

BIOGRAPHICAL SKETCH

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NAME: Kathryn R. Dalton

eRA COMMONS USER NAME (credential, e.g., agency login): kdalton4

POSITION TITLE: Assistant Professor

EDUCATION/TRAINING:

INSTITUTION AND LOCATION	DEGREE	Completion Date MM/YYYY	FIELD OF STUDY
SUNY Stony Brook University	BS	05/2008	Ecology and Evolution
University of Pennsylvania School of Veterinary Medicine	VMD	05/2013	Veterinary Public Health
Johns Hopkins Bloomberg School of Public Health	MPH	05/2016	Infectious Disease, Food Systems
Johns Hopkins Bloomberg School of Public Health	Clinical Research Fellow	08/2017	One Health
Johns Hopkins Bloomberg School of Public Health	PhD	10/2020	Environmental Epidemiology
Johns Hopkins Bloomberg School of Public Health	Postdoctoral Fellow	12/2021	Microbiome Bioinformatics, Microbial Exposures
National Institute of Environmental Health Sciences, NIH	IRTA Postdoctoral Fellow	06/2024	Environmental Health, Metagenomics

A. PERSONAL STATEMENT

My research broadly explores microbial dynamics among humans, animals, and their shared environment, and how microbial community profiles relate to human health outcomes. My diverse research portfolio employs multidisciplinary techniques from epidemiology, environmental science, microbiology, and ethnography to explore the concept of the One Health Microbiome – the dynamic balance of detrimental and positive impacts on health from human-animal-environmental interactions through the mechanism of the microbiome. I am well suited to carry out this research due to my advanced training in environmental health, metagenomics, and epidemiology. This is evidenced by my publication record that spans advanced microbiome techniques (1), One Health microbial dynamics (2), and environmental epidemiology (3). My diverse educational background as an environmental epidemiologist, microbial ecologist, and public health veterinarian uniquely qualifies me to carry out this transdisciplinary research. My long-term goal is to establish an independent research laboratory at an academic institution to conduct high quality scientific studies focused on One Health, which is the intersection of human and animal health, and the health of their shared environment.

- 1) **Dalton, K.R.**, Wang, Z., Lee, M., Parks, C.G., Beane Freeman, L.E., Zhu, Q., González, A., Knight, R., Zhao, S., Motsinger-Reif, A.A. and London, S.J., 2023. Metagenomics reveals novel microbial signatures of farm exposures in house dust. *Frontiers in Microbiology*, 14, p.1202194. PMC10321240.
- 2) **Dalton, K.R.**, Ruble, K., Redding, L.E., Morris, D.O., Mueller, N.T., Thorpe Jr, R.J., Agnew, J., Carroll, K.C., Planet, P.J., Rubenstein, R.C. and Chen, A.R., 2021. Microbial sharing between pediatric patients and therapy dogs during hospital animal-assisted intervention programs. *Microorganisms*, 9(5), p.1054. PMC8153335.
- 3) **Dalton, K.R.**, Louis, L.M., Fandiño-Del-Rio, M., Rule, A.M., Pool, W., Randolph, K., Thomas, S., Davis, M.F. and Quirós-Alcalá, L., 2022. Microbiome alterations from volatile organic compounds (VOC)

exposures among workers in salons primarily serving women of color. *Environmental research*, 214, p.114125. PMC11316258.

B. POSITIONS, SCIENTIFIC APPOINTMENTS, AND HONORS

Positions and Scientific Appointments

2024 – Current	Assistant Professor, University of Iowa College of Public Health, Occupational & Environmental Health Department
2017 – 2020	Graduate Research Assistant, Johns Hopkins Bloomberg School of Public Health
2019 - Current	Member, International Society of Exposure Science
2018 - Current	Member, International Society of Environmental Epidemiology
2017 - Current	Member, Infectious Disease Society of America

