on leveraging these fields to improve patient care. My research interests include cardiac arrest, trauma, therapeutic hypothermia, sepsis, and medical education.

Recent Publications

1. **Teeter W**, Neal MD, Brown JB, MacLeod JB, Vesselinov R, Kozar RA. TRAUMA-INDUCED COAGULOPATHY: PREVALENCE AND ASSOCIATION WITH MORTALITY PERSIST 20 YEARS LATER. *Shock*. 2024 Sep 1;62(3):380-385. PMID: 38920139.
2. Tran QK; Okolo R; Gum W; Faisal M; Gambhir V; Singh A; Gasparotti Z; Schrier C; Jindal G**; Teeter W** et al: Role of the Critical Care Resuscitation Unit in a Comprehensive Stroke Center: Operations for Mechanical Thrombectomy During the Pandemic. *West J Emerg Med.* 2024 Jul;25(4):548-556. PMID: 39028240.
3. Yang S, Galvagno S, Badjatia N, Stein D, **Teeter W**, Scalea T, Shackelford S, Fang R, Miller C, Hu P. A Novel Continuous Real-Time Vital Signs Viewer for Intensive Care Units: Design and Evaluation Study. *JMIR Hum Factors*. 2024 Jan 5:11:e46030. PMID: 38180791.
4. Sescleifer AM, Crane A; **Teeter W**, Scalea T, Twaddell WS, Alvarez-Casas J, Bhati C, Lominadze Z, Malik S, Maluf D et al: A Case Report of Rescue of Primary Nonfunction following Liver Transplant Using the Molecular Adsorbent Recirculating System (MARS). *Prog Transplant*. 2023 Dec;33(4):358-359. Epub 2023 Nov 9. PMID: 37941345.
5. Powell EK, Johnson GA, **Teeter W**, Mursch D, Broski J, Kolokythas C, Andersen KB, Gaasch S, Stein DM, Scalea TM, Galvagno SM. Actual versus expected survival with the use of the molecular adsorbent recirculating system (MARS) for acute liver failure. *CHEST Critical Care*. December 2023. 2(26):100041. doi: https://doi.org/10.1016/j.chstcc.2023.100041.

Samuel A. Tisherman, MD, FACS, FCCM

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Research Interests

My research has focused on the management of severe hemorrhagic shock and cardiac arrest, with a special interest in therapeutic hypothermia. Along with Drs. Peter Safar and Pat Kochanek, I have worked on the development of Emergency Preservation and Resuscitation (EPR), a novel approach to the management of the exsanguinating trauma patient utilizing hypothermia to "buy time" for resuscitative surgery. I am currently conducting a clinical trial of EPR at the RA Cowley Shock Trauma Center. I have also been a co-principal investigator on studies of surgeon and Army medic performance of trauma-related surgical procedures on cadavers.

Recent Publications

1. Yang JM, **Tisherman SA**, Leekha S, Smedley A, Kenaa B, King S, Wu C, Kim DJ, Dowling D, Baghdadi JD: What clinicians think about when they think about sepsis: Results from a survey across the University of Maryland Medical System. *Crit Care Explorations*. 2024 Dec 9;6(12):e1183. PMID: 39652432.
2. Pergakis MB, Ali AA, Chang WW, Neustein B, Albin C, Aysenne A, **Tisherman SA**, Morris NA. Smartphone Use in the Management of Neurological Emergencies: A Simulation-Based Study. *Neurocrit Care*. 2024 Dec;41(3):840-846. PMID: 38773041.
3. **Tisherman SA**, Brenner ML. Contemporary Adjuncts to Hemorrhage Control. *JAMA*. 2023 Nov 21;330(19):1849-1851. DOI: 10.1001/jama.2023.16135. PMID: 37824165.
4. Ali Y, Davis K, Chiu W, Cioffi W, Luchette F, **Tisherman S**, Spain D. Contributions of Surgical Critical Care Program Directors Society to the training of surgeons. *J Trauma Acute Care Surg*. 2023 Apr 1;94(4):e29-e32. PMID: 36577131.
5. Ferrada P, Cannon JW, Kozar RA, Bulger EM, Sugrue M, Napolitano LM, **Tisherman SA**, Coopersmith CM, Efron PA, Dries DJ, Dunn TB, Kaplan LJ. Surgical Science and the Evolution of Critical Care Medicine. *Crit Care Med.* 2023 Feb 1;51(2):182-211. PMID: 36661448.
6. Silverman H, Wilson T, **Tisherman S**, Kheirbek R, Mukherjee T, Tabatabai A, McQuillan K, Hausladen R, Davis-Gilbert M, Cho E, Bouchard K, Dove S, Landon J, Zimmer M: Ethical decision-making climate, moral distress, and intention to leave among ICU professionals in a tertiary academic hospital center. *BMC Med Ethics.* 2022 Apr 19;23(1):45. PMID: 35439950.
7. John PR, **Tisherman SA**, Truog RD: Do not resuscitate in the operating room: A misconstrued paradox? *J Amer Coll Surg.* 2022 May 1;234(5):953-957. PMID: 35426410.

