

# Elgin H. Akin

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## Personal Summary

I am a published molecular virologist with experience investigating respiratory pathogen kinetics and evolution to investigate the arms-race between viruses and the nasal mucosal barrier immune system. At current, I am a 3<sup>rd</sup> year PhD Candidate at the Johns Hopkins Bloomberg School of Public Health within the Department of Molecular Microbiology and Immunology under the supervision of [Dr. Andy Pekosz](#). Leveraging my graduate studies, I will continue to contribute computational tools and robust evidence to the field of virology in the field of government and/or industry.

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## Education

**Johns Hopkins Bloomberg School of Public Health**  
*PhD in Molecular Microbiology and Immunology (In progress)*

*Sept. 2021 – Current*

**University of Tennessee, Knoxville**  
*Bachelor of Science in Microbiology*

*August 2015 - May 2019*

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## Awards and Fellowships

**Johns Hopkins T32 Grant Recipient**

Johns Hopkins University – Department of Molecular Microbiology and Immunology

*July 2023 – July 2025*

**Oak Ridge Institute for Science and Education (ORISE) Fellowship**

Walter Reed Army Institute of Research, Silver Spring, MD

*Sept. 2019 – Aug. 2021*

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## Certifications

Coursera – Genomic Data Science Specialization through Johns Hopkins

Coursera – R Specialization

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## Computational Expertise

- Development of software such as [pyFLUte](#) for streamlining at-scale influenza genomic surveillance.
- Molecular clock modeling of viral, parasitic and bacterial genomic evolution.
- Strong background in R, Python, Perl, Java, JavaScript and Linux-based tools.
- Implementation of bioinformatic pipelines within UNIX environments.
- Competent with MiSeq, HiSeq, and ONT library preparation/QC, data generation and variant analysis pipelines
- Proficient streamlined data cleaning using R and Python tools.
- Proficient in advanced Bulk and scRNAseq analysis using R and Python-based tools.
- Interactive geospatial modeling of infectious disease data
- Efficient with large *-omics* data visualization

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## Wet lab Expertise

- Patient-derived Air-Liquid Interface (ALI) Epithelial Cell Culture Expansion and Differentiation
- Transgenic stem cell product development through lentiviral transduction systems for ALI culture systems
- Reverse Genetics of Orthomyxoviruses (Influenza B)
- Flow Cytometry – **FACS Caliber, LSR II, MacsQuant and BD Symphony Systems**
- Luminex Multiplex Serology Analysis (Magpix Platforms)
- Cell/tissue culture for: microbial, mammalian, and parasitic cell lines using aseptic technique
- Protein Extraction, isolation, Western Blotting.
- Serology: ELISA and agglutination testing in various parasite models
- PCR, PCR-RFLP, Multiplex PCR, qPCR, qRT-PCR, and HRM for pathogen detection, quantification, and genotyping
- Multi-Dye Flow Cytometry – on MACS Quant systems
- Cloning: Gibson Assembly, Restriction Digest, TOPO, Golden Gate
- CRISPR Library Screening in MMEJ repair systems
- Antibiotic and Fungicide Sensitivity Testing
- BL-1 and BL-2 Certifications relevant to cell culture and gene editing of blood borne pathogens.
- Environmental ATP Testing/quantitative analysis

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## Grants and Awards

- Fall 2023: The A. Ralph and Sylvia E. Barr Fellowship in Vector Biology
- Fall 2022: The A. Ralph and Sylvia E. Barr Fellowship in Vector Biology
- Fall 2021: The A. Ralph and Sylvia E. Barr Fellowship in Vector Biology
- Summer 2018: University of Tennessee Research IMPACT Independent Research Funding
- 2015 – 2019: Tennessee HOPE Scholarship recipient
- Summer 2015: Eagle Scout Recipient

## Research Experience

### Dr. Andy Pekosz Lab – Johns Hopkins Bloomberg School of Medicine

PhD Candidate

August 2021-Present

Thesis Project: “The Evolutionary Dynamics of Influenza B at the Nasal Barrier”

- Team lead on Influenza B surveillance, genome and phenotypic characterization
- Development of novel transgenic primary cell cultures derived for respiratory virus characterization
- Rescue of isogenic influenza B viruses for targeted genomic determinants of viral and host phenotypes.
- Development of bioinformatic and database pipelines for Johns Hopkins Hospital collaborative seasonal influenza A and B surveillance.

### Walter Reed Army Institute of Research - Silver Spring, Maryland Genetics and Parasite Biology Malarial Biologics Branch

September 2019 – August 2021

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 various experiments
- **Implemented** CRISPR/Cas9 editing protocols of *P. falciparum* SNP targets investigating PfCRT resistance to Chloroquine in CHMI workflows.
- Worked routinely with clinicians, scientists, software engineers across multiple departments within a government-restricted environment.

### University of Tennessee: Hansen Laboratory, Knoxville, TN Department of Etymology and Plant Pathology

May 2018 – July 2019

Undergraduate Laboratory Manager

Project: “Investigations into azoxystrobin fungicide sensitivity dynamics in the frogeye leaf spot *Cercospora nicotianae*”

- **Fungal Cell Culture** – Isolated unknown plant pathogens on selective or nutrient rich media in a BSL-1 setting
- **Molecular Biology** - Performed various methods of PCR to identify unknown plant pathogens in fungal and bacterial species
- **Fungicide Resistance** – Investigated the level of azoxystrobin fungicide sensitivity of *Cercospora nicotianae* through spore germination microscopy
- Assisted in training for 1 graduate and 2 undergraduate students in basic laboratory techniques: pathogen isolation, sterile technique, PCR, Media Preparation, basic bioinformatics, and agricultural extension protocols.

