

BIOGRAPHICAL SKETCHNAME: **Alexandra L. Polasko**eRA COMMONS USER NAME (credential, e.g., agency login): **APOLASKO**POSITION TITLE: **Postdoctoral Fellow****EDUCATION/TRAINING**

INSTITUTION AND LOCATION	DEGREE	Completion Date MM/YYYY	FIELD OF STUDY
University of California, Berkeley	B.S.	05/2015	Environmental Science
University of California, Los Angeles	M.S.	12/2017	Civil Engineering
University of California, Los Angeles	Ph.D.	07/2021	Civil & Environmental Engineering
University of California, Los Angeles	Postdoc	07/2022	Oral Biology/Microbiology
Stanford University	Postdoc	Current	Urology

A. Personal Statement

I bring a diverse and unique expertise to the field of benign urology, owing to my research experiences in molecular and microbiology, engineering, and cancer biology; elements that are tightly woven in benign prostate hyperplasia (BPH). In my proposed research, I plan to leverage this expertise to accomplish pre-clinical testing of BMP5 inhibitors to treat human BPH using patient-derived xenograft models. I have three research experiences that built the foundation for my work in urology with the first two during my doctoral degree and last during a postdoctoral position. In the first half of my Ph.D., I formulated and engineered a bacterial consortium to break down carcinogenic groundwater pollutant mixtures and methods for optimizing their use *in situ*. While aiming to remediate pollutants directly related to cancer, I became interested in the healthcare field and carcinogenesis. This interest led to a collaboration with Dr. Richard Kaner in UCLA's Chemistry Department to develop a hydrophilic coating to reduce microbial adhesion on catheters and other clinically relevant medical surfaces. My knowledge in applied microbiology and environmental engineering was an ideal combination of skills to investigate the surfaces of new materials exposed to bacterial and fungal infections. Ultimately, we demonstrated the efficacy of this novel coating to reduce biofilm formation on catheters both *in vivo* and *in vitro* and published our work in the journal *Advanced Materials*. I am an inventor on the patent for the application of this novel coating, which is now part of the UCLA-affiliated start-up-- SILQ. During the next pre-clinical phase of this research, I had the opportunity to work with the urologist, Dr. Matthew Bui, at Cedars Sinai to develop a unique and now-published multipronged method for evaluating biofilm formation on catheters in a clinical setting. Through these experiences I developed a passion for clinically driven urology.

Accelerating my drive to the medical field was the sudden news that my Ph.D. advisor was diagnosed with cancer. To support her incredibly difficult journey through surgery and chemotherapy, I strived to be as independent and productive as possible as well as understand the science behind these types of illnesses. Therefore, after graduation, I aimed to further my knowledge of bacteriology and tumor growth by joining a laboratory that investigated the mechanisms through which bacteria can progress gastrointestinal cancer. As a postdoc at UCLA's School of Dentistry in Dr. Hung Ton-That's lab, I researched how the oral microbiome can influence disease states (e.g., urinary tract infections, stillbirth) and cancer progression (specifically colorectal). I gained experience working with murine models (e.g., xenografts, pre-term birth, subcutaneous implants), growing human carcinoma cell lines, scanning electron microscopy, and immunohistochemistry staining methods. These experiences strategically aligned with the benign and cancerous urological diseases work of Dr. Brooks' lab. As a member of Dr. Brooks' lab, it has been rewarding to leverage my previous background and enthusiasm for urological research. For example, a small exploratory study on blocked catheter microbiomes was recently accepted for publication in the *Journal of Clinical and Experimental Urology* with our collaborators Dr. John Lavelle, Dr. Sharon Pitteri, and myself.

B. Positions and Honors

Positions

2022 – Present	Postdoctoral Fellow, Stanford University
2022 – Present	Member, American Urological Association
2022 – Present	Member, American Society of Microbiology
2021 – 2022	Postdoctoral Fellow, University of California, Los Angeles
2020 – 2021	UCLA Doctoral Student Advisory Committee for Civil Engineering Faculty Search- <i>Leadership role: Committee Chair of Advisory Doctoral Student Committee (2020-2021)</i>
2019 – 2020	Graduate Student Instructor, CEE 200-Teaching Assistant Training Seminar
2017 – 2020	UCLA CARE Science, Engineering, and Math Undergraduate Summer Research Program- <i>Leadership role: Graduate Mentor (2017-2020)</i>
2016 – 2021	Graduate Society of Women Engineers (GradSWE), Member- <i>Leadership roles: Secretary (2017-2018), VP of Undergrad-Graduate Affairs (2018-2019)</i>
2015 – 2021	Graduate Student Researcher, University of California, Los Angeles
2012 – 2015	Undergraduate Research Assistant, University of California, Berkeley