Roumen Vesselinov, PhD

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Research Interests

My primary research interests lie in statistical methodology, data analysis, and predictive modeling. I am also passionate about Machine Learning (ML) and Artificial Intelligence (AI), with a specific focus on Classification and Regression Tree (CART) models and hybrid approaches that combine ML with Generalized Linear Models (GLM).

Recent Publications

1. Teeter W, Neal M, Brow J, MacLeod J, **Vesselinov R**, Kozar R, Trauma-Induced Coagulopathy: Prevalence and Association with Mortality Persists 20 Years Later. *Shock*. 2024 Sep 1;62(3):380-385. PMID: 38920139.
2. Anandalwar S, O'Meara L, **Vesselinov R**, et al., Warfarin, not Direct Oral Anticoagulants nor Antiplatelet Therapy, is Associated with Increased Bleeding Risk in Emergency General Surgery Patients: Implications in this New Era of Novel Anticoagulants, An EAST Multicenter Study. *Journal of Trauma and Acute Care Surgery*. 2024 Aug 1;97(2):225-232. PMID: 38595274.
3. Harfouche M, Ghneim M, Nezami N, **Vesselinov R**, Diaz J. Greater Cost without Greater Benefit: The need to refine transfer criteria for patients with severe acute pancreatitis. *Pancreatology*. 2023 Nov;23(7):784-788. doi: 10.1016/j.pan.2023.08.010. Epub 2023 Aug 30. PMID: 37696729.
4. Zeineddin A, Wu F, Dong, J-F, **Vesselinov R**, Neal M, Corash L, Pati S, Kozar R. Early Lyophilized Cryoprecipitate Enhances the ADAMTS13: VWF Ratio to Reduce Systemic Endotheliopathy and Lessen Lung Injury in a Mouse Polytrauma Hemorrhage Model: Lyophilized Cryoprecipitate Protects After Hemorrhage. *Journal of Trauma and Acute Care Surgery*. 2023 Aug 1;95(2S Suppl 1):S137-S143. Epub 2023 May 22. PMID: 37211640.

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Research Interests

My research interests include inflammatory mediated endotheliopathy and coagulopathy in critical illnesses. Coagulopathy is commonly described as impaired endogenous clotting ability with loss of localization and risk of intravascular thrombosis and bleeding, and greatly affects mortality in critically ill patients. My research has mainly focused on characterizing and describing intravascular coagulation dysfunction in the setting of systemic inflammation and endothelial injury, and the role of innate immune signaling. My goal is to increase our mechanistic understanding of the molecular triggers in systemic coagulopathy to provide a foundation for studying potential biomarkers and future therapeutic targets.

