

## Bryan P. Brown, PhD

Acting Assistant Professor

Department of Pediatrics, Division of Infectious Disease, University of Washington School of Medicine

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## EDUCATION

- 2017      Doctor of Philosophy, Duke University, Durham, NC  
Center for Genomic and Computational Biology; Nicholas School of the Environment  
Dissertation: *Ecological and Evolutionary Factors Shaping Animal-Bacterial Symbioses: Insights from Insects & Gut Symbionts*  
Advisor: Jennifer J. Wernegreen, PhD
- 2011      Bachelor of Science, The University of Akron, Akron, OH  
Majors: Biochemistry, Biology; Minor: Spanish  
Advisors: Stephen C. Weeks, PhD and John M. Senko, PhD

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## RESEARCH EXPERIENCE

- 2022 – Present    **Acting Assistant Professor, University of Washington**  
University of Washington School of Medicine, Department of Pediatrics, Division of Infectious Disease, Seattle, WA
- Investigated the effect of maternal HIV infection on the development of the enteric microbiome and immune response of related infants. Developed a methodology for bias-free whole genome amplification to sequence viral and bacterial metagenomes from maternal and infant stool and breastmilk samples. Employed various supervised and unsupervised learning approaches to identify microbial taxa associated with altered infant vaccine responses.
- 2017 - 2022    **Research Scientist III/ Postdoctoral Fellow, Seattle Children's**  
Seattle Children's Research Institute, Center for Global Infectious Disease Research, Seattle, WA (PIs: Heather Jaspan, MD, PhD; Rhea Coler, PhD)
- Integrated multiomic datasets (next generation sequencing and multiplexed cytokine assays) to assess shifts in vaginal microbiota and immune activation induced by contraceptive initiation and use in a cohort of African women. Conducted as part of the ECHO clinical trial (NCT02550067). Simultaneously, identified vaginal microbial and inflammatory predictors of Bacterial Vaginosis and HIV seroconversion. First author article in press at *Nature Communications*.
  - Used next-generation sequencing and comparative genomic analyses to identify single nucleotide variants arising from positive selective pressure across several human crAssphage genomes. First author article in *Virus Research*.
  - Used unsupervised learning approaches to identify interactions between bacterial microbiota and neonatal mucosal transcriptional responses elicited by alterations in feeding modality during the first year of life. First author articles in *Clinical Infectious Diseases* and *Gut Microbes*.
  - Developed two R packages to enable robust statistical analysis of multiomic (transcriptome, proteome, metabolome) datasets.
  - Performed the statistical qualification of a SARS-CoV-2 Spike-antigen ELISA and ELISPOT endpoint assay. Estimated survival and hazard ratios for several formulations of preclinical models of Mycobacterium tuberculosis vaccines. Co-author articles in the *Journal of Immunological Methods* and *Frontiers in Microbiology*.
- 2012 - 2017    **Predoctoral Fellow, Duke University**  
Nicholas School of the Environment, Durham, NC (PI: Jennifer Wernegreen, PhD)

- Discovered novel, insect gut associated species of Acetobacteraceae bacteria and characterized their genomes using isolate culturing and PacBio sequencing. First author article in *BMC Microbiology*.
- Isolated and characterized fastidious gut microbes under diverse conditions using a multistage bioreactor.
- Performed bacterial metagenome sequencing on an Illumina platform to identify sources of horizontal gene transfer in specific strains of gut bacteria. Employed phylogenomics to reconstruct evolutionary histories of various gut associated bacteria. First author article in *BMC Genomics*.

2009 – 2011 **Research Assistant, The University of Akron**

Department of Biology, Akron, OH

- Modeled crustacean development using geometric morphometric analyses.
- Employed various unsupervised learning approaches to infer population gender ratios and sexual system evolution through deep time via the fossil record. First author article in the *Journal of Crustacean Biology*

2010 – 2011 **Research Assistant, The University of Akron**

Department of Geosciences, Akron, OH

- Performed 16S rRNA gene pyrosequencing to identify bacterial communities with high corrosive potential in engineered environments. First author article in *Frontiers in Microbiology*.
- Used aerobic and anaerobic culturing to isolate thermophilic bacteria from flue gas desulfurization systems.

