William H. Aisenberg, Ph.D.

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Research Interests

Neuroimmunology Microglia Extracellular Matrix Biomechanics Neurodegeneration

Research Experience

Postdoctoral Fellow - University of Pennsylvania 2021–Present
Advisor: F. Chris Bennett, M.D. — Psychiatry
Microglial states, interactions, and tissue remodeling that drive pathology in brain disease

- Discovered pathologic and therapeutic roles of brain macrophages in Krabbe disease through direct microglia replacement, integrating in vivo macrophage engraftment, spatial and single-cell molecular profiling, and neuropathologic analysis.
- Revealed complex interactions between microglia an blood-infiltrating macrophages, identifying how macrophages of multiple origins shape brain disease.
- Investigating how microglia remodel the extracellular matrix to influence tissue pathology and repair during neurodegenerative disease. To address this I integrate in vivo models with biomechanics tools, and proteomic approaches.

Graduate Student - Johns Hopkins School of Medicine 2014–2021
Advisor: Charlotte Sumner, M.D. — Neurology
Molecular regulation of TRPV4 channel function in inherited neuropathy

- Defined how ubiquitination regulates TRPV4 channel activity and neuropathy-associated gain-of-function phenotypes through biochemical, proteomic, and cell-based approaches, linking post-translational modification to cellular dysfunction in peripheral nerve disease.

Research Technician - Johns Hopkins School of Medicine 2012–2014
Advisor: Jennifer Pluznick, Ph.D. — Physiology
Olfactory receptor signaling in non-sensory tissues

- Characterized olfactory receptor signaling in airway smooth muscle cells and demonstrated functional effects on cytoskeletal remodeling and cellular proliferation.

Education

Ph.D., Cellular and Molecular Medicine 2021
Johns Hopkins School of Medicine

B.S., Biology 2012
University of Maryland, College Park

Publications

First Author

William H. Aisenberg, Carleigh A. O'Brien, Madison Sangster, Fazeela Yaqoob, Yuanchao Zhang, Brian Temsamrit, Searlait Thom, Luca Gosse, Sai Chaluvadi, Bilal Elfayomi, Gavin Lee, Vidhur Polam, Eli Levitt, Gary Liu, Sonia I. Lombroso, Kelsey M. Nemec, Gavin Clowry, Cassaundra Nieves, Priyanka Rawat, Emily Church, Daniel Martinez, Clarissa Shoffler, Daliya

Kancheva, Christopher Petucci, Deanne Taylor, Julia Kofler, Daniel Erskine, Kiavash Movahedi, Mariko L. Bennett , F. Chris Bennett. "Direct microglia replacement reveals pathologic and therapeutic contributions of brain macrophages to a monogenic neurological disease." *Immunity*. 2025.
(Commentaries in Trends in Immunology and Alzforum)

William H. Aisenberg, Brett. A. McCray, Jeremy M. Sullivan, Erika Diehl, Lauren R. DeVine, Jonathan Alevy, Anna M. Bagnell, Patrice Carr, Jack K. Donohue, Benedikt Goretzki, Robert N. Cole, Ute A. Hellmich, and Charlotte J. Sumner. "Multi-ubiquitination of TRPV4 reduces channel activity independent of surface localization." *Journal of Biological Chemistry*. 2022.

Co-First Author

Philip Hasel*, **William H. Aisenberg***, F. Christopher Bennett, and Shane A. Liddelow. "Molecular and metabolic heterogeneity of astrocytes and microglia." *Cell Metabolism*. 2023.

William H. Aisenberg*, Jessie Huang*, Wanqu Zhu, Premraj Rajkumar, Randy Cruz, Lakshmi Santhanam, Niranjana Natarajan, HwanMee Yong, Breanne De Santiago, Jung Jin Oh, A-Room Yoon, Reynold Panettieri, Oliver Homann, John Sullivan, Stephen Liggett, Jennifer Pluznick, and Steven An. "Defining an olfactory receptor function in airway smooth muscle cells." *Scientific Reports*. 2016.

Other Publications

Alexis K. Loder, Gage P. Kosmanopoulos, **William H. Aisenberg**, Eric Cox, Alexis R. Meeker, Seth Blackshaw, Rachelle Gaudet, Ute A. Hellmich, Brett A. McCray, Charlotte J. Sumner, Jeremy M. Sullivan. "Profiling the TRPV4 ankyrin repeat domain interactome and its disruption by neuromuscular disease-causing mutations." *Journal of Biological Chemistry*. 2025.