Recent Publications

1. **Williams, B**, Zou L, Pittet JF, and Chao W. Sepsis-Induced Coagulopathy: A Comprehensive Review of Pathophysiology, Diagnosis, and Management Strategies. *Anesth Analg*. 2024. Feb 7;138(4):696-711. PMID: 38324297.
2. **Williams, B**, Kozar, R, and Chao, W. Emerging Role of Extracellular RNA in Innate Immunity, Sepsis, and Trauma. *Shock*. 2023 Feb 1;59(2):190-199. PMID: 36730864.
3. Suen AO, Chen F, Wang S, Li Z, Zhu J, Yang Y, Conn O, Lopez K, Cui P, Wechsler L, Cross A, Fiskum G, Kozar R, Hu P, Miller C, Zou L, **Williams B** and Chao W. Extracellular RNA Sensing Mediates Inflammation and Organ Injury in a Murine Model of Polytrauma. *J Immunol.* 2023. Jun 15;210(12):1990-2000. PMID:37133342.
4. Lopez K, Suen A, Yang Y, Wang S, **Williams B**, Zhu J, Hu J, Fiskum G, Cross A, Kozar R, Miller C, Zou L, and Chao W. Hypobaria Exposure Worsens Cardiac Function and Endothelial Injury in an Animal Model of Polytrauma: Implications for Aeromedical Evacuation. *Shock*. 2021. Oct 21;1;56(4):601-610. PMID: 33394971.
5. **Williams B**, Neder J, Cui P, Suen A, Tanaka K, Zou L, Chao W. Toll-like receptor 2 and 7 mediate coagulation activation and coagulopathy in murine sepsis. *J. Thromb. Haemost*. 2019 Oct;17(10):1683-1693. PMID: 31211901.
6. **Williams B**, Henderson RS, Reformato VS, Pham T, Taylor BS, Tanaka KA. Hemostasis Management of Patients Undergoing Emergent Cardiac Surgery After Ticagrelor Loading. *J Cardiothorac Vasc Anesth*. 2020 Jan;34(1):168-174. PMID: 31375405.
7. **Williams B**, McNeil J, Crabbe A, and Tanaka KA. Practical Use of Thromboelastometry in the Management of Perioperative Coagulopathy and Bleeding. *Transfus Med Rev*. 2017. Jan;31(1):11-25. PMID: 27622549.

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Research Interests

My research interests focus on neuromodulation for diabetic and peripheral neuropathy, as well as the monitoring and detection of respiratory depression in the setting of opioid overdose.

Recent Publications

1. Wahezi S, Naeimi T, Caparo M, Emerick T, Choi H, Eshraghi Y, Anitescu M, Kiran P, Przkora R, **Wright T**, Moeschler S, Barad M, Rand S, Mooyeon O, Seidel B, Yener U, Alerte J, Shaparin N, Kaye A, Kohan L. Trainee Insight into Pain Fellowship Programs: A Critical Evaluation of the Current Educational System by the APPD. *Pain Physician* 2024 Jul;27(5):E627-E636. PMID: 39087976.
2. Wahezi SE, Emerick TD, Caparó M, Choi H, Eshraghi Y, Naeimi T, Kohan L, Anitescu M, **Wright T**, Przkora R, Patel K, Lamer TJ, Moeschler S, Yener U, Alerte J, Grandhe R, Bautista A, Spektor B, Noon K, Reddy R, Osuagwu UC, Carpenter A, Gerges FJ, Horn DB, Murphy CA, Kim C, Pritzlaff SG, Marshall C, Kirchen G, Oryhan C, Swaran Singh TS, Sayed D, Lubenow TR, Sehgal N, Argoff CE, Gulati A, Day MR, Shaparin N, Sibai N, Dua A, Barad M. The current state of training in pain medicine fellowships: An Association of Pain Program Directors (APPD) survey of program directors. *Pain Pract*. 2024 Mar 30. doi: 10.1111/papr.13373. PMID: 38553945.
3. Ahuja P, Ujjain S, Kukobat R, Urita K, Moriguchi I, Furuse A, Hatton Y, Fujimoto K, Rao G, Ge X, **Wright T**, Kaneko K. Air-permeable redox mediated transcutaneous CO2 sensor. *Chem Eng J.* 2023 Feb 1:457:141260. doi: 10.1016/j.cej.2022.141260. Epub 2022 Dec 31. PMID: 36620723.
4. Bedford T, Kisaalita N, Haycock NR, Mullins CD, **Wright T**, Curatolo M, Hamlin L, Colloca L. Attitudes Toward a Pre-authorized Concealed Opioid Taper: A Qualitative Analysis of Patient and Clinician Perspectives. *Front Psychiatry.* 2022 Mar 24:13:820357. PMID: 35401245.

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Research Interests

My research focuses on vascular leakage, a key factor in the pathogenesis of lung permeability in hemorrhage shock/sepsis. Syndecan-1, a protein backbone of the glycocalyx, plays a critical role in maintaining endothelial integrity. For the first time, we discovered that fibrinogen, a major plasma component, binds to heparan sulfate on syndecan-1/glycocalyx forming a gel-like layer that lines the endothelium and maintains vascular barrier. This gel-like layer shields the cleavage sites on syndecan-1/glycocalyx by MMP9, which otherwise cleaves syndecan-1/glycocalyx to cause lung vascular leakage in hemorrhage shock/sepsis.

