Talia Backman

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Education

Ph.D. in Molecular, Cellular, and Evolutionary Biology **2025**
University of Utah, Salt Lake City, UT
Thesis title: Tailocin Evolution in *Pseudomonas viridiflava*: Genomic Conservation, Host Interactions, and Trade-offs in Pathogenicity
Thesis advisor: Dr. Talia Karasov

B.Sc. in Biology, Utah Valley University, Orem, UT **2020**
Thesis title: The Evolutionary History of Mayflies
Thesis advisor: Dr. Heath Ogden

Awards

T32 Microbial Pathogenesis Training Grant	**2023-2025**
University of Utah Gold Scholarship	**2021**
UVU Showcase 2nd Place Presentation Award	**2019**
Undergraduate Grants at Utah Valley University (x5, adding up to $10,220)	**2018-2020**

Publications

1. **Backman, Talia**, Emma Caullireau, Ella Bleak, Efthymia Symeonidi, Allison M. Perkins, Hernán A. Burbano, Talia L. Karasov, et al. 2025. "A Natural Model for Tailocin-Pathogen Coevolution: Trade-Offs Between Bacterial Defense and Virulence." *In preparation for submission to Nature Microbiology.*
2. **Backman, Talia**, Hernán A. Burbano, and Talia L. Karasov. 2024. "Tradeoffs and Constraints on the Evolution of Tailocins." *Trends in Microbiology*, June. https://doi.org/10.1016/j.tim.2024.04.001.
3. **Backman, Talia**, Sergio M. Latorre, Efthymia Symeonidi, Artur Muszyński, Ella Bleak, Lauren Eads, Paulina I. Martinez-Koury, et al. 2024. "A Phage Tail-like Bacteriocin Suppresses Competitors in Metapopulations of Pathogenic Bacteria." *Science* 384 (6701): eado0713.
4. Bradshaw, Alexander J., **Talia A. Backman**, Virginia Ramírez-Cruz, Dale L. Forrister, Jaclyn M. Winter, Laura Guzmán-Dávalos, Giuliana Furci, Paul Stamets, and Bryn T. M. Dentinger. 2022. "DNA Authentication and Chemical Analysis of Psilocybe Mushrooms Reveal Widespread Misdeterminations in Fungaria and Inconsistencies in Metabolites." *Applied and Environmental Microbiology* 88 (24): e0149822.

Presentations

Wild Populations of Plant Pathogens Repurpose Phage to Kill Competitors

Function of Evolving Systems Symposium, Simons Foundation (Poster)	**Dec. 2024**
Oxford Phages Conference (Talk)	**Sept. 2024**
Microbial Pathogenesis Symposium (Talk)	**May 2024**
Utah Valley University Undergraduate Biology Seminar Series (Talk)	**March 2024**
Evolutionary Genetics and Genomics (Talk)	**Jan. 2024**
School of Biological Sciences Scientific Speaking (Talks)	**Oct 2023**

Virus-Like Weapons as Biocontrol Agents

Evolutionary Genetics and Genomics (Talk)	**June 2022**
School of Biological Sciences Scientific Speaking (Talk)	**March 2022**
Environment and Sustainability Research Symposium (Poster)	**Feb. 2022**

Undergraduate Research Presentations

Multiple conferences and showcases, including UVU Showcase and the Utah Conference for Undergraduate Research, on topics such as CRISPR gene editing, insect evolution, and microbial plastic degradation (Posters) **2019-2020**

Research Experience

Ph.D. Candidate, University of Utah **2021-Present**

Designed and led a research project investigating the evolution of phage-derived bacteriocins (tailocins) using bioinformatics and high-throughput genomic methods. Developed the first natural model for studying bacterial competition mediated by tailocins, revealing key evolutionary trade-offs in microbial interactions. Pioneered a high-throughput approach to analyze tailocin diversity across 1,524 bacterial strains collected from wild *Arabidopsis thaliana*. Secured external funding, with an NSF grant awarded to my PI based solely on this project, underscoring its significance in microbial evolution research. Established a foundational system that has expanded into a collaborative project involving two other labs, three PhD students, and two postdocs.

Undergraduate Researcher, Utah Valley University **2018-2020**

Conducted independent and collaborative research across multiple labs, utilizing molecular and bioinformatics tools:

- Evolutionary Genomics (Ogden Lab): Investigated mayfly evolutionary history, managed lab operations, and trained students in Sanger sequencing and bioinformatics.

- Functional Genetics (Domyan Lab): Studied pigmentation genes in domesticated pigeons with gene knock-outs, identifying *Abcb5* as a key regulator of recessive red pigment. Engaged with pigeon breeders for applied research.
- Microbial Biodegradation (Zahn Lab): Designed experiments on a team testing microbial degradation of polyethylene.

Forensic Chemist Intern, Utah State Crime Lab **2019**
Identified controlled substances and crime scene evidence using GC/MS. Developed and updated standard curves. Established a computational pipeline to modernize analyses procedures.

Skills

Bioinformatics: Python, R, Bash, pipeline development, and computational genomics: genome assembly and annotation, comparative genomics, functional genomics, genotyping, phylogenomics, selection studies, pangenome studies, protein structure prediction, TnSeq library characterization and analysis of barcode abundance after selection experiments. Link to GitHub.
Wet Lab Techniques: Tailocin induction and killing assays, growth curve assays, bacterial competition assays, monosaccharide competition assay development, SDS-PAGE, LPS extraction, TnSeq fitness assays, sequencing of TnSeq libraries, plant infections and culturing bacteria from plant leaves, cloning and plasmid construction, PCR and gel electrophoresis, general microbiology techniques, protein purification.
Teaching & Communication: Scientific writing, mentoring, presenting.

Mentorship & Teaching Experience

Graduate Teaching Assistant, Mycology, University of Utah **2021**
Assisted Dr. Bryn Dentinger in teaching an upper-level undergraduate Mycology course and lab. Developed and led two laboratory sessions, providing hands-on instruction to students. Delivered a full lecture on Mycology research. Supervised approximately 30 students, offering guidance on assignments, exams, lab notebooks, and experiments. Organized weekly meetings to assess student progress and provide exam preparation support.

Undergraduate Research Mentor, The Karasov Lab, University of Utah **2020-2025**
Mentored and trained two undergraduate students in microbiology research, tailoring instruction to their individual learning needs. Trained mentees in tailocin induction, killing assays, and other microbiological and bioinformatics techniques, fostering independence in research and experimental design. Supported students in developing independence and confidence in the lab, with one mentee progressing to train others in key experimental techniques. Guided students in presenting their research at multiple conferences, including UCUR, NCUR, and University of Utah undergraduate symposia. Both mentees contributed to a *Science* publication, with one continuing as a co-author on an upcoming manuscript. Assisted in preparing one student for

graduate studies in an interdisciplinary science field combining biology, chemistry, and mathematics.

Service

Science Fair Judge	**2018, 2019, 2024**
English Teacher (Nanjing, China)	**2017-2018**
Service Mission in New York City	**2016-2017**