Elgin H. Akin

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Education

Johns Hopkins Bloomberg School of Public Health *Expected:* October 2026
PhD in Molecular Microbiology and Immunology

University of Tennessee, Knoxville May 2019
Bachelor of Science in Microbiology

Research Interests

My research integrates computational and experimental approaches to study RNA virus evolution, immune escape, and fitness at both in vitro and population scales. I am particularly interested in phylogenetics, antigenic characterization, and reverse genetics, with a primary focus on influenza viruses and broader interest in segmented RNA viruses with pandemic potential. I aim to develop computational tools that guide hypothesis-driven research and public health decisions concerning the evolutionary constraints on viruses.

Research Experience

Dr. Andy Pekosz Lab – Johns Hopkins Bloomberg School of Public Health
Department of Molecular Microbiology and Immunology
PhD Candidate August 2021-Present

Thesis Research: "Phenotypic consequences of Influenza B Virus Evolution"

- Integrated Influenza B surveillance genomic sequencing and phylogenetics to guide phenotypic characterization of clinical isolates
- Leveraged reverse genetic to map genomic determinants of antigenic drift and fitness
- Identified emergence of antigenically drifted reassortant influenza B strain, C.3.1/re, with implications for 2026–27 vaccine effectiveness and mapped escape to D197N.
- Established Victoria and Yamagata lineage-specific differences in epithelial cell tropism and host transcriptional responses using patient-derived primary nasal epithelial cells

Computational Tool Development

- Built and maintained Nextstrain pipelines for JH-zCEIRR influenza surveillance (www.github.com/Pekosz-Lab/nextstrain)
- Developed flusort and fludb tools for systematic selection of clinical isolates for phenotypic characterization based on genomic ancestry
- Designed reproducible serological data visualization pipelines deployed across multiple publications

Laboratory Infrastructure and Mentorship

- Mentored 7 trainees (5 ScM thesis students, 2 summer students) in wet and dry lab techniques across influenza A and B projects
- Established lab-wide data management ecosystem with standardized hierarchical organization for internal operations and reagent distribution to collaborating centers

Walter Reed Army Institute of Research - Silver Spring, Maryland September 2019
Genetics and Parasite Biology Malarial Biologics Branch
ORISE Fellow
Project: "Developing a Suite of Geographically and Genetically Diverse Human Malaria Parasite Strains to Enable Heterologous Controlled Human Malaria Infections (CHMI)"

- **Facilitated** implementation of the department's first high-performance computing platform for GWAS analysis.
- **Utilized** next generation sequencing for whole genome and amplicon-based genotyping and drug resistance profiles of *Plasmodium* field isolates from endemic regions.
- **Designed** and optimized SOPs for antigenic diversity of *Plasmodium falciparum* field isolates for detection vaccine and surveillance studies.
- **Supported** active clinical trial as diagnostic hub for malarial infections.
- **Maintained** routine cell-line culture of parasites for clonal selection and genome sequencing and growth inhibition experiments
- **Implemented** CRISPR/Cas9 editing protocols of *P. falciparum* SNP targets investigating PfCRT resistance to Chloroquine in CHMI.
- Worked routinely with clinicians, scientists, software engineers across multiple departments within a government-restricted environment.

University of Tennessee: Hansen Laboratory, Knoxville, TN May 2018
Department of Etymology and Plant Pathology
Undergraduate Laboratory Manager
Project: "Investigations into azoxystrobin fungicide sensitivity dynamics in the frogeye leaf spot *Cercospora nicotianae"*

- Investigated azoxystrobin resistance in *Cercospora nicotianae* by combining pathogen isolation, PCR-based identification, spore germination microscopy, and undergraduate laboratory training in microbiological, molecular, and phylogenetic techniques.

University of Tennessee: Su laboratory, Knoxville TN Jan. 2019
Department of Microbiology – Population Genetics, BSL-1
Laboratory Technician and Research Assistant

- Conducted molecular, serological, computational, and cell-culture research on *Toxoplasma gondii*, including GIS platform development, PCR-RFLP genotyping of 100+ isolates, phylogenetic analysis, tissue processing, and parasite propagation.

UT Institute of Agriculture: Stewart Laboratory, Knoxville, TN May 2017
Department of Plant Sciences – Synthetic biology, BSL-1
Undergraduate Research Assistant—Reggie Millwood

- Developed and maintained a molecular clone database, performed PCR-based screening of bacterial isolates, supported synthetic biology research workflows, and trained undergraduate researchers in molecular biology and laboratory operations.