## AWARDS AND HONORS

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2021 – 2026	Pathway to Independence Award, Eunice Kennedy Shriver National Institute of Child Health and Human Development, National Institutes of Health, Department of Health and Human Services
2021 – 2022	Loan Repayment Program Renewal Award, Pediatric Research, National Institute of Allergy and Infectious Disease, National Institutes of Health, Department of Health and Human Services
2020	Research Scholarship, 4th HIV Research for Prevention Conference (HIVR4P), International AIDS Society
2020 - 2021	Ruth L. Kirschstein National Research Service Award Individual Postdoctoral Fellowship, Eunice Kennedy Shriver National Institute of Child Health and Human Development, National Institutes of Health, Department of Health and Human Services
2019	New Investigator Scholarship, 2020 Conference on Retroviruses and Opportunistic Infections (CROI), International Antiviral Society-USA
2019 - 2021	Loan Repayment Program, Pediatric Research, National Institute of Allergy and Infectious Disease, National Institutes of Health, Department of Health and Human Services
2019	International Scholarship, 10th International AIDS Society Conference on HIV Science, International AIDS Society
2018	Travel award, 4 <sup>th</sup> International Workshop on Microbiome in HIV, National Institutes of Allergy and Infectious Diseases, National Institutes of Health
2015 - 2016	Graduate Research Opportunities Worldwide Travel Award, National Science Foundation
2013 - 2016	Graduate Research Fellowship, National Science Foundation
2011	Undergraduate Researcher of the Year, The University of Akron
2011	Outstanding Undergraduate Research Award, The University of Akron
2011	Dr. Paul Acquarone Award in Plant Sciences, The University of Akron
2010	Placed 1st overall, Conference on Integrated Bioscience, The University of Akron
2007 - 2008	Honors Recognition Scholarship, The University of Akron
2007 - 2008	Presidential Scholarship, The University of Akron

## RESEARCH FUNDING

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Pending funding

R00HD106861

9/1/2023 – 8/31/2026

Eunice Kennedy Shriver National Institute of Child Health and Human Development  
National Institutes of Health  
PI: Brown

NIH Pathway to Independence Award

Title: Identifying inter-kingdom microbial determinants of altered immunity in HIV exposed infants

Description: The project utilizes integrative multiomic techniques and gnotobiotic mouse models to characterize the effects of the expanded gut virome of HIV-exposed infants on their bacterial microbiota and responses to vaccination. Role: Principal Investigator

#### Active funding

##### **K99HD106861**

9/1/2021 – 8/31/2023

Eunice Kennedy Shriver National Institute of Child Health and Human Development  
National Institutes of Health  
PI: Brown

NIH Pathway to Independence Award

Title: Identifying inter-kingdom microbial determinants of altered immunity in HIV exposed infants

Description: The project utilizes integrative multiomic techniques and gnotobiotic mouse models to characterize the effects of the expanded gut virome of HIV-exposed infants on their bacterial microbiota and responses to vaccination. Role: Principal Investigator

##### **L40AI147257**

7/1/2019 – 6/30/2022

National Institute of Allergy and Infectious Diseases  
National Institutes of Health  
PI: Brown

Extramural Loan Repayment Program for Pediatric Research

Title: Influence of gut virome on bacterial microbiota and vaccine responsiveness in HIV-exposed infants

Description: The project aims to characterize the effects of maternal HIV infection on infant endogenous microbial communities and their responses to vaccination. Role: Principal Investigator

#### Completed research funding

##### **F32HD102290**

4/1/2020 – 3/31/2023

Eunice Kennedy Shriver National Institute of Child Health and Human Development  
National Institutes of Health  
PI: Brown

Ruth L. Kirschstein National Research Service Award Individual Postdoctoral Fellowship

Title: Influence of gut virome on bacterial microbiota and vaccine responsiveness in HIV-exposed infants

Description: The project aims to characterize the effects of maternal HIV infection on infant endogenous microbial communities and their responses to vaccination. Role: Principal Investigator

##### **NSF1106401**

9/1/2013 – 8/31/2016

National Science Foundation  
PI: Brown

NSF Graduate Research Fellowship

Title: Ecological and evolutionary forces shaping animal-bacterial interactions

Description: The project aims to identify mechanisms underlying genomic adaptation of bacterial mutualists living inside of animal hosts. Role: Principal Investigator

##### **NSF1106401**

8/1/2015 – 4/30/2016

National Science Foundation, United States Agency for International Development  
PI: Brown

NSF Graduate Research Opportunities Worldwide, and USAID Research and Innovation Fellowship

Title: Structural and functional dynamics of vaginal microbiota associated with altered HIV susceptibility

Description: The goal of this study is to identify shifts in vaginal bacterial microbiota that are associated with elevated HIV susceptibility in adolescent South African women. Role: Principal Investigator

**DUSOM1075**

2/1/2016 – 1/31/2017

Duke University

PI: Wernegreen

Research Grant, Duke University School of Medicine

Title: A world within: Diversity and dynamics of bacterial communities inhabiting ants

Description: The purpose of this study is to identify mechanisms and dynamics of bacterial transmission between interacting hosts and across developmental stages. Role: Co-Investigator

**DUNSOE0789**

1/1/2016 – 4/30/2017

Duke University

PI: Wernegreen

SEED grant, Duke University Nicholas School of the Environment

Title: Evolutionary dynamics across the genomes of persistent gut bacterial associates

Description: This project aims to characterize the genomes of persistent gut bacteria and to identify selective pressures acting on these associates via adaptation to the gastrointestinal tract. Role: Co-Investigator.