Honors

2023	NIH Fellows Award for Research Excellence (FARE)
2020	Delta Omega Honors Society Induction
2018	IDweek 2018 Kass Award
2016	Johns Hopkins Bloomberg School of Public Health Capstone Award
2015	FDA Center for Excellence in Regulatory Science and Innovation (CERSI) Award
2012	University of Pennsylvania School of Vet Medicine, Student Inspiration Award

C. CONTRIBUTIONS TO SCIENCE

Modifiable Environmental Exposures that Impact Environmental and Host Microbiomes

Humans contribute and are exposed to environmental microbes, especially indoors where they spend the most time. The home environment microbiome (i.e., the microbial communities in our homes) can influence health outcomes by altering the human host microbiome and through direct effects on biological processes, leading to allergic, atopic, and respiratory diseases. My research in this topic centers on understanding the upstream physical and social environmental drivers that affect the microbes that surround us, and the subsequent health conditions resulting from these microbial alterations. I seek to identify modifiable environmental exposures that impact health through the mechanism of the microbiome, and to design interventions to minimize morbidity from microbial-induced disease conditions. As a postdoctoral fellowship, I explored farming exposures that impact the microbes inside farmers' homes using advanced metagenomic sequencing techniques in the Agricultural Health Study. Not only did we show, for the first time, that this advanced technique was more sensitive for characterizing the environmental dust microbiome, but I also identified specific farming exposures, such as the type of facility (e.g. animal vs. crop) where the participants worked, that lead to unique microbial profiles in their homes. As a follow-up to this project, I further examined the occupational exposures on farms and found individualized job roles and tasks associated with differential changes to the microbes inside workers' homes. This work suggests that occupational farm exposures could impact the health of workers and their families by modifying the indoor environment, specifically the microbial composition of house dust, offering possible future intervention targets. Another area of research I am actively pursuing is the association between home-based factors and sleep health, an important homeostatic function that influences many aspects of health, and the role that the microbiome plays as a mediator in this relationship. I am working concurrently in the NIH-AARP Cohort Study to examine the role of the home environment and the host oral microbiomes on sleep health.

Dalton, K.R., Chang, V.C., Lee, M., Maki, K., Saint-Maurice, P., Purandare, V., Hua, X., Wan, Y., Dagnall, C., Jones, K., Hicks, B.D., Hutchinson, A., Liao, L.M., Gail, M.H., Shi, J., Sinha, R., Abnet, C.C., London, S.J., Vogtmann, E. Sleep duration associated with altered oral microbiome diversity and composition in the NIH-AARP cohort. *Undergoing peer review in SLEEP Advances*.

Dalton, K.R., Lee, M., Wang, Z., Zhao, S., Parks, C.G., Beane-Freeman, L.E., Motsinger-Reif, A.A., London, S.J. Occupational farm work activities influence workers' indoor home microbiome. *Environmental Research*. 2024 Feb 15; 243:117819. PMC10872285.

Dalton, K.R., Wang, Z., Lee, M., Parks, C.G., Beane Freeman, L.E., Zhu, Q., González, A., Knight, R., Zhao, S., Motsinger-Reif, A.A. and London, S.J., 2023. Metagenomics reveals novel microbial signatures of farm exposures in house dust. *Frontiers in Microbiology*, 14, p.1202194. PMC10321240.

The Role of One Health and the Microbiome in Hospital Infection Control

Despite improvements in hospital infection prevention and control, healthcare-associated infections remain a challenge with significant patient morbidity, mortality, and cost for the healthcare system. Hospitals serve as an incubator that incorporates dynamic microbial inputs from the community from both people and animals. In the clinical setting, One Health can provide practical ways to incorporate environmental and service/therapy animal contact considerations into patient care. The first research project that I conducted as a graduate student involved evaluating the infection risk of patients involved in hospital animal-assisted intervention programs. As the primary study coordinator, I was involved in all stages of the study design, collection, processing, analysis, and dissemination. I discovered that patients with closer interaction with the therapy animal had a higher risk of carrying hospital pathogens. Yet, when we implemented a targeted cleaning protocol for the therapy animals, this excess risk from higher contact was nullified, indicating our novel animal decolonization protocol has promise to protect the animals and patients from infections. As a part of my doctoral dissertation research, I expanded this study to evaluate holistic microbial communities. As the first study to evaluate the microbiome in hospital pet therapy programs, this project brought important insights that more than pathogens are being shared between patients and therapy animals, and brief interactions between the two groups can alter the microbiomes of each – and possibly subsequent health changes from these microbial alterations.