UT Institute of Agriculture: Stewart Laboratory, Knoxville, TN May 2016
Department of Plant Sciences – Synthetic biology, BSL-1
Undergraduate Research Assistant

- Supported synthetic biology and plant biotechnology research through molecular cloning, vector construction, microbial and plant culture, fluorescence-based gene expression analysis, and statistical evaluation of experimental data in tobacco and soybean systems.

Workshops and Professional Training

- 2025 Workshop on Molecular Evolution – Marine Biological Laboratory Spring Class of 2025
- 2025 Antigenic Cartography workshop – Center of Excellence for Influenza Research and Response

Professional Affiliations

- 2022 – Present American Society for Virology
- 2022 – Present Johns Hopkins Center of Excellence for Influenza Research and Response, JH-CEIRR

Fellowship, awards and honors

- *Spring 2026 First Place Poster Prize – Vaccine Day. Johns Hopkins Bloomberg School of Public Health. Poster Title:* Recent Influenza B Viruses Escape prior immunity due to a mutation that masks key neutralizing antibody epitopes: Implications for Vaccine Effectiveness in 2026-27
- American Society for Virology Conference Travel Award 2026
- **T32 T32AI007417 Fellowship Grant** *July 2023 – July 2025*
- The A. Ralph and Sylvia E. Barr Fellowship in Vector Biology (2021, 2022, 2023)
- University of Tennessee Research IMPACT Independent Research Funding (2018)
- Tennessee HOPE Scholarship recipient (2015 – 2019)
- Eagle Scout Recipient (2015)

Publications Under Peer Review

[Preprint] **Akin, E**., Zhang, J., Villafuerte, D., Yunker, M., Werner, A. P., Swanson, N. J., Rothman, R. E., Fenstermacher, K. J., Mostafa, H., & Pekosz, A. (2025). *In-vitro characterization of 2019-24 Influenza B Viruses reveals increased temperature-dependent fitness in later timepoints independent of antigenic drift* (p. 2025.10.27.25338757). medRxiv. https://doi.org/10.1101/2025.10.27.25338757

Publications †indicates co-first authorship

Akin, E., Villafuerte, D. A., Werner, A. P., Pinsley, M., Fall, A., Abdullah, O., Norton, J. M., Rothman, R. E., Fenstermacher, K. Z. J., Gong, Y.-N., Klein, E., Mostafa, H. H., & Pekosz, A. (2026). *Emergence of an Antigenically Drifted and Reassorted Influenza B Virus at the end of the 2024-25 Influenza Season* (p. 2025.07.24.666632). bioRxiv. https://doi.org/10.1101/2025.07.24.666632 [*in press*, mBio]

Akin, E. †, Wilson, J. L. †, Zhou, R., Jedlicka, A., Dziedzic, A., Liu, H., Fenstermacher, K. Z. J., Rothman, R. E., & Pekosz, A. 2023. The Influenza B Virus Victoria and Yamagata Lineages Display Distinct Cell Tropism and Infection-Induced Host Gene Expression in Human Nasal Epithelial Cell Cultures. *Viruses*, *15*(9), 1956. https://doi.org/10.3390/v15091956

Werner AP, Schneider CG, **Akin EH**, Hayes J, Fenstermacher KZJ, Rothman RE, Coughlan L, Pekosz A. 2025. Low levels of influenza H5N1 HA and NA antibodies in the human population are boosted by seasonal H1N1 infection but not by H3N2 infection or influenza vaccination. mBio 16:e02145-25. https://doi.org/10.1128/mbio.02145-25

Villafuerte, D., Fall, A., **Akin, E.**, Werner, A. P., Pinsley, M., Vue, Y., Abdullah, O., Zhuang, T. X., Norton, J. M., Rothman, R. E., Fenstermacher, K. Z. J., Morris, C. P., Klein, E., Pekosz, A., & Mostafa, H. H. (2026). Genomic Evolution of Influenza A Virus During the 2024–2025 Season, the Johns Hopkins Health System: Antigenic Drift Reduces Serum Neutralization. *The Journal of Infectious Diseases*, jiag069. https://doi.org/10.1093/infdis/jiag069

Smith, J. E., Wang, K. J., Kennedy, E. M., Munday, J. C., Singer, L., Hakim, J. M. C., So, J., Beaver, A. K., Magesh, A., Gilligan-Steinberg, S. D., Zheng, J., Zhang, B., Moorthy, D. N., Brown, Z. E., **Akin, E. H**., Mwakibete, L., McCulloch, R., & Mugnier, M. R. (2026). DNA damage drives antigen diversification in Trypanosoma brucei. *Nature*, 1–10. https://doi.org/10.1038/s41586-026-10337-6