Recent Publications

1. **Wu F**, Dorman B, Zeineddin A, Kozar RA. Fibrinogen inhibits metalloproteinase-9 activation and syndecan-1 cleavage to protect lung function in ApoE null mice after hemorrhagic shock. *J Surg Res*. 2023 Aug:288:208-214. PMID: 37023568.
2. **Wu F**, Wang JY, Dorman B, Zeineddin A, Kozar RA. c-Jun-mediated microRNA-19b expression induces endothelial barrier dysfunction in an in vitro model of hemorrhagic shock. *Molecular Medicine*. 2022 Oct 12;28(1):123. PMID: 36224531.
3. **Wu F**, Wang JY, Chao W, Sims C, Kozar RA. miR-19b targets pulmonary endothelial syndecan-1 following hemorrhagic shock. *Sci Rep.* 2020 Sep 25;10(1):15811. PMID: 32978505.
4. **Wu F**, Kozar RA. Fibrinogen protects against barrier dysfunction through maintaining cell surface syndecan-1 in vitro. *Shock*. 2019 Jun;51(6):740-744. PMID: 29905671.

Junfang Wu, BM, MS, PhD

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Research Interests

Dr. Wu's research program has concentrated on examining secondary injury processes following traumatic spinal cord/brain injury (SCI/TBI) and pharmacological/gene therapeutic interventions for SCI/TBI. Her lab is particularly interested in studying pathological mechanisms including disruption of autophagy and lysosomal pathway, microglial Hv1 channel, NOX2, extracellular vesicles (EVs), astrocytic TrkB.T1, and their contribution to neuroinflammation and neurodegeneration in both acute CNS trauma and aging conditions including chronic SCI/TBI and Alzheimer's disease and related dementia (AD/ADRD). Her goal is to understand the cellular and molecular mechanisms of functional recovery after CNS trauma and to develop potential therapeutic strategies. In addition, Dr. Wu's group works to better understand the pathogenesis of general anesthesia (GA)/post-operation affecting brain and systemically. Dr. Wu's research capitalizing on powerful cutting-edge technologies to address mechanistic questions on neurotrauma and GA is currently supported by several R01 level NIH programs.

Topics of Focus:

- The function and mechanisms of autophagy in SCI
- Inflammatory mechanisms underlying olfactory dysfunction in prognosis of TBI progression to dementia
- Mechanism of inflammatory related brain dysfunction after SCI
- Role of EVs after CNS Injury: Mechanisms and Modulation
- Mechanisms and intervention of GA-caused olfactory deficit and its progression to late cognitive impairment
- Targeting cGAS pathway improves functional recovery after CNS injury

Recent Publications

1. Lei Z, Krishnamachary B, Khan NZ, Ji Y, Li Y, Li H, Brunner K, Faden AI, Jones JW, **Wu J**. Spinal cord injury disrupts plasma extracellular vesicles cargoes leading to neuroinflammation in the brain and neurological dysfunction in aged male mice. *Brain, Behavior, and Immunity*. 2024 Aug, 120: 584-603. PMID: 38986724.
2. Ritzel RM, Li Y, Jiao Y, Doran SJ, Khan N, Henry RJ, Brunner K, Loane DJ, Faden AI, Szeto G, **Wu J**. Bi-directional neuro-immune dysfunction after chronic experimental brain injury. *Journal of Neuroinflammation*. 2024 Apr 5;21(1):83. PMID: 38581043.
3. Li Y, Khan N, Ritzel RM, Lei Z, Allen S, Faden AI, **Wu J**. Sexually dimorphic extracellular vesicle responses after chronic spinal cord injury are associated with neuroinflammation and neurodegeneration in the brain. *Journal of Neuroinflammation*. 2023, Aug 31;20(1):197. PMID: 37653491.
4. Liu X, Lei Z, Gilhooly D, He J, Li Y, Ritzel RM, Li H, Wu L-J, Liu S, **Wu J**. Traumatic brain injury-induced inflammatory changes in the olfactory bulb disrupt neuronal networks leading to olfactory dysfunction. *Brain, Behavior, and Immunity*. 2023 Nov:114:22-45. Epub 2023 Aug 7. PMID: 37557959.
5. Ritzel RM, Li Y, Jiao Y, Lei Z, Doran S, He J, Shahror RA, Henry RJ, Khan R, Tan C, Liu S, Stoica BA, Faden AI, Szeto G, Loane DJ, **Wu J**. Brain injury accelerates the onset of a reversible age-related microglial phenotype associated with inflammatory neurodegeneration. *Science Advances*. 2023 Mar 10;9(10): eadd1101. PMID: 36888713.

