

CURRICULUM VITAE

Keith Z. Hazleton, M.D., Ph.D.

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Pediatrics
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EDUCATION AND PROFESSIONAL APPOINTMENTS

EDUCATION AND POST-GRADUATE TRAINING

1997-2002 Bachelor's of Science, Biochemistry/Biophysics, Oregon State University, Corvallis, OR
2004-2013 M.D., The Albert Einstein College of Medicine, Bronx NY
2004-2013 Ph.D., Biomedical Science, The Albert Einstein College of Medicine, Bronx NY
2013-2015 Residency, General Pediatrics, University of Colorado/Children's Hospital Colorado, Aurora, CO
2015-2019 Fellowship, Pediatric Gastroenterology, Hepatology and Nutrition, University of Colorado/Children's Hospital Colorado, Aurora, CO
2019-2020 Fellowship, Advance/Transplant Hepatology, University of Colorado/Children's Hospital Colorado, Aurora, CO
2025- M.S., Clinical and Translational Science, Department of Population and Public Health, Keck School of Medicine, University of Southern California

ACADEMIC APPOINTMENTS

2021-2023 Assistant Professor, Tenure Eligible, Pediatrics, University of Arizona College of Medicine, Tucson, AZ, USA
2023- Assistant Professor, Pediatrics, University of Southern California, Keck School of Medicine, Los Angeles, CA, USA

CLINICAL APPOINTMENTS

2020-2021 Assistant Professor, Clinical Scholars Track Pediatrics, Banner University Medical Center, Tucson, AZ, USA

ADMINISTRATIVE APPOINTMENTS

2022-2023 Interim Section Chief for Clinical Affairs, University of Arizona College of Medicine, Tucson, AZ, USA

LICENSURE AND CERTIFICATION

LICENSURE

2013 TL.0004686, Colorado, Expired (training license, expired 2015)

2015 DR.0055436, Colorado, Expired (2021)
2020 61253, Arizona, Active
2023 C190821, California, Active

BOARD CERTIFICATION OR ELIGIBILITY

2016 American Board of Pediatrics, General Pediatrics, Board Certified
2019 American Board of Pediatrics, Pediatric Gastroenterology, Board Certified
2020 American Board of Pediatrics, Pediatric Transplant Hepatology, Board Certified

OTHER CERTIFICATIONS OR EXAMINATIONS

2013 Diplomat of the National Board of Medical Examiners, Passed

HONORS, AWARDS:

1997 Presidential Scholar, four-year full tuition scholarship, Oregon State University, Corvallis, OR
2013 Elected to AOA upon graduating in the top of my medical school class, Alpha Omega Alpha Honor Medical Society
2014 Emerging Liver Scholar Program, Travel Award for pediatric, surgical and medical residents interested in hepatology, American Association of the Study of Liver Disease, Boston, MA
2019 Travel Award, top abstract, Gut Microbiota for Health World Summit/American Gastroenterological Association Institute, Miami, FL

TEACHING

CLASSROOM/DIDACTIC TEACHING

2022-2023 University of Arizona College of Medicine – Tucson, Pediatric Clerkship, Gastroenterology Lecture, Lecturer, 8 hours per year

CLINICAL BEDSIDE TEACHING/TRAINEE SUPERVISION

2020-2023 University of Arizona College of Medicine Tucson, Supervising Attending, Pediatric Gastroenterology, Medical Students/Pediatrics Residents, 100 hours/yr, 20 learners/yr
2023- Supervising Attending, Pediatric Gastroenterology and Hepatology Rotations, Medical Students/Pediatrics Residents, 100 hours/yr, 20 learners/yr

MENTORSHIP OF HIGH SCHOOL, UNDERGRADUATE, MASTER’S AND MEDICAL STUDENTS

2022-2024 Issa Jimenez-Espinoza, Medical Student, NASPGHAN Underrepresented in Medicine Summer Fellowship; Title: “High-fiber diet regime as protection against Clostridioides difficile infection”, Primary Mentor
2022-2023 Tatum Bardsley, Medical Student, Primary Mentor
2024- Samantha Rosen, Medical Student, NASPGHAN Summer Research Fellowship: The role of long-acting octreotide in the management of pediatric esophageal variceal bleeding, Primary Mentor