Sonia I. Lombroso, Emily I. Church, Ryan N. Anderson, Carleigh A. O'Brien, Y. Zhu , Asif A. Dar, Frederick S. Purnell, Eli M. Levitt, Brian Temsamrit, Fazeela Yaqoob, **William H. Aisenberg**, Mara Davis, Bilal Elfayoumi, Sai Chaluvadi, Kelsey M. Nemec, Jessie Axsom, Daniel A. Shapiro, Chet Huan Oon, Jean Paul Chadarevian, Charles-Antoine Assenmacher, Stefano De Arcangeli, Esha Banerjee, Sangeeta Shukla, Hayk Davtyan, Will Bailis, Christopher A. Hunter, Mathew Blurton-Jones, Mariko L. Bennett, Michael S. Haney, F. Chris Bennett. "Microglia replacement by peripheral delivery of CSF1R inhibitor-resistant hematopoietic cells." *Molecular Therapy*. 2025.

Kelsey M Nemec, Genevieve Uy, V Sai Chaluvadi, Freddy S Purnell, Bilal Elfayoumi, Carleigh A O'Brien, **William H. Aisenberg**, Sonia I Lombroso, Xinfeng Guo, Niklas Blank, Chet Huan Oon, Fazeela Yaqoob, Brian Temsamrit, Priyanka Rawat, Christoph A Thaiss, Qingde Wang, Mariko L Bennett, F Chris Bennett. " "Microglia replacement by ER-Hoxb8 conditionally immortalized macrophages provides insight into Aicardi-Goutières Syndrome neuropathology." *eLife*. 2025.

Jeremey M Sullivan, Anna M. Bagnell, Jonathan Alevy, Elvia Mena Avila, Ljubica Mihaljević, Pamela C. Saavedra-Rivera, Lingling Kong, Jennifer S. Huh, Brett A. McCray, **William H.**

Aisenberg, Amir R. Zuberi, Laurent Bogdanik, Cathleen M. Lutz, Zhaozhu Qui, Katharina A. Quinlan, Peter C. Searson, Charlotte J. Sumner. "Gain-of-Function Mutations of TRPV4 Acting in Endothelial Cells Drive Blood-CNS Barrier Breakdown and Motor Neuron Degeneration in Mice." *Science Translational Medicine*. 2024.

Jean Paul Chadarevian*, Sonia I Lombroso*, Graham C Peet, Jonathan Hasselmann, Christina Tu, Dave E Marzan, Joia Capocchi, Frederick Purnell, Kelsey Nemec, Alina Lahian, Adrian Escobar, Whitney England, Sai Chaluvadi, Carleigh O'Brien, Fazeela Yaqoob, **William H. Aisenberg**, Matias Porras Paniagua, Mariko Bennett, Robert Spitale, Hayk Davtyan, Mathew Blurton-Jones, F Chris Bennett. "Engineering an inhibitor resistant human CSF1R variant for microglia replacement." *Journal of Experimental Medicine*. 2022.

Laura Aisenberg, Kimberly Rosseau, Guido Massaccesi, **William H. Aisenberg**, Wensheng Luo, Kar Muthumani, David Weiner, Stephen Whitehead, Michael Chattergoon, Anna Durbin, and Andrea Cox. "Cross-reactive antibodies facilitate innate sensing of Dengue and Zika viruses." *JCI Insight*. 2022.

Brett McCray, Erika Diehl, Jeremy Sullivan, **William H. Aisenberg**, Nicholas Zaccor, Alexander Lau, Dominick Rich, Benedikt Goretzki, Ute Hellmich, Thomas Lloyd, and Charlotte Sumner. "Neuropathy-causing TRPV4 mutations disrupt TRPV4-RhoA interactions and impair neurite extension". *Nature Communications*. 2021.

Jeremy M. Sullivan, William W. Motley, Janel O. Johnson, **William H. Aisenberg**, Katherine L. Marshall, Katy E.S. Barwick, Lingling Kong, Jennifer S. Huh, Pamela C. Saavedra-Rivera, Meriel M. McEntagart, Marie-Helene Marion, Lucy A. Hicklin, Hamid Modarres, Emma L. Baple, Mohamed H. Farah, Aamir R. Zuberi, Cathleen M. Lutz, Rachelle Gaudet, Bryan J. Traynor, Andrew H. Crosby, and Charlotte J. Sumner. "Dominant mutations of the Notch ligand Jagged1 cause peripheral neuropathy". *Journal of Clinical Investigation*. 2020.

Brian Woolums, Brett McCray, Hyun Sung, Masashi Tabuchi, Jeremy Sullivan, Kendra Ruppell, Yunpang Yang, Catherine Mamah, **William H. Aisenberg**, Pamela Saavedra, Bryan Larin, Alexander Lau, Douglas Robinson, Yang Xiang, Mark Wu, Charlotte Sumner, and Thomas Lloyd (2020) "TRPV4 disrupts mitochondrial transport and causes axonal degeneration via a CaMKII-dependent elevation of intracellular Ca2+". *Nature Communications*. 2020.

Jeremy Sullivan, Christina Zimanyi, **William H. Aisenberg**, Breanne Bears, Dong-Hui Chen, John Day, Thomas Bird, Carly Siskind, RachelleGaudet, and Charlotte Sumner. "Novel mutations highlight the key role of the ankyrin repeat domain in TRPV4-mediated neuropathy." *Neurology Genetics*. 2015.