Dalton, K.R., Ruble, K., Redding, L.E., Morris, D.O., Mueller, N.T., Thorpe Jr, R.J., Agnew, J., Carroll, K.C., Planet, P.J., Rubenstein, R.C. and Chen, A.R., 2021. Microbial sharing between pediatric patients and therapy dogs during hospital animal-assisted intervention programs. *Microorganisms*, 9(5), p.1054. PMC8153335.

Dalton, K.R., Rock, C., Carroll, K.C. and Davis, M.F., 2020. One Health in hospitals: how understanding the dynamics of people, animals, and the hospital built-environment can be used to better inform interventions for antimicrobial-resistant gram-positive infections. *Antimicrobial Resistance & Infection Control*, 9, pp.1-17. PMC7268532.

Dalton, K.R., Waite, K.B., Ruble, K., Carroll, K.C., DeLone, A., Frankenfield, P., Serpell, J.A., Thorpe Jr, R.J., Morris, D.O., Agnew, J. and Rubenstein, R.C., 2020. Risks associated with animal-assisted intervention programs: A literature review. *Complementary therapies in clinical practice*, 39, p.101145. PMC7673300.

Davis, M., **Dalton, K.R.**, Johnson, Z., Ludwig, S., Sabella, K., Newman, M., Whaley, S.B., Keet, C., McCormack, M.C., Carroll, K.C. and Matsui, E.C., 2018. Household Pets and Recovery of *Moraxella catarrhalis* and Other Respiratory Pathogens from Children with Asthma. *Open Forum Infectious Diseases*. Vol. 5, No. suppl_1, pp. S692-S693.

Chemical-Microbiota Interactions

Emerging evidence suggests that there is a dynamic balance between environmental chemical exposure and the microbiome. In prior research, microbes can alter the metabolism and bioavailability of toxic chemical byproducts, leading to modified health effects. Conversely, chemical exposure can alter the composition and function of our microbiome, as well as the environmental microbiome, which can have physiological effects and be a mechanism driving chemical toxic effects. Understanding this relationship can offer insights into novel mechanisms to ameliorate the toxic effects of chemical exposure, particularly ubiquitous chemicals with challenging remediation. My work in this field has centered on evaluating chemical exposure in occupational cohorts. As a doctoral student, I first examined volatile organic compound (VOC) exposure in racially diverse salon workers, shown to have higher chemical exposures and adverse health consequences. We discovered that the nasal microbiome could be a mechanism for the observed health disparities, as workers with higher urinary VOC levels had altered nasal microbial composition and lowered microbial diversity. In a follow-up project, I assessed effects on the nasal microbiome of phthalate exposure on Latino workers and observed higher phthalate levels associated with higher abundance of certain microbes, including respiratory pathogens linked to asthma and atopic conditions.

Dalton, K.R., Louis, L.M., Fandiño-Del-Rio, M., Rule, A.M., Pool, W., Randolph, K., Thomas, S., Davis, M.F. and Quirós-Alcalá, L., 2022. Microbiome alterations from volatile organic compounds (VOC) exposures among workers in salons primarily serving women of color. *Environmental research*, 214, p.114125. PMC11316258.

Dalton, K.R., Fandiño-Del-Rio, M., Louis, L.M., Garza, M.A., Quirós-Alcalá, L. and Davis, M.F., 2022. Microbiome alterations associated with phthalate exposures in a US-based sample of Latino workers. *Environmental research*, 214, p.114126. PMC36027966.

Complete List of Published Work in MyBibliography:

<https://www.ncbi.nlm.nih.gov/myncbi/1pkR5O82KSe57u/bibliography/public/>