

**Hannah W. Miller, Ph.D.**

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## Education

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**Ph.D. IMMUNOLOGY • University of California, Davis • Davis, California • September 2015 – December 2021**

Degree conferred: March 18, 2022

- Designated Emphasis: Host-Microbe Interactions
- Dissertation: Defining the Role of Trophocytosis in Complement Evasion by *Entamoeba histolytica* and Tools for Future Study
- Advisor: Dr. Katherine S. Ralston

**B.A. BIOLOGY • Goshen College • Goshen, Indiana • August 2006 – May 2010**

Degree conferred: August 26, 2010

- Minor: Environmental Science

## Research Experience

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**POSTDOCTORAL SCHOLAR • University of California, Davis & California Department of Water Resources • Davis, CA & West**

Sacramento, CA • April 2024 – Present

Principal Investigators: Dr. Andrea Schreier & Dr. Melinda Baerwald

- Developing a multiplexed SHERLOCK genetic assay for rapid detection of Central Valley Chinook salmon migration phenotypes.

**RESEARCH SCIENTIST I • California Department of Fish and Wildlife • Sacramento, CA • May 2022 – March 2024**

Principal Investigators: Dr. Bryan Barney & Dr. Jeff Rodzen

- Developed and optimized qPCR assays for detection of native fish species from environmental DNA.
- Collected and filtered water samples for isolation of environmental DNA.
- Collaborated as part of a team working on projects related to genetic management of native fish species.

**GRADUATE STUDENT RESEARCHER • University of California, Davis • Davis, CA • April 2016 – December 2021**

Principal Investigator: Dr. Katherine Ralston

- Independently designed, performed, and analyzed experiments for dissertation research on immune evasion in *E. histolytica*.
- Shared scientific findings by preparing manuscripts for publication and presenting data at meetings and conferences.
- Utilized genetic manipulation of cell lines and immunofluorescence assays to test hypotheses.
- Mentored undergraduate student researchers working in the laboratory.

**GRADUATE STUDENT RESEARCH ROTATIONS • University of California, Davis • Davis, CA • October 2015 – March 2016**

- Completed short, defined research projects in several graduate group laboratories.
- Learned about different model organisms and was exposed to a variety of research techniques.

**RESEARCH TECHNICIAN • Fred Hutchinson Cancer Research Center • Seattle, WA • October 2012 – July 2015**

Principal Investigator: Dr. Martin Prlic

- Safely conducted work in a Biosafety Level 2/3 facility with SHIV-infected non-human primate samples.
- Studied T cell activation in multiple contexts; independently performed experiments and analyzed data.

- Managed an independent research project as well as contributed to the research of others.
- Coordinated with multiple collaborators.

**LABORATORY VOLUNTEER • UW Medicine & Seattle Children's Research Institute • Seattle, WA • February – October 2012**  
Principal Investigators: Dr. Qinghua Feng (UW) & Dr. Lakshmi Rajagopal (SCRI)

- Volunteered part time in two separate medical research laboratories and gained experience in microbiology techniques.

**UNDERGRADUATE STUDENT RESEARCH • Goshen College • Goshen, IN • October 2009 – April 2010**

Advisors: Dr. Ryan Sensenig & Jody Saylor, M.S.

- Carried out an undergraduate research project on the growth rate of chlorella algae under the mentorship of Biology Department faculty members.

## Teaching and Mentoring Experience

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**TEACHING ASSISTANT • University of California, Davis • Davis, CA • April 2019 – June 2019**

Instructor on Record: Dr. Smita Iyer

- PMI 127: Medical Microbiology
- Graded quizzes, the midterm, and the final.
- Facilitated in-class discussions, answered questions, and held weekly office hours.

**UNDERGRADUATE MENTORSHIP • University of California, Davis • Davis, CA • August 2016 – October 2021**

Principal Investigator: Dr. Katherine Ralston

- Mentored 3 undergraduate students in the laboratory as a graduate student researcher (names have been omitted for privacy).
- Trained students in laboratory techniques and advised them on undergraduate research projects.
- Mentored student research resulted in 1 co-authorship on a peer reviewed publication and was included in 3 dissertation chapters.

