

Samuel X. Shi Ph.D.

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5258 Coleridge Ct, Carlsbad, CA, 92008, USA

EDUCATION

- 2012 – 2016 Case Western Reserve University
Cleveland, Ohio
Bachelor of Arts: Nutritional Biochemistry & Metabolism
Minors: Biology & Chemistry
Undergraduate Advisor: Lynn C. Kam Ph.D. M.B.A
- 2017 – 2018 University of Arizona College of Medicine – Phoenix
Phoenix, Arizona
Master of Science: Clinical Translational Sciences; *magna cum laude*
Mentor: Rayna J. Gonzales Ph.D.
- 2018 – 2020 Barrow Neurological Institute – Arizona State University
Phoenix, Arizona
Doctor of Philosophy: Neuroscience
Faculty Committee: Yung Chang M.D., Ph.D. (Chair)

EMPLOYMENT & APPOINTMENTS

- 2008 – 2012 Student Research Assistant. Timothy L. Vollmer M.D., Barrow Neurological Institute, St. Joseph's Hospital & Medical Center, Phoenix, AZ
- 2012 – 2014 Research Technician. Richard Ransohoff M.D., Center for Neuroinflammation, Lerner Research Institute, Cleveland Clinic, Cleveland, OH
- 2014 – 2016 Clinical Clerk/Observer. Deren Huang M.D. Ph.D., Neurology and Neuroscience Associates, Unity Health Network, Akron, OH
- 2014 – 2016 Teaching Assistant, Physiology & Physiology Lab (BIO2016). Susan Burden-Gulley Ph.D., The Department of Biology, Case Western Reserve University, Cleveland, OH
- 2016 – 2017 Graduate Student, Master of Science. Clinical Translational Sciences Program, University of Arizona College of Medicine – Phoenix, Phoenix, AZ. Graduate Advisor: Rayna J. Gonzales Ph.D.
- 2017 – 2020 Graduate Student, Doctor of Philosophy Candidate. Interdisciplinary Neuroscience Program, Barrow Neurological Institute & Arizona State University, Phoenix, AZ. Graduate Advisor: Qiang Liu M.D. Ph.D.
- 2020 Visiting Scholar, O'Connor Laboratory, Department of Neurology, Yale School of Medicine, New Haven, CT. Principal Investigator: Kevin O'Connor Ph.D.
- 2020 – Pres. Post-Doctoral Fellow, Wang Laboratory, Clinical Neuroscience Research Center, Dept. of Neurosurgery & Neurology, Tulane University School of Medicine, New Orleans, LA. Principal Investigator: Xiaoying Wang M.D., Ph.D.
- 2021 – 2023 Post-Doctoral Fellow, American Heart Association. Dallas, TX. AHA Awards Coordinator: Katherine Cruz, Katherine.cruz@heart.org, 214-706-1709.

SELECTED PEER-REVIEWED PUBLICATIONS (chronological order)

Full Bibliography: <https://scholar.google.com/citations?user=A5cPxxgEAAAAAJ&hl=en>

1. Shi SX, Shi K, Liu Q. Brain injury instructs cellular lineage destination in bone marrow. *Sci. Trans. Med.* (2021). In Press
2. Shi K, Zou M, Jia DM, Shi SX, Yang X, Liu Q, Dong J, Sheth KN, Wang X, Shi FD. tPA Mobilizes Immune Cells that Exacerbate Hemorrhagic Transformation in Stroke. *Circulation Res.* (2020). PMID: 33070717
3. Li Z, Li M, Shi SX, Yao N, ... Liu Q. Brain transforms natural killer cells that exacerbate brain edema after intracerebral hemorrhage. *J. Experimental Medicine* (2020). PMID: 32870258
4. Shi SX, Li Y, Shi K, Wood K, Ducruet AF, Liu Q. Interleukin-15 bridges astrocyte-microglia crosstalk and exacerbates brain injury following intracerebral hemorrhage. *Stroke* (2020). PMID: 32019481
5. Li YJ, Shi SX, Liu Q, ... Gonzales RJ. Targeted role for sphingosine-1-phosphate receptor 1 in cerebrovascular integrity and inflammation during acute ischemic stroke. *Neurosci Lett.* (2020). PMID: 32561451