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Research Interests

My research interest is focused on large scale data analysis and medical sensor signal processing with a goal of developing an efficient machine learning algorithm, to predict lifesaving interventions and long-term outcomes for trauma patients.

Recent Publications

1. Podell J, **Yang S**, Miller S, Felix R, Tripathi H, Parikh G, Miller C, Chen H, Kuo Y, Lin C, Hu P, Badjatia N. Rapid prediction of secondary neurologic decline after traumatic brain injury: a data analytic approach. *Scientif Report*. 2023 Jan 9;13(1):403. PMID: 36624110.
2. **Yang S**, Galvagno S, Badjatita N, Stein D, Teeter W, Scalea T, Shackelford S, Fang R, Miller C, Hu P, VS viewer study group. A novel continuous Real-time vital signs viewer for intensive care units: design and evaluation study. *J. Medical Internet Research Human Factors*. 2024 Jan 5:11:e46030. PMID: 38180791.
3. Podell J, Pergakis M, **Yang S**, Felix R, Parikh G, Chen H, Chen L, Miller C, Hu P, Badjatia N. Leveraging continuous vital sign measurements for real-time assessment of autonomic nervous system dysfunction after brain injury: a narrative review of current and future applications. *Neurocritical Care*. 2022 Aug;37(Suppl 2):206-219. PMID: 35411542.
4. Zeineddin A, Hu P, **Yang S**, Floccare D, Lin CY, Scalea TM, Kozar RA. Prehospital continuous vital signs predict need for resuscitative endovascular balloon occlusion of the aorta and resuscitative thoracotomy prehospital continuous vital signs predict resuscitative endovascular balloon occlusion of the aorta. *Journal of Trauma and Acute Care Surgery.* 2021 Nov 1;91(5):798-802. PMID: 33797486.
5. **Yang S,** Mackenzie CF, Rock P, Lin C, Floccare D, Scalea T, Stumpf F, Winans C, Galvagno S, Miller C, Stein D. Comparison of massive and emergency transfusion prediction scoring systems after trauma with a new Bleeding Risk Index score applied in-flight. *Journal of Trauma and Acute Care Surgery*. 2021 Feb 1;90(2):268-73. PMID: 33502145.

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Research Interests

The research in Yuan lab (https://www.yuanlaboratory.com/) focuses on integrating molecular biology, bioengineering, and computational biology to investigate biological mechanisms within the lung vascular microenvironment, aiming to promote functional vascular homeostasis. There are two main research areas: 1) Leveraging multi-omics and molecular biology tools to delineate molecular mechanisms in the lung vascular microenvironment during homeostasis and diseases; 2) Incorporating decellularization/recellularization, bioreactors, multi-omics, iPSC, and microfluidics to develop vascular and alveolar tissue models for drug screening applications. Our recent work involved understanding the role of cell-cell and cell-matrix interactions in maintaining vascular homeostasis, with the ultimate goal of developing new therapeutic strategies for lung vascular diseases.

Recent Publications

1. Leiby KL, **Yuan Y**, Ng R, Raredon MSB, Adams TS, Baevova P, Greaney AM, Hirschi KK, Campbell SG, Kaminski N, Herzog EL, Niklason LE. In vitro engineering of the lung alveolus. *NPJ Regen Med*. 2023 Apr 28;8(1):22. doi: 10.1038/s41536-023-00295-2. PMID: 37117221.
2. **Yuan Y**. Clinical translation of engineered pulmonary vascular models. *Adv Exp Med Biol*. 2023:1413:273-288. doi: 10.1007/978-3-031-26625-6_14. PMID: 37195536.
3. Schupp JC, Adams TS, Raredon MSB, **Yuan Y**, Omote N, Poli S, Chioccioli M, Rose KA, Manning EP, Sauler M, Deluliis G, Ahangari F, Neumark N, Habermann AC, Gutierrez AJ, Bui LT, Lafyatis R, Pierce RW, Meyer KB, Nawijn MC, Teichmann SA, Banovich N, Kropski JA, Niklason LE, Pe'er D, Yan X, Homer R, Rosas IO, Kaminski N. Integrated single-cell atlas of endothelial cells of the human lung. *Circulation*. 2021 Jul 27;144(4):286-302. doi: 10.1161/CIRCULATIONAHA.120.052318. PMID: 34030460.
4. **Yuan Y**, Leiby KL, Greaney AM, Raredon MBS, Qian H, Schupp JC, Engler AJ, Baevova P, Adams TS, Kural MH, Wang J, Kural M, Wang J, Obata T, Yoder MC, Kaminski N, Niklason LE. A pulmonary vascular model from endothelialized whole organ scaffolds. *Front Bioeng Biotechnol***.** 2021 Nov 19:9:760309. doi: 10.3389/fbioe.2021.760309. eCollection 2021. PMID: 34869270.
5. **Yuan Y**, Khan S, Stewart DJ, Courtman DW. Engineering blood outgrowth endothelial cells to optimize endothelial nitric oxide synthase and extracellular matrix production for coating of blood contacting surfaces. *Acta Biomater*. 2020 Jun:109:109-120. doi: 10.1016/j.actbio.2020.04.016. Epub 2020 Apr 14. PMID: 32302726.