Creisher, P. S., Perry, J. L., Zhong, W., Lei, J., Mulka, K. R., Ryan, W. H., Zhou, R., **Akin, E. H**., Liu, A., Mitzner, W., Burd, I., Pekosz, A., & Klein, S. L. (2023). Adverse outcomes in SARS-CoV-2–infected pregnant mice are gestational age–dependent and resolve with antiviral treatment. *The Journal of Clinical Investigation*, *133*(20). https://doi.org/10.1172/JCI170687

Robben PM, **Akin EH**, Dunbar CR, Pichugin A, Regules JA. Late-presenting Plasmodium falciparum Malaria in a Non-Endemic Setting During COVID-19 Travel Restrictions. Mil Med. 2023 May 16;188(5-6):e1335-e1337. doi: 10.1093/milmed/usab393. PMID: 34557926; PMCID: PMC8500131.

Publications in preparation

Werner, A. **Akin,E…**Pekosz, A. 2026**.** Highly Pathogenic Avian Influenza (H5N1) Clade 2.3.4.4b exhibits enhanced replication at temperatures associated with the lower respiratory airway

Sachithanandham, J., **Akin, E**...Pekosz,A. 2026. Differential Live Virus Neutralization of Emerging SARS-CoV-2 Variants Following Vaccination or Natural Infection.

Akin, E., Kamau, E…Pichugin, A., 2026. “Down Selection of 4 Kenyan Plasmodium falciparum strains for Heterologous non-3D7 CHMI challenge”, Walter Reed Army Institute of Research, Malaria Biologics Branch, Silver Spring, MD.

Teaching Experience

2025-26 Guest Lecturer – Biology of the Next pandemic (260.603.01)
2024-24 Teaching Assistant and Guest Lecturer – (260.603.01)
2023-24 Teaching Assistant – Biology of the Next Pandemic (260.603.01)
2023-24 Teaching Assistant – Immunology, Infection and Disease (260.631.01)
2023-24 Teaching Assistant – Fundamentals of Immunology (550.603.81)
2022-23 Teaching Assistant – Biology of the Next Pandemic (260.603.01)

Co- and independent* Manuscript Reviews

Virology*
Journal of Virology
PNAS
Journal of Clinical Virology
Microbial Genomes
Frontiers
iScience

Presentations and Abstracts **Accomplished During PhD Work*

*2026 (Upcoming August) I **Poster and Flash Talk**. OPTIONS XIII Conference for the Control of Influenza: “Regional emergence and persistence of antigenically drifted and reassorted Influenza B Virus Lineages in 2024-26”

*2026 (Upcoming July) I **Poster and Flash Talk**. American Society of Virology Conference: “**Back to the Glycan!:** Emergence of an antigenically drifted and 4:4 reassorted Influenza B Virus in North America”

*2026 May I **Poster and Flash Talk**. Centers of Excellence for Influenza Research and Response (CEIRR): **Return of the Glycan:** Emergence of an antigenically drifted and 4:4 reassorted Influenza B Virus in North America – **Travel Award**

*2026 I **Poster**, Vaccine Day, Johns Hopkins Bloomberg School of Public Health: "Recent Influenza B Viruses Escape Prior Immunity Due to a Mutation That Masks Key Neutralizing Antibody Epitopes" — Best Poster Award

*2025 I **15 minute Talk.** American Society of Virology Conference: “No Drift? No Problem: *In vitro* characterization of 2023-24 Influenza B Viruses reveals increased temperature-dependent fitness in later timepoints independent of antigenic drift”

*2025 | **Poster and Flash Talk** Centers of Excellence for Influenza Research and Response (CEIRR): "*In vitro* fitness and antigenic characterization of diverging Influenza B viruses from the 2023-24 season in Baltimore, MD"

* 2024, **Poster** | American Society of Virology Conference Untangling the Lineage-Dependent Impact of Influenza B NS1 Antagonism in Human Nasal Epithelial Cells

* 2024,15 minute Talk. Centers of Excellence for Influenza Research and Response (CEIRR) Genotype to Phenotype: Leveraging real-time genomic surveillance for characterization of season influenza A and B viruses within JH-CEIRR.

* 2024,Poster | . Centers of Excellence for Influenza Research and Response (CEIRR) .*In vitro* fitness and antigenic characterization of diverging Influenza B viruses from the 2023-24 season in Baltimore, MD

* 2024, Poster. Vaccine Day, Johns Hopkins Bloomberg School of Public Health: **In-vitro Assessment of Antigenic Characteristics of Influenza B Viruses in Maryland During the 2023-2024 Season**

* 2023. Seminar Talk. Centers of Excellence for Influenza Research and Response (CEIRR). Title: **Distinct Transcriptional Landscapes of Influenza B are Independent of Viral Load in Infected Human Nasal Epithelial Cells**. Johns Hopkins Bloomberg School of Public Health. Baltimore, MD.