## Publications

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- **Miller, H. W.**, Tam, T.S.Y., Ralston, K. S. Entamoeba histolytica Develops Resistance to Complement Deposition and Lysis After Acquisition of Human Complement Regulatory Proteins through Trophocytosis. *mBio*. **2022**, e0316321. <https://doi.org/10.1128/mbio.03163-21>.
- Bettadapur A, Hunter SS, Suleiman RL, Ruyechan MC, Huang W, Barbieri CG, **Miller HW**, Tam TSY, Settles ML, Ralston KS. Establishment of Quantitative RNAi-Based Forward Genetics in Entamoeba histolytica and Identification of Genes Required for Growth. *PLoS Pathog*. **2021**, 29;17(11):e1010088. <https://doi.org/10.1371/journal.ppat.1010088>.
- Bettadapur, A.\*; **Miller, H. W.\***; Ralston, K. S. Biting off What Can Be Chewed: Trophocytosis in Health, Infection and Disease. *Infect. Immun*. **2020**, 88(7). <https://doi.org/10.1128/IAI.00930-19>. (\*Akhila Bettadapur and Hannah W. Miller contributed equally to this work. Author order is alphabetical.) – **Journal Cover**
- **Miller, H. W.**; Suleiman, R. L.; Ralston, K. S. Trophocytosis by Entamoeba histolytica Mediates Acquisition and Display of Human Cell Membrane Proteins and Evasion of Lysis by Human Serum. *mBio*. **2019**, 10 (2), e00930-19. <https://doi.org/10.1128/mBio.00068-19>.
- Mpina, M.; Maurice, N. J.; Yajima, M.; Slichter, C. K.; **Miller, H. W.**; Dutta, M.; McElrath, M. J.; Stuart, K. D.; De Rosa, S. C.; McNevin, J. P.; Linsley, P. S.; Abdulla, S.; Tanner, M.; Hoffman, S. L.; Gottardo, R.; Daubenberger, C. A.; Prlic, M. Controlled Human Malaria Infection Leads to Long-Lasting Changes in Innate and Innate-like Lymphocyte Populations. *J. Immunol*. **2017**, 199 (1), 107–118. <https://doi.org/10.4049/jimmunol.1601989>.

- Lovelace, E. S.; Maurice, N. J.; **Miller, H. W.**; Slichter, C. K.; Harrington, R.; Magaret, A.; Prlic, M.; De Rosa, S.; Polyak, S. J. Silymarin Suppresses Basal and Stimulus-Induced Activation, Exhaustion, Differentiation, and Inflammatory Markers in Primary Human Immune Cells. *PLoS ONE* **2017**, *12* (2), e0171139. <https://doi.org/10.1371/journal.pone.0171139>.
- Slichter, C. K.; McDavid, A.; **Miller, H. W.**; Finak, G.; Seymour, B. J.; McNevin, J. P.; Diaz, G.; Czartoski, J. L.; McElrath, M. J.; Gottardo, R.; Prlic, M. Distinct Activation Thresholds of Human Conventional and Innate-like Memory T Cells. *JCI Insight* **2016**, *1* (8). <https://doi.org/10.1172/jci.insight.86292>.
- Finak, G.; McDavid, A.; Yajima, M.; Deng, J.; Gersuk, V.; Shalek, A. K.; Slichter, C. K.; **Miller, H. W.**; McElrath, M. J.; Prlic, M.; Linsley, P. S.; Gottardo, R. MAST: A Flexible Statistical Framework for Assessing Transcriptional Changes and Characterizing Heterogeneity in Single-Cell RNA Sequencing Data. *Genome Biol.* **2015**, *16*, 278. <https://doi.org/10.1186/s13059-015-0844-5>.
- Younan, P. M.; Peterson, C. W.; Polacino, P.; Kowalski, J. P.; Obenza, W.; **Miller, H. W.**; Milless, B. P.; Gafken, P.; DeRosa, S. C.; Hu, S.-L.; Kiem, H.-P. Lentivirus-Mediated Gene Transfer in Hematopoietic Stem Cells Is Impaired in SHIV-Infected, ART-Treated Nonhuman Primates. *Mol. Ther.* **2015**, *23* (5), 943–951. <https://doi.org/10.1038/mt.2015.19>.
- Peterson, C. W.; Younan, P.; Polacino, P. S.; Maurice, N. J.; **Miller, H. W.**; Prlic, M.; Jerome, K. R.; Woolfrey, A. E.; Hu, S.-L.; Kiem, H.-P. Robust Suppression of Env-SHIV Viremia in Macaca Nemestrina by 3-Drug ART Is Independent of Timing of Initiation during Chronic Infection. *J. Med. Primatol.* **2013**, *42* (5), 237–246. <https://doi.org/10.1111/jmp.12060>.