**BIBLIOGRAPHY**Peer-Reviewed Publications

- **Brown BP**, Feng, C, Tanko RF, Jaumdally SZ, Bunjun R, Dabee S, Happel A, Onono M, Nair G, Palanee-Phillips T, Scoville CW, Heller K, Nyangahu DD, Baeten JM, Bosinger SE, Burgener A, Passmore JS, Heffron R, Jaspan HB. Copper intrauterine device initiation induces increased bacterial load of inflammatory anaerobes and depletion of *Lactobacillus crispatus* compared to DMPA-IM and LNG implant in the vaginal microbiota in a randomized trial. *Nature Communications*. *Accepted*
- Baldwin SL, Reese VA, Larsen SE, Pecor T, **Brown BP**, Granger B, Podell BK, Fox CB, Reed SG, Coler RN. Therapeutic efficacy against *Mycobacterium tuberculosis* using ID93 and liposomal adjuvant formulations. *Frontiers in Microbiology*. 2022:3063. PMID36090093
- Bunjun R, Tanko RF, Jaumdally SZ, Noel-Romas L, Ayele H, **Brown BP**, Gamielidien H, Harryparsad R, Nair G, Onono M, Palanee-Phillips T, Scoville C, Heller KB, Baeten JM, Bosinger SE, Burgener A, Passmore JS, Jaspan HB, Heffron R. Initiating intramuscular depot medroxyprogesterone acetate (DMPA-IM) increases frequencies of Th17-like HIV target cells in the genital tract of women in South Africa: a randomised trial. *Clinical Infectious Diseases*. 2022 Aug 9. PMID35941737
- Dabee S, Tanko RF, **Brown BP**, Bunjun R, Balle C, Feng, C, Konstantinus I, Jaumdally SZ, Onono M, Nair G, Palanee-Phillips T, Gill K, Baeten JM, Bekker LG, Passmore JS, Heffron R, Jaspan HB, Happel A. Comparison of Female Genital Tract Cytokine and Microbiota Signatures Induced by Initiation of Intramuscular DMPA and NET-EN Hormonal Contraceptives-a Prospective Cohort Analysis. *Frontiers in Immunology*. 2021: 5296. PMID34956191
- Larsen S, Berube B, Pecor T, Cross E, **Brown BP**, Williams B, Johnson E, Qu P, Baldwin SL, Coler RN. Qualification of ELISA and neutralization methodologies to measure SARS-CoV-2 humoral immunity in human clinical samples. *Journal of immunological methods* 2021 Dec 1;499:113160. PMID34599915
- **Brown BP**, Wendoh J, Chopera D, Havyarimana E, Jaumdally S, Nyangahu DD, Gray CM, Martin DP, Varsani A, Jaspan HB. crAssphage genomes identified in fecal samples of an adult and infants with evidence of positive genomic selective pressure within tail protein genes. *Virus Res*. 2020 Oct 30;198219. PMID33137401
- Nyangahu DD, Darby M, Havyarimana E, **Brown BP**, Horsnell W, Jaspan HB. Preconception helminth infection alters offspring microbiota and immune subsets in a mouse model. *Parasite Immunology*. 2020 Apr 11:e12721. PMID32277499
- **Brown BP**, Jaspan HB. Compositional analyses reveal correlations between taxon-level gut bacterial abundance and peripheral T cell marker expression in African infants. *Gut microbes*. 2019 Jul 28:1-8. PMID31347944
- **Brown BP**, Wernegreen JJ. Genomic erosion and extensive horizontal gene transfer in gut-associated *Acetobacteraceae*. *BMC genomics*. 2019 Dec;20(1):472. PMID31182035.
- Wood LF\*, **Brown BP\***, Lennard K, Karaoz U, Passmore JS, Hesseling AC, Edlefsen PT, Mulder N, Brodie EL, Sodora DL, Jaspan HB. Feeding related gut microbial composition associates with peripheral T cell activation and mucosal gene expression in African infants. *Clin Infect Dis* 2018 Sep 28;67(8):1237-1246. PMID29659737. **\*co-first authors.**

