

Claire E. Anderson, Ph.D.

Department of Civil and Environmental Engineering, Stanford University

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APPOINTMENTS

2024 – Present **Postdoctoral Scholar** in Environmental Engineering
Stanford University, Stanford, CA
Hosts: Alexandria Boehm (Civil and Environmental Engineering) &
Jade Benjamin-Chung (Epidemiology and Population Health)

EDUCATION

2021 – 2023 **Doctor of Philosophy** in Environmental Engineering
Stanford University, Stanford, CA
Ph.D. Committee: Alexandria Boehm (Advisor), Jade Benjamin-Chung, Jenna Davis,
Marlene Wolfe, Kevin Boyce (Chair) | GPA: 4.07/4.00
Dissertation: Enveloped Viruses in the Environment: Fate, Transmission, and Intervention Strategies

2019 – 2021 **Master of Science** in Environmental Engineering
Stanford University, Stanford, CA
Advisor: Alexandria Boehm | GPA: 4.07/4.00

2015 – 2019 **Bachelor of Science** in Environmental Engineering, Minor in Economics
Georgia Institute of Technology, Atlanta, GA | GPA: 3.94/4.00

FELLOWSHIPS AND SCHOLARSHIPS

2020 National Science Foundation (NSF) Graduate Research Fellowships Program (GRFP)

2019 Stanford University Civil and Environmental Engineering Ph.D. Fellowship

2019 American Association of University Women (AAUW) Selected Professions Fellowship

2018 Georgia Institute of Technology Presidential Undergraduate Research Award

2018 Carl Hofstadter Scholarship

2018 R.J. Bouchard AECOM Scholarship

2017 Carl Hofstadter Scholarship

2016 Mundy Foundation Scholarship

2015 Farrior Science Scholarship

2015 GTE Financial Credit Union Scholarship

HONORS AND AWARDS

- 2024 Dean's Graduate Student Advisory Council Justice, Equity, Diversity, and Inclusion (JEDI) Graduation Award, Stanford School of Engineering
- 2024 University of Wisconsin-Madison WiscProf Future Faculty in Engineering Program Participant
- 2021 Manuscript highlighted in the *Applied and Environmental Microbiology* journal's spotlight section
- 2019 Water Environment Federation's Technical Exhibition and Conference (WETEC) Student Design Competition
- 2019 Outstanding Senior in Environmental Engineering Award
- 2018 Association of Environmental Engineers and Scientists Outstanding Student Award
- 2018 Georgia Institute of Technology Civil and Environmental Engineering Outstanding Undergraduate Researcher Award
- 2018 University of Illinois Urbana-Champaign Multicultural Engineering Recruitment for Graduate Education (MERGE) Scholar

WORKS IN PROGRESS

- [1] **Anderson, C. E.**, Hernandez, J., Hanif, S., Crider, Y., Billington, S. L., Lepech, M, Boehm, A.B., & Benjamin-Chung, J. Investigating Cement-Based Surfaces as a Sustainable Flooring Solution to Improve *Ascaris* Egg Removal and Decay in Low-Resource Settings.
- [2] Ercumen, A., Hossain, Md. S., Tabassum, T., Haque, A., Rahman, A., Rahman, Md. H., **Anderson, C. E.**, Tazin, S., Hanif, S., Heitmann, G. B., Miah, Md. R., Yeamin, A., Jahan, F., Shoab, A.K., Mahmud, Z. H., Rahman, M., Benjamin-Chung, J. Dirt floors and domestic animals are associated with soilborne exposure to antimicrobial resistant *E. coli* in rural Bangladeshi households
- [3] Ercumen, A., Ratnasiri, K., Nguyen, A. T., Heitmann, G. B., Tazin, S., **Anderson, C. E.**, Hanif, S., Yeamin, A., Shoab, A.K., Shanta, I. S., Jahan, F., Hossain, S., Mahmud, Z. H., Jubair, M., Rahman, Md. M., Rahman, M., Benjamin-Chung, J. Microbiomes and Resistomes in Household Environments with Soil Floors and Domestic Animal Cohabitation: A Study in Rural Bangladesh

JOURNAL PUBLICATIONS

Note: * denotes equal contribution; † denotes corresponding author;