* 2023. Seminar Talk, American Society of Virology Conference. Title: **Distinct Transcriptional Landscapes of Influenza B are Independent of Viral Load in Infected Human Nasal Epithelial Cells.** Johns Hopkins Bloomberg School of Public Health. Athens, GA

* 2022. Poster. American Society of Virology Conference. Title: **Evolutionary Dynamics of Influenza B: Characterizing Lineage Determinants of Host Response at the Nasal Barrier.** Johns Hopkins Bloomberg School of Public Health. Madison. WI

* 2022. Flash Talk. Centers of Excellence for Influenza Research and Response (CEIRR) Annual Meeting. Title: **Evolutionary Dynamics of Influenza B: Characterizing Lineage Determinants of Host Response at the Nasal Barrier.** Johns Hopkins Bloomberg School of Public Health. Memphis, TN

* 2022 Poster: Centers of Excellence for Influenza Research and Response (CEIRR) Annual Meeting **Title: Evolutionary Dynamics of Influenza B: Characterizing Lineage Determinants of Host Response at the Nasal Barrier.** Johns Hopkins Bloomberg School of Public Health. Memphis, TN

Akin E., 2020. Department Seminar. Drug Resistance Mechanisms in P. falciparum: Chloroquine and other 4-aminoquinalones and to how diminish it through CRISPR/Cas9 mediated mutagenesis. Malaria Biologics Branch. Silver Spring, MD

Akin E., 2020. Department Presentation. Whole genome analysis of down-selected parasites against recorded Pf3K database genotypes. Malaria Biologics Branch. Silver Spring, MD

Akin E., 2020. Department Presentation. Targeted Analysis of Circumsporozoite Protein in *Plasmodium ovale* subspecies reveal novel haplotypes of central repeat region. Malaria Biologics Branch. Silver Spring, MD

Akin E., 2020. Department Presentation. Application of machine learning in estimating genetic relatedness in Plasmodium field isolates. Malaria Biologics Branch. Silver Spring, MD

Akin E., 2020. Department Presentation. Down selection of Kenyan Plasmodium falciparum field strains using microsatellite and targeted sequencing analysis for heterologous CHMI. Malaria Biologics Branch. Silver Spring, MD

Akin E., 2019. Keystone Presentation. Continued investigations into azoxystrobin fungicide sensitivity dynamics in the frogeye leaf spot pathogen, Undergraduate Research and Creative Achievement. Knoxville, TN

Akin et. al, 2018. The Q-System: A New Technology to Regulate Transgene Expression in Plants. Abstract.

Akin, E., 2018. The Q system: A new transcriptional technology to regulate gene expression in plants. The Exhibition of Undergraduate Research and Creative Achievement. Knoxville, TN

Akin, E., 2018. The Q system: A new transcriptional technology to regulate gene expression in plants. Annual Student Conference of current College of Agriculture and Natural Science work. Knoxville, TN

Akin, E., 2017. The Q system: A protein- based transcriptional regulation module for gene expression in plants. College of Agriculture and Natural Science Alpha Gamma Rho Honors Society Induction. Knoxville, TN.

Volunteer and Leadership Experience

UT Crew Club – Knoxville, TN Aug. 2015 - May 2018
Secretary

- Utilized Excel skills to track volunteer hours, organization
- Designed core training programs for both the novice and varsity teams

East Tennessee Children's Hospital – Knoxville, TN Aug. 2017 - May2019
Emergency Department Volunteer

- Accumulated over 100 hours of volunteer work assisting clinicians through

Ask a Scientist
STEAM Community engagement Jan 2018 - Jan 2019

Microbiology Undergraduate Club Aug 2016 - May 2019 Microbiology journal and education outreach club

Volunteer Experience

- Logged over 100+ total service hours in and around the Knoxville community over the course of four years
- Achieved recognition from the University of Tennessee Center for Leadership and Service for participation in more than 100 hours of volunteer service

Leadership Experience

2018 **Writer** - Ask A Scientist, The University of Tennessee - Knoxville 2018 - current
2018 **Photography Media Manager** - Imagine UT, The University of Tennessee – Knoxville, 2018
2018 **Secretary** - Microbiology Undergraduate. Club - The University of Tennessee – Knoxville, 2018
2018 **Ambassador** – The Division of Biology, The University of Tennessee
2016 **TEDxUTK** – Logistics Team Leader – University of Tennessee, 2016-2018
2016 **Secretary** - Tennessee Crew Club - Knoxville, 2016-2017 term.

References

Dr. Andy Pekosz, PhD
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