Honors

2022	UCLA Institutional Research and Academic Career Development Award (IRACDA) Postdoctoral Fellow Recipient (3-Year Award)
2022	UCLA School of Dentistry Research Day Oral Presentation Competition, 1 st Place
2021	UCLA Dentist-Scientist and Oral Health-Researcher T90 NIH Training Fellowship
2021	UCLA Distinguished Teaching Award for Teaching Assistants <i>1st female engineering graduate student to receive in UCLA history</i>
2015–2020	University of California Eugene V. Cota Robles 4-Year Graduate Fellowship
2019, 2020	SILQ Industry-Sponsored Research Fellowship
2019	UCLA Center for Advancement of Teaching Classroom Mini-Grant Award
2019	American Water Works Association Drinking Water Fellowship
2018	Emerging Contaminants Conference Poster Presentation Award, 1 st Place
2017	UCLA Distinguished Master's Thesis Award- <i>Engineering</i>
2017	UCLA Campus Wide Research Pitch Competition (GradSlam), 3 rd Place
2017	American Society of Microbiology Agar Art Finalist
2016	Brown and Caldwell Women in Leadership Fellowship
2016	New England Biolabs National Passion in Science Award- <i>Environmental Stewardship</i>
2016	National Science Foundation Graduate Research Fellowship, Honorable Mention
2015	Malcolm R. Stacey Research Fellowship
2015	Charlene Conrad Liebau Prize for Undergraduate Research, Honorable Mention
2015	Len Assante National Groundwater Research Fellowship
2011	AMEC Consulting Firm Student Scholarship Award
2011	Stockholm Junior Water Prize, Arizona State Winner

Patents

1. Shaily Mahendra and **Alexandra L. Polasko**. Anaerobic-Aerobic Bioremediation of Contaminated Water. Application Serial No. 62/590,030, Published on November 26, 2020
2. Richard B. Kaner, Dayong Chen, Brian T. McVerry, Ethan Rao, and **Alexandra L. Polasko**. The Regents of the University of California, Hydrophilix. Biofouling Resistant Coatings and Methods of Making and Using The Same. United States patent US 10,729822. 2020 Aug 4.

C. Contributions to Science

1. **[Postdoc Career] Characterized the oral pathogen, *Fusobacterium nucleatum*'s, motility and virulence factors:** As a postdoctoral fellow, I elucidated the oral pathogen, *Fusobacterium nucleatum*'s, ability to be motile as well as critical factors that contribute to its motility. *F. nucleatum* is a key colonizer in the development of oral biofilms and is classified as an oncobacterium that can proliferate cancers such as colorectal cancer. Most literature characterizes *F. nucleatum* as non-motile without validation. However, I visualized and quantified single cell and colony movement in three independent *F. nucleatum* strains on a macro and micro-scale in real-time using computational image

analyses. Additionally, using a transposon (Tn5) *F. nucleatum* mutant library, I discovered that lipopolysaccharides, a known endotoxin and virulence factor, aids *F. nucleatum* motility. Specifically, I found that truncating the outer most portion of the LPS structure (i.e. O-antigen) leads to reduced viability as well as virulence as demonstrated in a murine pre-term birth model of infection. The results from this work determined that LPS biogenesis is critical for *F. nucleatum* motility, bacterial colonization, and virulence as well as provides a new paradigm through which to view *F. nucleatum* pathogenicity.

- a. **Polasko, A.**, Chen, Y. Chen, Y-W., and Ton-That, H. Oral pathogen on the move: Characterizing *Fusobacterium nucleatum*'s motility. UCLA School of Dentistry Research Day, Mar. 2022. 2022 UCLA School of Dentistry Research Day Oral Presentation, 1st Place
- b. **Polasko, A.**, Chen, Y-W., Aadil, B., Escalante, N., and H. Ton-That. *Fusobacterium nucleatum* motility and the role of lipopolysaccharide O-antigens in physiology and pathogenesis. (2022). Manuscript Prepared.