- [1] **Anderson, C. E.*†**, Hernandez, J.*, Hanif, S., Owens, L., Crider, Y., Billington, S. L., Lepech, M, Boehm, A.B., & Benjamin-Chung, J. Evaluating the Survival and Removal of *Escherichia coli* from Surfaces Made with Traditional and Sustainable Cement-Based Materials in Field-Relevant Conditions. Submitted and under peer review. <https://www.biorxiv.org/content/10.1101/2024.11.07.622504v1>
- [2] Fernández, S[†], **Anderson, C. E.**, Boehm, A.B., & Congreve, D. N.[†] (2024). Strengthening the Academic Pipeline for Underrepresented Students via Early Exposure to Graduate Education. *Chem*, 10, 1609-1619, 2024.
- [3] **Anderson, C. E.**, & Boehm, A. B.[†] (2023). Sunlight inactivation of enveloped viruses in clear water. *Environmental Science & Technology*. 57 (50), 21395-21404.

- [4] Yin, R., **Anderson, C. E.**, Zhao, J., Boehm, A. B., & Mitch, W. A.[†] (2023). Controlling contaminants using a far-UVC-based advanced oxidation process for potable reuse. *Nature Water*, 1-8.
- [5] **Anderson, C. E.**, Wolfe, M. K., & Boehm, A. B.[†] (2023) Enveloped and Non-Enveloped Virus Survival on Microfiber Towels. *PeerJ*, 11, e15202.
- [6] **Anderson, C. E.**, Tong, J., Zambrana, W., Boehm, A. B., & Wolfe, M. K.[†] (2023). Investigating the Efficacy of Various Handwashing Methods against Enveloped and Non-Enveloped Viruses. *The American Journal of Tropical Medicine and Hygiene*, tpm2220287–tpm2220287.
- [7] Zambrana, W., Tong, J., **Anderson, C. E.**, Boehm, A. B.[†], & Wolfe, M. K.[†] (2022). Quantifying the Viral Reduction Achieved Using Ash and Sand as Handwashing Agents. *The American Journal of Tropical Medicine and Hygiene*, tpm2220581–tpm2220581.
- [8] **Anderson, C. E.**, & Boehm, A. B.[†] (2021). Transfer rate of enveloped and nonenveloped viruses between fingerpads and surfaces. *Applied and Environmental Microbiology*, 87(22), e01215-21.
► Highlighted in the Journal's Spotlight Section.
- [9] Graham, K. E., **Anderson, C. E.**, & Boehm, A. B.[†] (2021). Viral pathogens in urban stormwater runoff: Occurrence and removal via vegetated biochar-amended biofilters. *Water Research*, 207, 117829.
- [10] Knee, J., Sumner, T., Adriano, Z., **Anderson, C.**, Bush, F., Capone, D., Casmo, V., Holcomb, D., Kolsky, P., MacDougall, A., & others. (2021). Effects of an urban sanitation intervention on childhood enteric infection and diarrhea in Maputo, Mozambique: A controlled before-and-after trial. *Elife*, 10, e62278.

CONFERENCE PROCEEDINGS AND ABSTRACTS

Refereed

- [1] **Anderson, C. E.**, Zhang, M., Zheng, G., Gurfield, K., Gong, W., Mitch, W. A., McNeil, K., & Boehm, A. B. (2024, June 23-28). *Sunlight Inactivation of Viruses in Colored Water* [In-Person Poster Presentation]. Gordan Research Conference Environmental Sciences: Water, Holderness School, NH, United States. <https://drive.google.com/file/d/1w15f6jKYhHMBgkJqk7LGOLR5FWjx--Q3/view?usp=sharing>
- [2] **Anderson, C. E.**, Tong, J., Zambrana, W., Boehm, A. B., & Wolfe, M. K. (2022, October 30-November 3). *Investigating the efficacy of various handwashing methods against enveloped and non-enveloped viruses* [Virtual Recorded Conference Presentation]. American Society of Tropical Medicine & Hygiene Annual Meeting, Seattle, WA, United States. <https://drive.google.com/file/d/1V6Vq5EZ-uPJqIGHj-tzsTxZ1YIUcWeJ-/view?usp=sharing>
- [3] Zambrana, W., Tong, J., **Anderson, C. E.**, Chan, E. M. G., Boehm, A. B., & Wolfe, M. K. (2022, October 24-28). *Quantifying the viral reduction achieved using ash and sand as handwashing agents* [In-Person Conference Presentation]. University of North Carolina Water & Health Conference, Chapel Hill, NC, United States. <https://youtu.be/mx9kFOtHpMk?t=1240>
- [4] **Anderson, C. E.**, Tong, J., Zambrana, W., Boehm, A. B., & Wolfe, M. K. (2022, October 24-28). *Investigating the efficacy of commonly used handwashing methods against enveloped and non-enveloped viruses* [In-Person Poster Presentation]. University of North Carolina Water & Health Conference, Chapel