- Nyangahu D, Lennard KS, **Brown BP**, Darby MG, Wendoh JM, Havyarimana H, Smith P, Butcher J, Stintzi A, Mulder N, Horsnell W, Jaspan HB. Disruption of maternal gut microbiota during gestation alters offspring immunity. *Microbiome* 2018 Jul 7;6(1):124. PMID29981583. PMC6035804.
- Ho NT, Li F, Lee-Sarwar KA, Tun HM, **Brown BP**, Pannaraj PS, Bender JM, Azad MB, Thompson AL, Weiss ST, Azcarate-Peril MA, Litonjua AA, Kozyrskyj AL, Jaspan HB, Aldrovandi GM, Kuhn L. Meta-analysis of effects of exclusive breastfeeding on infant gut microbiota across populations. *Nat Commun* 2018 Oct 9;9(1):4169. PMID30301893. PMC6177445.
- **Brown BP** and Wernegreen JJ. Deep divergence and rapid evolutionary rates in gut-associated Acetobacteraceae of ants. *BMC Microbiol* 2016 Jul 11;16(1):140. PMID27400652. PMC4939635.
- **Brown BP**, Astrop TI, Weeks SC. Post-larval developmental dynamics of the Spinicaudatan (Branchiopoda: Diplostraca) carapace. *Journal of Crustacean Biology* 2014 34 (5), 611-617.
- Astrop, TI, Park, LE, **Brown, BP**, and Weeks, SC. Sexual discrimination at work: Spinicaudatan 'Clam Shrimp' (Crustacea: Branchiopoda) as a model organism for the study of sexual system evolution. *Palaeontologia Electronica* 2012 Vol. 15, Issue 2;20A, 15p.
- **Brown BP**, Brown SR and Senko JM. Microbial communities associated with wet flue gas desulfurization systems. *Front Microbiol* 2012 3:412. PMID23226147. PMC3510643.

#### Submitted Manuscripts and Cited Preprints

- Donald D Nyangahu, Anna-Ursula Happel, Jerome Wendoh, Agano Kiravu, Colin Feng, Courtney Plumlee, Sara Cohen, **Bryan P Brown**, Danijel Djukovic, Tariq Ganief, Melanie Gasper, Daniel Raftery, Jonathan M Blackburn, Clive M. Gray, Jisun Paik, Kevin B Urdahl and Heather B Jaspan. *Bifidobacterium infantis* associates with T cell immunity in human infants and is sufficient to enhance antigen specific T cells in mice. Under review at *Science Advances*
- Nyangahu DD, Courtney P, **Brown BP**, Feng C, Havyarimana E, Cohen S, Urdahl K, Jaspan HB. Shifts in gestational gut bacterial communities impact antigen-specific cellular immunity in offspring in a maternal antibody-dependent manner. In revision at *Microbiology Spectrum*.
- Maust BS, Petkov S, Herrera C, Feng C, **Brown BP**, Lebina L, Opoka D, Ssemata A, Pillay N, Serwanga J, Seatlholo P. Bacterial Microbiome of Foreskin Tissue: Impact of Short-course PrEP and Host Inflammation. bioRxiv. 2022 Jan 1.
- **Brown BP**, Wendoh J, Chopera D, Havyarimana E, Jaumdally SZ, Nyangahu DD, Gray C, Martin DP, Varsani A, Jaspan HB. crAssphage abundance and genomic selective pressure correlate with altered bacterial abundance in the fecal microbiota of South African mother-infant dyads. bioRxiv. 2019 Jan 1:582015.

#### Invited presentations

- **Brown BP**, Maust BM, Happel AU, Havyarimana E, Jaumdally SZ, Varsani A, Coler, RN, Jaspan HB. (2022, November). Inter-kingdom microbial determinants of altered immunity in HIV-exposed infants. 7<sup>th</sup> International Conference on Vaccines Research and Development. Boston, MA, USA.
- **Brown BP**, Maust BM, Happel AU, Havyarimana E, Jaumdally SZ, Varsani A, Jaspan HB. (2022, April). Multi-omic insights into endogenous microbiota and immunity in African women and infants. Pacific Northwest Research Institute Seminar Series, Seattle, WA, USA.