2. **[Graduate Career] Treated contaminated water using biodegradation by engineered bacterial cultures as well as constructed and validated a novel antibiofouling coating:** My graduate research investigated microbial interactions with water contaminants and surfaces with applications ranging from bioremediation to biofouling prevention. With a focus on the duality of the microbial world, my first doctoral project successfully constructed an unconventional microbial community comprised of anaerobic (*Dehalococcoides mccartyi* 195) and aerobic bacteria (*Pseudonocardia dioxanivorans* CB1190) to remove chlorinated solvent mixtures over varying redox conditions. This microbial culture was deployed to a field site located in Pennsylvania *in situ* and successfully removed these recalcitrant pollutants from groundwater over 9 months. Additionally, I discovered CB1190's ability to biodegrade the known carcinogen and water pollutant, vinyl chloride (VC) to benign end products. Using metabolomics of ¹³C-labeled VC, I confirmed VC incorporation by CB1190 and tracked the production of isotopically labeled amino acids, keto acids, and sugar phosphate molecules to construct a degradation pathway. In my second doctoral project, I collaborated with Dr. Richard Kaner in the Chemistry Department at UCLA to construct a novel superhydrophilic, zwitterionic-based coating to reduce microbial attachment to surfaces. After demonstrating the material's ability to reduce bacterial and fungal adhesion on silicone, we demonstrated the application of this material on Foley catheters. From there, I worked with the urologist, Dr. Matthew Bui, at Cedars Sinai Hospital, to develop a multipronged assay for biofilm detection on catheters. We then tested the performance of our catheters compared to traditional latex and silicone catheters in patients as well as the foreign body reaction in mice, both of which showed reduction in microbial and collagen adhesion.
 - a. *McVerry, B., ***Polasko, A. [co-first author]**, *Rao, E., Haghniaz, R., Chen, D., He, N., Ramos, P., Hayahsi, J., Curson, P., Wu, C.-Y., BAndaru, P., Anderson, M., Bui, B., Sayegh, A., Mahendra, S., Carlo, D., Kreydin, E., Khademhosseini, A., Sheikhi, A., Kaner, R. B., A readily scalable, clinically demonstrated, antibiofouling zwitterionic surface treatment for implantable medical devices. *Adv. Mater.* 2022, 34, 2200254. ***authors contributed equally to this work**
 - b. ***Polasko, A.**, *Miao, Y., Kwok, K., Park., K., Park, J. O., and Mahendra, S. Vinyl chloride and 1,4-dioxane metabolism by *Pseudonocardia dioxanivorans* CB1190. *J. Haz Mat. Lett.*, 2021, 2:100039. ***authors contributed equally to this work.**
 - c. ***Polasko, A.**, *Ramos, P., Kaner, R. B., and S. Mahendra. A multipronged approach for accurate *in vitro* quantification of catheter-associated biofilms. *J. Haz. Mat. Lett.*, 2021, 2:10032. ***authors contributed equally to this work**
 - d. **Polasko, A.**, A. Zulli, P. Gedalanga, P. Pornwongthong, and S. Mahendra. A mixed microbial community for the biodegradation of chlorinated ethenes and 1,4-dioxane. *Environ. Sci. & Technol. Lett.*, 2019, 6: 49-54.
Awarded ACS Editors' Choice - This is an open access article published under an ACS AuthorChoice [License](#).
 - e. **Polasko, A.**, Zulli, A., and Mahendra, S. Biodegradation of CVOCs and 1,4-dioxane by an engineered microbial community, Emerging Contaminants Summit, Denver, CO., Mar. 2018. 2018 Emerging Contaminants Summit Student Poster Presentation, 1st Place

3. **[Early Career] Sulfate and sulfide inhibit biodegradation of the groundwater pollutant, trichloroethylene:** My early career contributions focused on applying my knowledge in environmental science and engineering to provide improvements to bioremediation technologies (i.e. use of microorganisms to breakdown hazardous compounds to benign end-products) for the removal of

drinking water pollutants. I worked with a group of engineering graduate students to characterize an anaerobic microbial consortium's ability to biodegrade carcinogenic groundwater contaminants. My role was to investigate the impact sulfate and sulfide, common and often disruptive geochemical parameters, have on the microbial consortia's ability to breakdown the water pollutant, trichloroethene.