6. Jin WN, **Shi SX**, Li M, Wood K, Gonzales RJ, and Liu Q. Depletion of microglia exacerbates post-ischemic inflammation and brain injury. *J. Cerebral Blood Flow & Metabolism* (2017). PMID: 28273719
7. Jin WN, Yang X, Li Z, Li M, **Shi SX**, Wood K, Liu Q, Fu Y, Han W, Xu Y, Liu Q. Non-invasive tracking of CD4+ T cells with a paramagnetic and fluorescent nanoparticle in brain ischemia. *J. Cerebral Blood Flow & Metabolism* (2016). PMID: 26661207
8. Jin W, Li Z, Li MS, **Shi SX**, Wood K, Liu QW, Fu Y, Han W, Xu Y, Liu Q. Non-invasive tracking of CD4+ T cells with a nanoparticle in brain ischemia. *J. Cerebral Blood Flow & Metabolism* (2015). PMID: 26661207
9. Liu L, Spangler C. L, Prager B, Benson B, **Shi SX**, Zhang CJ, Coteleur C. A, Ransohoff M. R. Spatiotemporal ablation of CXCR2 on oligodendrocyte lineage cells role in myelin repair. *Neurol Neuroimmunol Neuroinflamm.* (2015). PMID: 26668819

MANUSCRIPTS IN PREPARATION

1. **Shi SX**, Hernandez A, Nowak RJ, Yang X, Yuan M, Li Y, Zheng P, Shen Y, Li M, Hafler DA, O'Connor KC, Jin WN. Detection of autoantibodies in neurological diseases via tyramide signal amplification-based assay.
2. Li Z, Li Y, **Shi SX**, Ma H, Wang X, Zhu Z, Li M, Shi FD. Formyl peptide receptor 1 switches on inflammatory brain injury.

RESEARCH ACTIVITY

- The course of my graduate research activity and training has been focused on stroke immunology. I have established and been published using multiple clinically relevant experimental models of stroke in both acute ischemic stroke as well as intracerebral hemorrhage (ICH), notably, middle cerebral artery occlusion, autologous and collagenase models of rodent ICH, and photothrombotic ischemic stroke. Moreover, I have utilized to tissue and serum samples from human stroke patients of both subtypes.
- I have extensive experimental experience with immunological data acquisition and analysis. In the context of my current research investigating neuroimmune interactions in central nervous system (CNS) injury and repair, I have utilized novel approaches for sequential monitoring of infiltrating lymphocytes during brain ischemia using PET and MRI as well as using genetic approaches to manipulate the neurogenic signals received by lymphocytes after brain ischemia. I have extensively utilized flow cytometry in both animal and human samples to characterize immune cell count and phenotype and have used Nanostring genetic profiling to the same end.
- Editorial works: 1. Tocilizumab versus azathioprine in highly relapsing neuromyelitis optica spectrum disorder (TANGO): a multicenter, randomized, head-to-head comparison trial. *Lancet Neurology*, In Press
Neurovascular inflammation and complications of tissue plasminogen activator thrombolysis therapy in stroke. *Nature Reviews Neurology*, In Press

SUBMITTED/PUBLISHED ABSTRACTS & PRESENTATIONS

1. Shi SX, Liu Q, Gonzales RJ. Neuroprotective Effects of Dihydrotestosterone Following Ischemic Stroke in Male Mice. Arizona Physiological Society 9th Annual Meeting, Oct. 21-22, 2016. Graduate Student Presentations.
2. Shi SX, Liu Q, Gonzales RJ. Dihydrotestosterone Protects against Ischemia/Reperfusion in Adult Male Mice Involving Activation of Estrogen Receptor B. *Experimental Biology* 2017. Chicago IL, Apr. 22-26, 2017. APS Student Presentations.
3. Shi SX, Mohamed A, Shi K, Rodriguez J, Liu Q, Gonzales RJ. Differential Sphingosine-1-Phosphate Receptor 1 Expression in the Heart and Brain Following Transient Middle Cerebral Artery Occlusion in Mouse Model. *Experimental Biology* 2018. San Diego, CA. Apr. 20-25, 2018. Graduate Student Physiology Research Presentations.
4. Shi SX, Li Y, Shi K, Wood K, Ducruet AF, Liu Q. Interleukin-15 bridges astrocyte-microglia crosstalk and exacerbates brain injury following intracerebral hemorrhage. *Immunology* 2020. Honolulu, HI. May 8-12, 2020.
5. Shi SX, Shi K, Hendricks B, Liu Q, Ducruet AF. Brain injury instructs bone marrow cellular lineage destination that suppresses neuroinflammation. 6th Annual ABRC-Flinn Research Conference. Phoenix, AZ. Feb. 24, 2021. Grant Awardee Presentations.
6. Shi SX, Li Y, Shi K, Wood K, Ducruet AF, Liu Q. Astrocyte-Microglia Crosstalk Exacerbates Acute Brain Injury. 1st International Stroke Immunology Meeting. Munich, Germany. Mar. 1-3, 2021. Research Presentation.