#### Platform presentations

- **Brown BP**, Wendoh J, Chopera D, Havyarimana E, Jaumdally SZ, Martin DP, Varsani A, Jaspan HB. (2019, July). Maternal HIV infection alters the community composition and dynamics of the enteric microbiome of associated infants. 10th International AIDS Society Conference on HIV Science, Mexico City, Mexico.
- Balle C, Lennard K, Konstantinus I, Jaumdally S, Esra R, Gasper M, **Brown BP**, Karaoz U, Gill K, Myer L. (2018, October). Hormonal Contraception Induced Changes to the Female Genital Microbiota in South African Adolescents: A Randomized, Crossover Trial. HIV Research for Prevention. Madrid, Spain.
- **Brown BP**, Jaspan HB, Study Team I. (2018, October). A compositional transform reveals HIV exposure induced shifts in the fecal microbiota and vaccine responsiveness of Nigerian infants. 4th International Workshop on Microbiome in HIV Pathogenesis, Prevention and Treatment. Washington, DC, USA.
- **Brown BP**, Jaspan HB. (2018, September). A penalized compositional transform reveals shifts in the fecal microbiota of HIV exposed Nigerian infants. Fred Hutchinson Microbiome Research Initiative Biennial Symposium. Seattle, WA, USA.

## Poster presentations

- **Brown BP**, et al. (2021, January). HIV exposure alters the fecal microbiome in Nigerian infants. 4th HIV Research for Prevention Conference (HIVR4P). Virtual.
- **Brown BP**, et al. (2020, March). Contraceptive use induces durable shifts in the female genital-tract microbiota. 2020 Conference on Retroviruses and Opportunistic Infections (CROI). Boston, MA, USA.
- **Brown BP**, Jaspan HB. (2018, October). A compositional transform reveals HIV exposure induced shifts in the fecal microbiota and vaccine responsiveness in Nigerian infants. HIV Research for Prevention. Madrid, Spain.
- **Brown BP**, Varsani A, Jaspan HB. (2018, October). Altered composition and elevated diversity in the enteric virome of HIV exposed uninfected South African infants. HIV Research for Prevention. Madrid, Spain.
- **Brown BP**, Jaspan HB, Study Team I. (2018, April). HIV exposure alters the fecal microbiome and efficacy of oral polio vaccine in Nigerian infants. 25th International HIV Dynamics & Evolution. Leavenworth, WA, USA.
- **Brown BP**, Senko J. (2012, June). Microbial Communities Associated With Flue Gas Desulfurization Systems. American Society for Microbiology: 112th General Meeting. San Francisco, CA, USA.
- **Brown BP**, Weeks S. (2011, June). Morphometrics and Ontogenetics: Evolutionary Dynamics of the Spinicaudatan 'Clam Shrimp'. The Evolution Conference. Norman, OK, USA.

## **TEACHING AND MENTORING**

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### Courses taught

#### **One Health: Philosophy to Practical Integration of Human, Animal, and Environmental Health**

Duke University, Global Health Institute

Role: Teaching Assistant, Co-Instructor

Description: This graduate-level, interdisciplinary course will introduce the concept of One Health as an increasingly important approach to a holistic understanding of the promotion and maintenance of human, animal, and environmental health.

#### **Applied Data Analysis for Environmental Sciences**

Duke University, Nicholas School of the Environment

Role: Teaching Assistant, Laboratory Instructor

Description: This graduate-level course provides an introduction to statistical analysis and modeling for applied problems in the environmental sciences. All labs are instructed using the R statistical framework.

#### **Molecular Ecology**

Duke University, Department of Biology

Role: Teaching Assistant, Co-Instructor

Description: This graduate-level course explores key questions in molecular ecology, a field that employs molecular tools to investigate ecological processes within natural populations and communities. While genetic techniques are central to this discipline, the course is not a methods class per se. Rather, emphasis is placed on fundamental principles and predictions from ecological and evolutionary theory, as well as historical approaches and precedents.

#### **Genetics and Evolution**

Duke University, Department of Biology

Role: Teaching Assistant, Laboratory Instructor

Description: This undergraduate-level course provides an introduction to principles of genetics and evolution. Includes Mendelian and non-Mendelian inheritance, quantitative genetics, genetic mapping, evidence for evolution, natural selection, genetic drift, kin selection, speciation, molecular evolution, and phylogenetic analysis.

### Mentoring

#### **Advising: Research**

- 1 Master's student
- 8 Undergraduate students

## OTHER

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### Reviewing activities

#### **Journals:**

PLOS ONE

Clinical and Translational Medicine

Symbiosis

Gut Microbes

### Outreach

2012 Environmental Science Instructor, Lakewood Elementary School, Durham, NC

### R packages developed

**pico:** a suite of compositional data analysis functions targeted for marker gene (16S/18S) microbiome datasets, including a novel transformation that couples an L1 penalized matrix decomposition to the isometric log ratio transformation.

**microfiltR:** identifies and corrects for multiple sources of contamination (exogenous and cross) in compositional marker gene surveys. Available at <https://github.com/itsmisterbrown/microfiltR>