## Talks

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- **Miller, H.W. 2022.** Current Projects and Technology at the Genetics Research Laboratory. *CDFW Statewide Native Fishes Conservation and Management Meeting, Sacramento, CA.*
- **Miller, H.W.;** Tam, T.S.Y.; Suleiman R.L.; Ralston K.S. **2021.** Trophocytosis of Human Cells by *Entamoeba histolytica* Allows for Evasion of Complement Lysis. *Ph.D. Exit Seminar, Davis, CA.*
- **Miller H.W.;** Ralston K.S. **2019.** Trophocytosis by *Entamoeba histolytica* mediates acquisition and display of human cell membrane proteins and evasion of lysis by human complement. *NAIST Bio International Student Workshop, Nara, Japan.*
- **Miller H.W.;** Suleiman R.L.; Ralston K.S. **2019.** Trophocytosis in *Entamoeba histolytica*: Human cell nibbling leads to complement evasion. *UC Davis PMI 127 (Medical Microbiology) Class lecture, Davis, CA.*
- **Miller H.W.;** Suleiman R.L.; Ralston K.S. **2019.** Trophocytosis in *Entamoeba histolytica*: Human cell nibbling leads to complement evasion. *UC Davis Host Microbe and Pathogenesis Bi-Weekly Meeting, Davis, CA.*
- **Miller H.W.;** Ralston K.S. **2018.** *Entamoeba histolytica* trophocytosis contributes to acquisition of host cell membrane proteins and protection from lysis by human serum. *Annual Molecular Parasitology Meeting, Woods Hole, MA.*

## Poster Presentations

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- **Miller HW,** Canfield JC, Funk EC, Schreier AD, Baerwald MR. **2024.** Developing a Multiplexed SHERLOCK Genetic Assay for Rapid Detection of Central Valley Chinook Early and Late Migration Phenotypes. *Bay-Delta Science Conference, Sacramento, CA.*
- **Miller HW,** Ralston KS. **2020.** Trophocytosis by *Entamoeba histolytica* mediates acquisition and display of human cell membrane proteins and evasion of lysis by human complement. *Annual Graduate Group in Immunology Recruitment Weekend, Davis, CA.*
- **Miller HW,** Ralston KS. **2019.** Trophocytosis by *Entamoeba histolytica* mediates acquisition and display of human cell membrane proteins and evasion of lysis by human complement. *NAIST Bio International Student Workshop, Nara, Japan.*

- **Miller HW, Ralston KS. 2019.** Trophocytosis by *Entamoeba histolytica* mediates acquisition and display of human cell membrane proteins and evasion of lysis by human complement. *Annual UC Davis Research Retreat on Host Microbe Interaction, Tahoe City, CA.* -Received poster presentation award
- **Miller HW, Suleiman R, Ralston KS. 2019.** Trophocytosis by *Entamoeba histolytica* mediates acquisition and display of human cell membrane proteins and evasion of lysis by human serum. *Annual Bay Area Microbial Pathogenesis Symposium, San Francisco, CA.*
- **Miller HW, Suleiman RL, Ralston KS. 2019.** Trophocytosis by *Entamoeba histolytica* mediates acquisition and display of human cell membrane proteins and evasion of lysis by human serum. *Annual Graduate Group in Immunology Recruitment Weekend, Davis, CA.*
- **Miller HW, Suleiman RL, Ralston KS. 2018.** *Entamoeba histolytica* trophocytosis contributes to acquisition of host cell membrane proteins and protection from lysis by human serum. *Annual UC Davis Research Retreat on Host Microbe Interaction, Tahoe City, CA.* -Received poster presentation award
- **Miller HW, Ralston KS. 2018.** Amoebic Trophocytosis Contributes to Acquisition of Host Membrane Proteins and Protection from Human Serum. *Annual Graduate Group in Immunology Recruitment Weekend, Davis, CA.* -Received poster presentation award
- **Miller HW, Ralston KS. 2017.** Identifying the Contribution of Amoebic Trophocytosis to Acquisition of Host Membrane Proteins. *Annual UC Davis Research Retreat on Host Microbe Interaction, Tahoe City, CA.*
- **Miller HW, Ralston KS. 2017.** Identifying the Contribution of Amoebic Trophocytosis to Pathogenesis. *Annual Graduate Group in Immunology Recruitment Weekend, Davis, CA.*
- **Miller HW, Ralston KS. 2016.** Identifying the contribution of amoebic trophocytosis to pathogenesis. *Annual UC Davis Research Retreat on Host Microbe Interaction, Tahoe City, CA*

## Research Skills

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### Microscopy / Flow Cytometry

- Confocal microscopy
- Imaging flow cytometry
- Flow cytometry
- Cell sorting

### Cell Culture / Biological Materials

- *Entamoeba histolytica*
- Human cell lines, primary cells, serum
- SHIV-infected non-human primate samples
- *Plasmodium falciparum* sporozoites

### Molecular Biology Techniques

- Real-time PCR (qPCR)
- CRISPR/Cas9, CRISPRi/dCas9, siRNA
- SHERLOCK
- Cloning: Gibson and traditional
- DNA/RNA extraction
- Reverse transcription PCR (RT-PCR)
- Traditional PCR
- Bacterial culture
- Transfection and transformation

### Leadership

- Mentorship of undergraduate students
- Training of new lab members

### Research Skills

- Experimental design
- Data analysis
- Development and optimization of new assays
- Publication of manuscripts
- Presentation of scientific talks and posters

### Data Analysis Software

- QuantStudio • Amnis Ideas
- Graphpad Prism • Fiji/ImageJ
- FlowJo