Hill, NC, United States. https://drive.google.com/file/d/1OISjG1Zx_RO1Art-xoBF8wPaOhS-9zoo/view?usp=sharing

- [5] **Anderson, C. E.**, Tong, J., Zambrana, W., Boehm, A. B., & Wolfe, M. K. (2022, May 18–19). *Investigating the efficacy of various handwashing methods against enveloped and non-enveloped viruses* [Virtual Live Conference Presentation]. 11th Emergency Environmental Health Forum (EEHF), Budapest, Hungary.

Non-Refereed

- [1] **Anderson, C. E.**, Boyce, S., Lindner, B., & Thomas, E. (2019, September). *Evaluation of direct potable reuse alternatives*. Water Environment Federation (WEF) Student Design Competition, Chicago, Illinois, United States.

RESEARCH EXPERIENCE

Research Interests: Pathogen persistence in the environment; human-animal-pathogen intersections; one-health systems; disease intervention methods; low-resource settings; pollution monitoring; risk assessment; microbial source tracking

Jan 2024 – Present

Postdoctoral Fellow, Boehm Lab

Civil and Environmental Engineering, Stanford University

Identified key mechanisms of enveloped virus inactivation (Influenza A) from sunlight, including genome and protein degradation. Determined the inactivation rate of enveloped viruses given the presence of photosensitizers in natural pond water. *Collaborators:* Catherine Blish, Medicine - Infectious Diseases at Stanford University; Bill Mitch, Environmental Engineering at Stanford University; Kris McNeill, Environmental Systems Science at ETH Zürich

Quantified the decay of *Ascaris suum* on concrete tiles as well as *Ascaris suum* removal from concrete by mopping. Related laboratory conditions to field conditions in Bangladesh to help inform results from the ongoing Cement floorS AnD chiLd hEalth (CRADLE) NIH trial. *Collaborator:* Jade Benjamin Chung, Medicine - Epidemiology & Population Health at Stanford University

Developed novel microbial source tracking (MST) markers for two phages recently identified in the human gut microbiome - Hankyphage and LoVEphage. Tested the new markers performance against common MST markers using different sample types and a range of environmental conditions. *Collaborator:* Ami Bhatt, Medicine - Hematology at Stanford University

Aug 2019 – Dec 2023

Doctoral Candidate Researcher, Boehm Lab

Civil and Environmental Engineering, Stanford University

Contributed to our understanding of enveloped viruses, including COVID-19, in the environment using viral surrogates to human pathogens as well as a variety of culture-based and molecular techniques. Explored the fate of viruses in the environment, transmission with human behavior, and intervention strategies, particularly for low-resource settings.

Examined the persistence of enveloped viruses in clear water with sunlight exposure, focusing on their decay compared to non-enveloped viruses. Found that

the enveloped viruses tested, Phi6 and Murine Hepatitis Virus, decayed at higher rates compared to the non-enveloped virus tested. Contributed to our understanding of virus fate in water and mechanisms of inactivation, including the role of specific solar wavelengths. Conducted experiments to evaluate the survival of enveloped and non-enveloped viruses on microfiber towels, including an antimicrobial variant, under varying environmental conditions. Identified that viruses decayed on hour-scale time frames, with increasing decay at high temperatures.

Investigated the role of human behavior in viral transmission by analyzing the transfer of enveloped and non-enveloped viruses between fingerpads and surfaces. Identified key factors influencing virus transfer rates, including virus type and surface characteristics. Revealed that non-enveloped viruses exhibited the highest transfer rates on smooth, nonporous surfaces.