RESEARCH SUPPORT

Margarito Chavez Student Award (\$5000.00)

PI: S. Shi

10/12/2018 – 10/12/2019

Sarver Heart Center, University of Arizona

Investigating the S1PR1 subtype to determine if expression profile in the endothelium of the brain following transient ischemia and reperfusion. We will also determine if sex differences exist in the expression of S1PR1 in brain endothelial cells under basal and ischemic conditions.

Completion Fellowship (\$10,500.00)

PI: S. Shi

8/20/2020 – 12/4/2020

School of Life Science, Arizona State University

The Completion Fellowship is a merit-based award to support degree completion of outstanding graduate students enrolled in one credit for their last semester or last year of a doctoral program. This is a competitive fellowship award, all applications are reviewed by faculty and selected based on the significance and impact of a students' research/work and strong support from the chair and department.

AHA Postdoctoral Fellowship (\$133,480)

PI: S. Shi

4/1/2021 – 3/31/2023

American Heart Association (Award #833696)

Two-year fellowship to support the proposed research proposal "T cells in neurovascular injury following intracerebral hemorrhage". To define the immune mechanisms associated with the development of PHE and neurovascular damage, we recently found abundant lymphocyte infiltration in brain sections from surgical specimens of peri-hematoma tissue from ICH patients. I aim to dissect the mechanisms by which T cells aggravates BBB disruption and neurovascular injury after ICH (Aim 1) and determine the impact of modulating T cells on long-term outcomes in ICH (Aim 2). In all, results from this study will significantly advance the understanding of the pathogenesis of PHE in ICH and delineate the contribution of the immune response to BBB disruption, neurovascular injury, and neurological outcomes. This will inform finding new avenues of targeted immunotherapeutic intervention in the currently untreatable critical medical conditions of neurovascular injury and ICH.

PROFESSIONAL MEMBERSHIPS

American Physiological Society: Member (Trainee) since 2017

American Heart Association: Member since 2018

American Association of Immunologists: Member (Trainee) since 2019

AWARDS & HONORS

2012 – 2016 University Scholarship Award, Case Western Reserve University

2012 – 2016 NCAA National Ranking (#17, 13, 8, 6) by year; CWRU Men's Tennis Team

2016 Dean's High Honors List, Case Western Reserve University

2017 CTS Graduate Program Travel Award, University of Arizona

2018 General Travel Award, American Physiological Society

2018 Margarito Chavez Student Award, Sarver Heart Center, University of Arizona

2018 Outstanding Mentor Award, Graduate and Professional Student Association, Arizona State University

2020 Completion Fellowship, Graduate College, Arizona State University

2021 – 2023 Postdoctoral Fellow, American Heart Association

VOLUNTEER & SERVICE

2014 – 2016 Instructor, Cleveland Inner City Tennis Clinic

2017 – 2018 Mentorship, Jasmin Lopez (Bioscience High School Student) & Sanna Rahman (ASU Undergraduate), Gonzales Laboratory, University of Arizona College of Medicine – Phoenix

2017 – 2018 Volunteer, Primary Prevention Mobile Health Unit, Univ. Arizona College of Public Health

2018 Counselor, Summer Scrubs Program, University of Arizona College of Medicine – Phoenix

2021 – Mentor, Samuel J. Vodovoz, Tulane University

REFERENCES

Xiaoying Wang M.D., Ph.D.

Professor, Dept. of Neurosurgery & Neurology. Program Director, Brain Injury Research, Clinical Neuroscience Research Center. Tulane University School of Medicine, New Orleans, LA

Tel: (504) 988-2646; Email: xwang51@tulane.edu

<https://medicine.tulane.edu/departments/clinical-neuroscience-research-tulane-center-aging-tips-mentor-neurosurgery-neurology>

Qiang Liu M.D., Ph.D.

Assistant Professor, Dept. of Neurobiology, Barrow Neurological Institute, Phoenix, AZ

Tel: (623) 399-0665; Email: Qiang.Liu@dignityhealth.org

<https://www.barrowneuro.org/research/research-programs/neurovascular-and-stroke/liu-laboratory/>

Rayna J. Gonzales Ph.D.

Tel: (949) 246-3810; Email: Rjgonzal@email.arizona.edu

Associate Professor, Dept. of Basic Medical Sciences, COM-PHX University of Arizona, Phoenix, AZ

<https://www.phoenixmed.arizona.edu/directory/gonzales-rayna>

Andrew F. Ducruet M.D., F.A.A.N.S., F.A.H.A.

Assistant Professor, Dept. of Neurosurgery, Barrow Neurological Institute, Phoenix, AZ

Assistant Director, Endovascular Neurosurgery, Barrow Brain & Spine, Phoenix, AZ

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<https://www.barrowneuro.org/research/research-programs/neurovascular-and-stroke/ducruet-laboratory/>