POSTGRADUATE MENTORSHIP

2022-2023 Christopher Gomez, M.D., Pediatrics Resident, University of Arizona/Banner University Medical Center Tucson, Faculty Mentor (now Pediatrician at Tanque Verde Pediatrics in Tucson, AZ)

SERVICE

DEPARTMENT SERVICE

2021-2022 Member, Pediatric Residency Education Committee, Banner University Medical Center-Tucson/University of Arizona College of Medicine

2023- Member, Gastroenterology Fellowship Selection Committee, Children's Hospital Los Angeles

HOSPITAL OR MEDICAL GROUP SERVICE, INCLUDING QUALITY IMPROVEMENT

2017 Gastroenterology Representative, ED/UC Constipation Clinical Care Guideline Committee, Children's Hospital Colorado

2018-2020 Gastroenterology Representative, Center for Cancer and Blood Disorders Clostridioides difficile Testing and Treatment Team, Children's Hospital Colorado

PROFESSIONAL SOCIETY MEMBERSHIPS

2014- American Association of the Study of Liver Disease

2015- North American Society for Pediatric Gastroenterology, Hepatology and Nutrition

2017- American Gastroenterological Association

2019- Society of Pediatric Liver Transplantation

PROFESSIONAL SERVICE

2021- Member, Research Committee, North American Society of Pediatric Gastroenterology, Hepatology and Nutrition

2022-2025 Co-Chair, Grants Subcommittee (Research Committee), North American Society of Pediatric Gastroenterology, Hepatology and Nutrition

RESEARCH AND SCHOLARSHIP

MANUSCRIPT REVIEWS

2017 mSystems

2018 Scientific Reports

2019 Nature Biofilms and Microbiomes

2020 Pediatric Pulmonology

2022 Microbiology

2024 Pediatric Obesity, Journal of Pediatric Gastroenterology and Nutrition

2025 Journal of Pediatric Gastroenterology and Nutrition

GRANT REVIEWS:

2022 NASPGHAN Foundation, Study Section Member, reviewer

2023-2025 NASPGHAN Foundation, Study Section Co-chair and reviewer

GRANT SUPPORT - CURRENT:

- 2021-2026 National Institute of Allergy and Infectious Disease, 1U01AI150589
Dietary and synbiotic strategy to limit gut microbiome dysbiosis and protect against
Clostridioides difficile infection
Co-Investigator (Lozupone), 15% Effort
- 2025-2028 Southern California Clinical and Translational Science Institute, UL1TR001855
Interplay between Gut Microbiome Dysbiosis and Acute Cellular Rejection in Pediatric
Liver Transplantation
Primary Investigator (Hazleton), 60% Effort, \$230,000

GRANT SUPPORT - PAST:

- 2018-2020 Cystic Fibrosis Foundation, HAZLET18D0
The role of the CF gut microbiome in modulating nutritional status: Fourth Year and
Fifth Year Clinical Fellowship Awards
Primary Investigator (Hazleton), 75% Effort, \$200,000
- 2016-2018 National Institute of Diabetes and Digestive and Kidney Diseases, 5T32DK067009
Institutional Training Grant in Pediatric Gastroenterology
Research Fellow (Sokol), 75% Effort
- 2015-2017 Cystic Fibrosis Foundation, HAZLET15B0
Clinical Fellowship Grant
Primary Investigator (Hazleton), 75% Effort, \$134,000

PATENTS AND PATENT APPLICATIONS:

- 2011 **Hazleton KZ**, Schramm VL, Crump DR, Clinch K, Tyler PC, Evans GB, Mason JM.
Phosphoribosyltransferase inhibitors and uses thereof, US Provisional Patent
Application 61/481784

INVITED AND CONTRIBUTED TALKS OUTSIDE USC

- 2017 Invited Lecture, "Distal Intestinal Obstructive Syndrome", Division of Pediatric
Pulmonology, Children's Hospital Colorado/University of Colorado, Aurora, CO
- 2017 Invited Lecture, "GI complications in Cystic Fibrosis", CF Bootcamp for providers, CF
Center at Children's Hospital Colorado, Aurora, CO.
- 2018 Invited Lecture, "Constipation for Hospitalists", Pediatric Hospital Medicine Fellows'
Lecture Series, Children's Hospital Colorado, Aurora, CO.
- 2021 Invited Lecture, "Neonatal Acute Liver Failure", Division of Neonatology, University of
Arizona College of Medicine, Tucson, AZ
- 2021 Invited Lecture, "Disorders in Pediatric Hepatology", Gastroenterology and
Hepatology Fellow's Conference, Department of Medicine, University of Arizona
College of Medicine, Tucson, AZ
- 2021 CME Lecture, "Pediatric Liver Disease: From Tinies to Teens", Banner University
Medical Center, Tucson, AZ