Quantified the efficacy of different handwashing methods in reducing enveloped and non-enveloped viruses. Demonstrated that certain handwashing techniques, including short-duration and water-only methods, were as effective as prolonged soap and water washing, especially for enveloped viruses. Provided crucial insights into suitable handwashing alternatives, particularly for low-resource settings.

Aug 2017 – May 2019

Undergraduate Student Researcher, Brown Lab

Civil and Environmental Engineering, Georgia Institute of Technology

Assisted in the Maputo Sanitation (MapSan) Study, which focused on the impact of improved sanitation on children's gut health in rural Mozambique. Performed DNA extraction and a Gastrointestinal Pathogen Panel (GPP) on samples, testing for 15 different pathogens, including Rotavirus, Shigella, and Campylobacter. Assisted in the detection of soil-transmitted helminths, such as hookworm, in samples using qPCR. Quantified intestinal inflammation markers in stool samples through enzyme-linked immunosorbent assays (ELISAs). Managed and processed over 2,000 unique stool samples, conducting four ELISAs weekly. Organized and analyzed data from tests, ensuring data validity and overseeing a total of approximately 10,000 samples and replicates.

Jan 2018 – May 2018

Undergraduate Independent Research Project, Brown Lab

Civil and Environmental Engineering, Georgia Institute of Technology

Designed an experiment to assess the relationship between diarrheal stool samples and the prevalence of enteric coinfections and specific pathogens. Conducted GPP 15 pathogen analysis on 815 samples, including 132 classified as diarrheal. Identified significantly higher rates of parasitic and viral infections compared to bacterial infections. Found that Shigella was nearly four times more prevalent in diarrheal samples and Giardia was almost six times more common in diarrheal stool compared to non-diarrheal samples.

Jan 2017 – May 2017

Undergraduate Course Research Project, Physics: Environmental Monitoring

Physics, Lund University

Attended Lund University for six months, gaining insight into both Swedish and European environmental practices and regulations. Monitored air pollution and aerosol emittance (Aerodynamic Particle Sizer). Created and implemented a project to analyze the aerosol emittance of 3D printers in a confined room.

TEACHING EXPERIENCE

- Teaching Interests:** Microbiology Lab Techniques; Environmental Policy and Law; Pathogens; Epidemiology of Infectious Diseases; Research Data Management; Environmental Microbiology Monitoring
- Sept 2024 – Dec 2024 **Co-Instructor, CEE 274P (Environmental Health Microbiology)**
Civil and Environmental Engineering, Stanford University
Led labs related to the quantification of bacteriophage species in environmental waters. Organized lab materials, communicated expectations and safety information, and lectured on the scientific background of the experiments.
- March 2022 – June 2022 **Graduate Teaching Assistant, CEE 274P (Environmental Health Microbiology)**
Civil and Environmental Engineering, Stanford University
Helped students learn fundamental microbiology skills, including both culture- and molecular-based detection techniques with environmental samples. Oversaw experiment comprehension and safety. Mentored students in the execution of independent projects, aligning them with course timelines and objectives. Created an extensive protocol for future teaching assistants, including the establishment of equitable grading rubrics and a new lab supply inventory.
Overall Effectiveness Score: 4.88/5.00

SERVICE AND OUTREACH

- May 2021 – Present **Stanford Engineering Research Introductions Organization (SERIO)**
Marketing Director and Financial Officer, Stanford University
Co-founded the Stanford Engineering Research Introductions Organization (SERIO), a volunteer student group dedicated to helping first- and second-year undergraduates from underrepresented backgrounds learn about graduate school and research so that they may better prepare to enter a graduate school of their choice. Spearheaded the planning and execution of a comprehensive three-day conference-style program, bringing students from Stanford and universities across the country together to learn about graduate school. Handled logistics for the event, including arranging venues, catering, lodging, guest speakers, and lab tours. Secured funding for SERIO (roughly \$37,000) through multiple university groups, including engineering departments, the Vice Provost for Graduate Education, and the Associated Students of Stanford University. Managed SERIO finances, including our overall budget and the preparation of an end-of-year expense report. Designed and developed an array of marketing materials, including the SERIO website, logos, brochures, flyers, and t-shirts. Helped expand SERIO from the three-day conference-style program into a continual mentorship program with events throughout the year. In less than three years, we have paired over 150 undergraduate students in STEM with graduate student mentors.
- July 2022 – July 2023 **School of Engineering Dean's Graduate Student Advisory Council (DGSAC)**
Chair, Stanford University
Managed a team of graduate student council members and administrative staff, including overseeing logistics such as arranging catering and guest speakers. Structured the council into four groups (community, support, and mentorship;