Premraj Rajkumar, **William H. Aisenberg**, Omar Acres, Ryan Protzko, and Jennifer Pluznick. "Identification and characterization of novel renal sensory receptors." *PloS one*. 2014.

Funding

- NIH K99/R00 Pathway to Independence Award NINDS K99NS150641 — start Aug. 2026
- Alavi-Dabiri Postdoctoral Fellowship — 2025–2026
- NIH F31 NRSA Predoctoral Fellowship NINDS: F31NS105404 — 2018–2020

Invited Talks

- Georgetown University Neuroscience Seminar Series — September 2026
  Title: "*Microglia and blood macrophages shape pathology and reveal therapeutic opportunities in a pediatric leukodystrophy*"
- Penn IRM mini-symposium on Fibrosis, Cell Matrix, and Regeneration — July 2026
  Title: "*Microglial remodeling of brain ECM in a pediatric leukodystrophy*"
- Oxford Instruments Webinar — May 2026
  Title: "*New Frontiers in Myeloid Therapy: High-Resolution Insights into Rescuing the Diseased Brain*"
- ACD Bio Seminar — May 2025
  Title: "*Direct microglia replacement reveals pathologic and therapeutic contributions of brain macrophages to a monogenic neurologic disease*"

Upcoming

- Yale University Molecular Psychiatry Advanced Postdoc Seminar — February 2027
  Title: "*Direct microglia replacement reveals pathologic and therapeutic contributions of brain macrophages to a monogenic neurologic disease*"

Selected Talks

- Institute of Regenerative Medicine Annual Symposium, UPenn - lightning talk — Oct. 2026
  Understanding Regeneration, Repair, and Fibrosis
- Glia in Health and Disease, Cold Spring Harbor — Aug. 2026
- Gliadelphia Spring Salon, Drexel University — May 2025
- Lifespan Brain Institute Seminar, University of Pennsylvania — May 2025
- Gliadelphia Fall Symposium, CHOP – short talk — Sept. 2024
- Neurodevelopmental Disabilities T32 Seminar Series — Sept. 2024
- Neurodevelopmental Disabilities T32 Seminar Series — Oct. 2023
- Philadelphia Macrophage Group — Feb. 2023
- Neurodevelopmental Disabilities T32 Seminar Series — Oct. 2022
- Peripheral Nerve Society Conference, Virtual – short talk — May 2021

Honors and Awards

Keystone Symposia Scholarship — 2025

Neural-Immune Interactions: A Systems-Wide Perspective on Whole Organism Physiology, Whistler, BC, Canada

Travel Award — 2016

Charcot-Marie-Tooth and Related Neuropathies Meeting, Venice, Italy

Poster Prizes

Gliadelphia Local Conference — Postdoc Poster Prize — 2024

Philadelphia, PA

CHOP Research Day — Laboratory-Based Research Poster — 2024

Philadelphia, PA

Gliadelphia Local Conference — Microglia-Focused Poster Prize — 2023

Philadelphia, PA

Richard P. Bunge Award, Charcot-Marie-Tooth & Related Neuropathies 2016
Venice, Italy

Teaching Experience

- Guest Lecturer, University of Pennsylvania 2026
  "Babysitters of the Brain: Glial Cells in Health and Disease" – undergraduate course
- Graduate Recitation Instructor, Johns Hopkins 2016
  "Pathways and Regulation" and "Molecular Biology and Genomics" – graduate courses
- Undergraduate Teaching Assistant, University of Maryland 2010–2011
  "Ecology and Evolution Lab" – undergraduate course

Mentorship

Research Associate - Fazeela Yaqoob, MS 2021-Present
Contributing author on one manuscript.

Graduate Student - Sai Chaluvadi 2022-Present
Contributing author on one manuscript.

Research Associate - Eli Levitt 2024-2026
Contributing author on one manuscript.
next position: Graduate Student UPenn NGG program

Graduate Rotation Student - Ilona Golynker Spring 2023
Provided mentorship and technical training in histology and myelin staining.
next position: Graduate Student Morris-Blanco Lab UPenn

MERIT Health Leadership Academy Summer Program - Pearl Dingzon Summer 2019
Mentored a high school student with technical training in cell culture, calcium imaging, and general introduction to lab science.
next position: Undergraduate Johns Hopkins University

High School Student - John Maragakis Summers 2017, 2018
Introduced high school student to biomedical research, cell culture, live cell calcium imaging, epxerimental design.
next position: Undergraduate Brown University

Service and Leadership

- Organizer and Moderator, ASMB E-Symposium 2026
  "ECM Dynamics in the Brain: Emerging Tools and Approaches"
- ad hoc reviewer 2026
  Developmental Neuroscience
- Alumni panelist CMM Graduate Program Annual Retreat 2026
  Baltimore, Maryland
- Grant Writing Workshop Panelist 2018–2020

Member Organizations

- Society for Neuroscience
- American Society for Matrix Biology