- a. Mao, X., **Polasko, A.** and Alvarez-Cohen, L. The effects of sulfate reduction on TCE dechlorination by *Dehalococcoides* containing microbial communities. *Appl. Environ. Microbiol.*, 2017, 83:1-28.
- b. Mao, X., Stenuit, B., **Polasko, A.** and Alvarez-Cohen, L. Efficient metabolic exchange and electron transfer within a syntrophic TCE degrading co-culture of *Dehalococcoides mccartyi* 195 and *Syntrophomonas wolfei*. *Appl. Environ. Microbiol.*, 2015, 81: 2015-2024.
- c. **Polasko, A.**, Mao, X. and Alvarez-Cohen, L. Effects of sulfate and sulfide on *Dehalococcoides mccartyi* and *Desulfovibrio vulgaris* Hildenborough's ability to biodegrade trichloroethene, American Geophysical Union Annual Meeting, San Francisco, CA, Dec. 2014.
- d. Ziv-El, M., Popat, S.C., Parameswaran, P., Kang, D.-W. **Polasko, A.**, Halden, R.U., Rittmann, B.E. and Krajmalnik-Brown, R. Using electron balances and molecular techniques to assess trichloroethene-induced shifts to a dechlorinating microbial community. *Biotechnol. and Bioeng.*, 2012, 109: 2230-2239.

Complete List of Published Work in MyBibliography:

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

Peer Review for Journals: *Current Microbiology, International Journal of Biological Macromolecules, Journal of Hazardous Materials, Water Research, Environmental Science & Technology, Cancers*

D. Additional Information: Research Support and/or Scholastic Performance

Teaching Experience and Community Outreach

Graduate Student Instructor

1. Graduate Teaching Seminar (Fall 2019): Instructed 30 engineering students weekly on techniques for communicating engineering principles, concepts, and methods to undergraduate students.
2. Graduate Teaching Seminar-Online (Fall 2020): Built and instructed a 10-week course for 16 engineering students on how to effectively teach online. Course introduced incoming doctoral students to the existing and new responsibilities required of online teaching assistants and resources for equitable/inclusive teaching.

Teaching Assistant

3. Introduction to Environmental Engineering (Fall 2016): Led weekly discussion sections with 20-40 students on the environmental engineering problems, obstacles, and solutions. Helped students solve quantitative homework problems and develop a deeper understanding of concepts.
4. Water and Wastewater Treatment (Winter 2017): Led weekly 2-hour discussion section with 15 students on fundamentals of water and wastewater treatment processes. Live and recorded demonstrations were used to illustrate biological and chemical treatment methods.
5. Environ. Biotechnology-Online (Spring 2019): Led weekly online classes on biological processes in natural and engineered environments. Developed course content, online interactions, and grading.

Guest Lecturer: Fate & Transport of Organic Chemicals (UCLA, Fall 2017, Fall 2018), Environmental Biotechnology (UCLA, Winter 2018), Microbial Remediation (Pepperdine, Fall 2020, Summer 2021), Environmental Microbiology (UCLA, Winter 2021), Microbial Remediation (Antelope Valley Community College, Spring 2021), Microbiology (UCLA-School of Dentistry, Winter 2022)

Undergraduate Research Mentor

- Mentored and designed research projects for 4 Master's, 9 undergraduate, 4 high school students.
- 88% undergraduate researcher assistants from underrepresented/underserved communities
- 3 undergraduate students received UCLA's Dean Undergraduate Research Award
- Mentored 2 Masters students from California State Universities
- 3 students received UCLA CARE Science, Engineering, and Math Summer Research Fellowship

- 3 students presented at ABRCMS & won 1st Place in Poster Competition (*Biology & Microbiology Division*)
- 1 student from UC Davis Summer Program for Undergraduate Research (SPUR)

Community Outreach

- **CNSI Nanoscience Education Outreach [2021-2022]:** UCLA graduate students and postdoctoral scholars facilitate nanoscience-based experiment demonstrations for LA-based high school teachers. As a facilitator, I was part of a team that designed laboratory experiments, protocols, and exam materials that illustrate concepts from a wide range of UCLA research avenues including biopolymers, artificial intelligence, and genetics. Our goal was to bring nanoscience to students in a way that supports their educators.
- **UCLA Nanovation Youth Program [2021-2022]:** Teams of middle and high school students in LA create cutting-edge design and technology business proposals based off CNSI's Nanoscience Institute workshop series. As a mentor, I met weekly with the students and guided their literature review, proposal writing, slide deck preparation, and pitch meeting.
- **Graduate Society of Women Engineers [2016-2021]:** Elected VP of Undergraduate-Graduate Affairs and Secretary for the GradSWE. Led 5+ events each year connecting undergraduates with research laboratories as well as hiring events and tours with local with companies such as SpaceX and Northrop Grumman.