diversity, equity, and inclusion; Master's students; and Ph.D. students) in alignment with overall motivations for the council. Initiated a review of graduate student handbooks across the School of Engineering, a help website to consolidate resources school-wide, the development of a standard research-group handbook, and the expansion of diversity, equity, and inclusion awards (totaling over \$25,000). Presented the council's work to engineering department chairs as well as the dean of engineering.

Oct 2023 & Feb 2021

Graduate Pathways to STEM (GPS)

Graduate Student Panelist, Stanford University and UC Berkeley

Assisted in a student panel for prospective graduate students interested in attending Stanford University or UC Berkeley. Provided guidance to students about graduate school, including what graduate life entails, preparing for graduate school, and finding an appropriate research group.

March 2023

Fecal Indicator Bacteria Monitoring Program with Middle School Students

Organizer and Volunteer, The Girl's Middle School

Organized lessons and activities for a group of middle schoolers who visited Stanford. Taught students what fecal indicators are and how they are useful for water management. Helped students collect environmental water samples on campus and quantify fecal indicators through IDEXX tests.

June 2022 – Sept 2022

Doerr School of Sustainability Transition Student Council

Chair, Stanford University

Facilitated the transition of established departments to the new School of Sustainability. Maintained regular communication with Dean Majumdar to discuss departmental transitions and organized council meetings. Consolidated Civil and Environmental Engineering department ideas, effectively presenting them at school-wide council meetings. Contributed to defining the vision of student involvement within the new school, including evaluating current channels for student feedback and making recommendations for future student organization structure. Played a role in curriculum development, conducting a comprehensive school-wide survey on curriculum. Provided insights on potential adjustments to existing classes, identified strengths in current courses, and assessed how students envision degree pathways. Advocated for the inclusion of programs beyond traditional academic coursework.

May 2022 & Nov 2019

Handwashing Program for Pre-School and Elementary Students

Organizer and Volunteer, Bing Nursey School and Escondido Elementary School

Demonstrated the importance of handwashing to elementary school students by conducting microbial growth experiments. Organized supplies, supervised experiments, and shared results of microbial growth from touching agar plates before and after handwashing.

INDUSTRY EXPERIENCE

- May 2019 – Aug 2019 **Refinery Environmental Engineering Intern, ExxonMobil Corporation**
Joliet, Illinois
Developed a new winter de-icing plan in accordance with Illinois EPA regulations to reduce chloride usage. Updated and managed the stormwater pollution prevention plan, conducted annual inspections, and submitted reports to the EPA. Collaborated with tank operators to improve tank procedures and minimize emissions. Created a tool to determine BACT for refinery renovation, facilitating compliance assessments.
- May 2018 – Aug 2018 &
May 2017 – Aug 2017 **Environmental Engineering Intern, Carter & Sloope Environmental Consulting**
Athens, Georgia
Secured a \$750,000 grant for storm drainage improvements in the city of Cornelia's low-income neighborhoods. Optimized the city of Covington's pipe system map using InfoWater hydraulic modeling. Conducted initial surveys and reservoir mapping for wastewater treatment sites. Created comprehensive maps of water valve locations, water treatment plants, and sewer lines for cities throughout Georgia. Oversaw construction site progress and attended management meetings.

