UNIVERSITY of MARYLAND
SCHOOL OF MEDICINE

Department of Anesthesiology

Research Faculty Profiles

2024 Edition

Baltimore, Maryland

Our Mission

To deliver state-of-the-art anesthesia services in perioperative care, pain management and critical care; educate students, residents, and fellows; be recognized for its contributions to the specialty of anesthesiology through education, research, and scholarly activities; and contribute to the success of the Medical School and Medical System.

Anesthesiology Research

Anesthesiology Research consists of more than twenty principal investigators and four main areas of NIH-funded research: 1) mechanisms and treatment of traumatic and ischemic brain and spinal cord injury, 2) sepsis and myocardial injury, 3) acute lung injury, and 4) critical-care outcomes research. Our Department of Defense-funded investigators lead programs in 1) aeromedical transport safety, 2) traumatic injury and resuscitation, 3) developing predictive clinical algorithms for life-saving interventions, and 4) education research.

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Anesthesiology Endowed Professor in Entrepreneurial Research
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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. The clinical studies involve a multi-disciplinary team with complementary expertise in multi-omics, bioinformatics, statistical modeling, machine-learning, animal models, and clinical investigation in several medical centers across the U.S.A.

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.

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.

Molly Goodfellow, PhD

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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.

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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.

Peter F. Hu, PhD

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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.

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

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.

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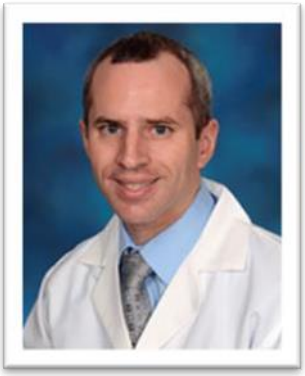
Research Interests

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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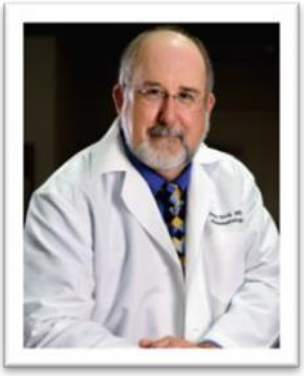
Research Interests

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 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.
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

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

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

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.