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Research Interests

My long-term research focuses on the role of innate immunity in inflammation and organ injuries associated with critical illnesses such as sepsis, shock, and trauma. Our recent findings have identified an increase in plasma cell-free RNA, including miRNAs, during sepsis and trauma. These extracellular RNAs (exRNAs) are released by host cells and their levels are closely correlated with the severity of sepsis. My research aims to test the hypothesis that ex-miRNAs play a critical role in the pathogenesis of acute lung injury and brain inflammation during polymicrobial sepsis. Additionally, we are also investigating whether exRNAs act as molecular drivers that activate innate immunity by modulating macrophage function, potentially contributing to trauma-induced inflammation and organ injury. To explore these mechanisms, we employ a range of complementary approaches, including genetically modified animal models, adoptive cell transfer, chimeric models, synthetic oligonucleotides, pharmacological inhibitors, receptor antagonists, and locked nucleic acid-modified anti-miRNA inhibitors. The research is supported by NIH R35GM124775 (PI), R01NS110567 (MPI).

Recent Publications

1. Park C, Lei Z, Li Y, Ren B, He J, Huang H, Chen F, Li H, Brunner K, Zhu J, Jay SM, Williams B, Chao W, Wu J, **Zou L**. Extracellular vesicles in sepsis plasma mediate neuronal inflammation in the brain through miRNAs and innate immune signaling. *J Neuroinflammation*. 2024 Oct 7;21(1):252. PMID: 39375720.
2. Suen AO, Chen F, Wang S, Li Z, Zhu J, Yang Y, Conn O, Lopez K, Cui P, Wechsler L, Cross A, Fiskum G, Kozar R, Hu P, Miller C, **Zou L**, Williams B, Chao W. Extracellular RNA Sensing Mediates Inflammation and Organ Injury in a Murine Model of Polytrauma. *J Immunol*. 2023 Jun 15;210(12):1990-2000. PMID: 37133342.
3. Huang H, Zhu J, Gu L, Hu J, Feng X, Huang W, Wang S, Yang Y, Cui P, Lin SH, Suen A, Shimada BK, Williams B, Kane MA, Ke Y, Zhang CO, Birukova AA, Birukov KG, Chao W, **Zou L**. TLR7 Mediates Acute Respiratory Distress Syndrome in Sepsis by Sensing Extracellular miR-146a. *Am J Respir Cell Mol Biol*. 2022 Sep;67(3):375-388. PMID: 35679261.
4. Wang S, Yang Y, Suen A, Zhu J, Williams B, Hu J, Chen F, Kozar R, Shen S, Li Z, Jeyaram A, Jay SM, **Zou L**, Chao W. Role of extracellular microRNA-146a-5p in host innate immunity and bacterial sepsis. *iScience.* 2021 Nov 13;24(12):103441. PMID: 34877498.
5. **Zou L**, He JY, Gu L, Shahror AR, Li Y, Cao T, Wang S, Zhu J, Huang H, Chen F, Fan X, Wu J, Chao W. Brain Innate Immune Response via miRNA-TLR7 Sensing in Polymicroblial sepsis. *Brain Behav Immun*. 2022 Feb:100:10-24. PMID: 34808293.
6. Jian W, Gu L, Williams B, Feng Y, Chao W, **Zou L**. Toll-like Receptor 7 Contributes to Inflammation, Organ Injury, and Mortality in Murine Sepsis. *Anesthesiology*. 2019 Jul;131(1):105-118. PMID: 31045897.