PRESS

- [1] **Bangladesh Concrete Project:** *Stanford researchers lead efforts to cut carbon in concrete production.* (2024, September 23). The Stanford Daily. <https://stanforddaily.com/2024/09/23/researchers-cut-carbon-in-concrete-production/>
- [2] **Bangladesh Concrete Project:** *Lower-carbon concrete floors could pave the way to a health solution.* (2024, September 4). The Stanford Report. <https://news.stanford.edu/stories/2024/09/lower-carbon-concrete-floors-could-pave-the-way-to-a-health-solution>
- [3] **SERIS Program:** Jasmin Prasad. (2023, May 6). *Pacific Students, Nathaly Diaz Rosales and Mark Castaneda, attend Stanford Engineering Program.* The Pacifican. <https://www.thepacifican.com/news/iyxhmaibat09zu497pbanw3rd2hqk>
- [4] **Hand Hygiene Study:** Claire Anderson, Marlene Wolfe, & Alexandria Boehm. (2023). *Enveloped and non-enveloped virus survival on microfiber towels.* Elrha. <https://www.elrha.org/researchdatabase/enveloped-and-non-enveloped-virus-survival-on-microfiber-towels/>
- [5] **Dean's Council:** *Claire Anderson elected chair of the Dean's Graduate Student Advisory Council | Civil and Environmental Engineering.* (2022, December 1). Stanford Engineering & School of Sustainability Civil & Environmental Engineering. <https://cee.stanford.edu/news/claire-anderson-elected-chair-deans-graduate-student-advisory-council>
- [6] **Hand Hygiene Study:** Claire Anderson, Marlene Wolfe, & Alexandria Boehm. (2022, November 4). *How do we determine which handwashing practices to promote in humanitarian settings?* Elrha. <https://www.elrha.org/project-blog/how-do-we-determine-which-handwashing-practices-to-promote-in-humanitarian-settings/>

- [7] **SERIS Program:** Royvi Hernandez. (2022, April 14). *SJSU Student Wins Spot in SERIS*. Spartan Daily Vol. 158 April 14, 2022 by Spartan Daily - Issuu. <https://issuu.com/spartandaily/docs/sd041422all>
- [8] **SERIS Program:** Griffin Clark, Hannah Basali, & Adri Kornfein. (2022, February 7). Stanford welcomes students to Engineering Research Introductions Conference. *The Stanford Daily*. <https://stanforddaily.com/2022/02/07/stanford-welcomes-students-to-engineering-research-introductions-conference/>
- [9] **Capstone Project:** Jacques, J. (2019, November 6). Teams from British Columbia, Colorado Win 18th WEF Student Design Competition. *WEF Highlights*. <https://news.wef.org/teams-from-british-columbia-colorado-win-18th-wef-student-design-competition/>
- [10] **Capstone Project:** *Environmental Engineering Team Places 2nd in International Design Competition*. (2019, October 17). Georgia Tech School of Civil & Environmental Engineering, College of Engineering. <https://ce.gatech.edu/news/environmental-engineering-team-places-2nd-international-design-competition>
- [11] **Capstone Project:** *Capstone projects reuse wastewater and dredging material, protect pedestrians, create new ways to move traffic in congested NW Atlanta*. (2019, April 23). Georgia Tech School of Civil & Environmental Engineering, College of Engineering. <https://ce.gatech.edu/news/capstone-projects-reuse-wastewater-and-dredging-material-protect-pedestrians-create-new-ways>
- [12] **Study Abroad:** Claire Anderson. (2017, June 29). *Anderson finds balance—In life and the environment—During semester in Sweden*. Georgia Tech School of Civil & Environmental Engineering, College of Engineering. <https://ce.gatech.edu/news/anderson-finds-balance-life-and-environment-during-semester-sweden>

REVIEWER SERVICE

- ◇ Environmental Science & Technology
- ◇ Environmental Science & Technology Letters
- ◇ Environmental Science: Water Research & Technology
- ◇ Journal of Applied Microbiology
- ◇ Microbiology Spectrum
- ◇ PLOS Global Public Health

SKILLS

Technical Languages	MATLAB, R, HTML
Software Tools	AutoCAD, ArcGIS, GIS Trimble, InfoWater
Laboratory Techniques & Equipment	Plaque Assays; TCID50; Membrane Filtration; Quantitative, Digital-Droplet, and Endpoint PCR; Primer/Probe Design; DNA/RNA Extraction; Gel Electrophoresis; ELISA Assays; QIACube; Luminex Detection Method; IDEXX kits; Metagenomic Data Processing; General Power Tools
Certifications	Envision Sustainability Professional (Institute for Sustainable Infrastructure)
Languages	English (Fluent), Spanish (Intermediate)

REFERENCES

Alexandria Boehm, Ph.D.

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