### University of Tennessee: Su laboratory, Knoxville TN Department of Microbiology – Population Genetics, BSL-1

Jan. 2019 – May 2019

Laboratory Technician and Research Assistant

- **Developed** a computational GIS-based application for spatial tracking of documented *T. gondii* genotypes (<https://myutk.maps.arcgis.com/apps/webappviewer/index.html?id=032057aa0bc84cbcaa2c8e18c6fd58c8>)
- **Delivered** a step-by-step protocol for data entry and computational utilization of WebGIS platform.
- **Parasite Cell Culture** – Isolated DNA from muscle, brain, liver and spleens of *T. gondii* infected mammals to be screened for antibody titers.
- **Prepared** – Mammalian muscle and brain tissue for antigen testing and microscopy.
- **Parasite Propagation** – Cultured and Managed *T. gondii* cell lines in select human fibroblast and liver cells.
- **Serotyping** – Performed serological testing on mammalian tissue samples via MAT immunological testing.
- **Molecular Biology** – Utilized PCR-RFLP to target and characterized over 100+ unique *T. gondii* genotypes.
- **Computational Biology** – Compiled sequences and curated phylogenetic trees for genomic characterization of *T. gondii*.

### UT Institute of Agriculture: Stewart Laboratory, Knoxville, TN Department of Plant Sciences – Synthetic biology, BSL-1

May 2017- Aug 2017

Undergraduate Research Assistant Advisor—Reggie Millwood

- **Develop** - A database for molecular clones by Stewart Lab scientists utilizing Microsoft Excel and Access
- **Performed** - PCR-based screening on bacterial clone isolates and software debugging for database development.
- **Shadowed** - Postdoctoral and Graduate staff working on crop genetics, chloroplast engineering, and CRISPR/Cas platforms.
- **Trained and Assisted** -several undergraduate students in molecular techniques and general laboratory maintenance.

### UT Institute of Agriculture: Stewart Laboratory, Knoxville, TN Department of Plant Sciences – Synthetic biology, BSL-1

May 2016 - Aug. 2018

Undergraduate Research Assistant

- **Bacterial Cell Culture** – Responsible for plate and liquid cultures of vector-carrying isolates in LB and YEP media.
- **Explored** - novel methods of protein-induced transcriptional regulation in *Nicotiana tabacum* through targeted genomic techniques utilizing *Agrobacterium tumefaciens*.
- **Fluorescent/ UV Microscopy**— Utilization of fluorescent protein spectroscopy technology for gene dosage, detection, and translational quantification.
- **Bacterial Vector Construction** – Utilized TOPO and Gibson assembly techniques to construct vectors appropriate for JM109 and EHA 105 strains of *E. coli* and *A. tumefaciens* respectively. Primarily worked with GFP/ RFP combination reporters for translation efficiency screening.
- **Molecular Cloning** —Utilizing type II restriction enzymes in order to test fluorescent markers, stress inducible promoters, and synthetic protein inducible promoter in plant systems.
- **Statistical Analysis** — Utilization of R and SAS platforms for analysis of experimental data.
- **Plant Horticulture** — In tobacco and soybean model systems.

## Volunteer and Leadership Experience

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### 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 – May 2019

#### 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

journal and education outreach club

Aug 2016 – May 2019 Microbiology

## Volunteer Experience

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- 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

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- 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.

## Publications \*co-first authored work

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\*Akin E, \*Wilson JL, Zhou R, Jedlicka A, Dziedzic A, Liu H, Fenstermacher KZ, Rothman R, Pekosz A. The Influenza B Virus Victoria and Yamagata Lineages Display Distinct Cell Tropism and Infection Induced Host Gene Expression in Human Nasal Epithelial Cell Cultures. *bioRxiv* [Preprint]. 2023 Aug 4:2023.08.04.551980. doi: 10.1101/2023.08.04.551980. PMID: 37577630; PMCID: PMC10418153.

Creisher PS, Perry JL, Zhong W, Lei J, Mulka KR, Ryan H, Zhou R, **Akin EH**, Liu A, Mitzner W, Burd I, Pekosz A, Klein SL. Adverse outcomes in SARS-CoV-2 infected pregnant mice are gestational age-dependent and resolve with antiviral treatment. *bioRxiv* [Preprint]. 2023 Mar 23:2023.03.23.533961. doi: 10.1101/2023.03.23.533961. PMID: 36993658; PMCID: PMC10055386.

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.

(expected) **Akin, E.**, Kamau, E. Pichugin, A. et al., 2024 “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.

## Presentations and Abstracts \*Accomplished During PhD Work

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\*Akin E, 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.

\*Akin E, 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

\*Akin E., 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

\*Akin E., 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

- \*Akin E., 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 Talk. Drug Resistance Mechanisms in *P. falciparum*: Chloroquine and other 4-aminoquinolones 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 frog-eye 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.