- 2022 Grand Rounds, “Diet-related Disease: Focus on the Cause”, Department of Pediatrics, University of Arizona College of Medicine Tucson, Tucson, AZ
- 2023 CME Lecture, “Acute and Chronic Hepatitis”, Pediatrics in the Desert, Tucson, AZ
- 2024 Grand Rounds, “Dietary Influences on C. difficile Infection”, Department of Pediatrics, SUNY-Downstate Health Sciences University, Brooklyn, NY
- 2025 Invited Webinar, “Biliary Atresia”, Liver Health Foundation, Los Angeles, CA

CITATION METRICS (WEB OF SCIENCE)

H-index: 12 Citation count: 771

PUBLICATIONS: * denotes trainees

REFEREED JOURNAL ARTICLES:

1. Vetting MW, Hegde SS, **Hazleton KZ**, Blanchard JS. Structural characterization of the fusion of two pentapeptide repeat proteins, Np275 and Np276, from *Nostoc punctiforme*: resurrection of an ancestral protein. Protein Sci. 2007 Apr;16(4):755-60. PMID: 17384236 PMCID: PMC2203339

I optimized recombinant protein purification protocol during my graduate school rotation in the Blanchard lab.

2. Taylor EA, Rinaldo-Matthis A, Lei L, Ghanem M, **Hazleton KZ**, Cassera MB, Almo SC, Schramm VL. *Anopheles gambiae* purine nucleoside phosphorylase: Catalysis, structure and inhibition. Biochem. 2007 Oct 30;46(43): 12405-15. PMID: 17918964

I purified the enzyme used in assays and performed the preliminary enzymology studies to optimize protocols.

3. Cassera MB, **Hazleton KZ**, Riegelhaupt PM, Merino EF, Luo M, Akabas MH, Schramm VL. Erythrocytic adenosine monophosphate as an alternative purine source in *Plasmodium falciparum*. J Biol Chem. 2008 Nov 21;283(47):32889-99. PMID: 18799466 PMCID: PMC2583302

Formulated hypothesis and designed experiments along with Dr. Cassera, performed cell culture of *Plasmodium* parasites. Assisted in writing of manuscript.

4. Riegelhaupt PM, Cassera MB, Fröhlich RF, **Hazleton KZ**, Hefter JJ, Schramm VL, Akabas MH. Transport of Purines and Purine Salvage Pathway Inhibitors by the *Plasmodium falciparum* Equilibrative Nucleoside Transporter PfENT1. Mol Biochem Parasitol. 2010 Jan;169(1):40-9. PMID: 19818813 PMCID: PMC2783484

Assisted in project design and writing of manuscript.

5. Cassera MB, **Hazleton KZ**, Merino EF, Obaldia N, Ho MC, Murkin AS, DePinto R, Gutierrez JA, Almo SC, Evans GB, Babu YS, Schramm VL. *Plasmodium falciparum* parasites are killed by a transition state analogue of purine nucleoside phosphorylase in a primate animal model. PLoS One. 2011;6(11):e26916. PubMed PMID: 22096507 PMCID: PMC3214022

I performed preliminary experiments of inhibitors in a mouse model of malaria that showed a lack of efficacy. These data, along with positive inhibition in cell culture laid the foundation for this project in

non-human primates using the human malarial parasite. For this manuscript, I performed analysis of purine nucleoside phosphatase activity in primate blood samples after pre-clinical trial of novel purine salvage inhibitors and assisted Dr. Cassera in quantifying purine levels in treated primates.

6. **Hazleton KZ**, Ho MC, Cassera MB, Clinch K, Crump DR, Rosario Jr. I, Merino EF, Almo SC, Tyler PC, Schramm VL. Acyclic Immucillin Phosphonates: Second generation inhibitors of *Plasmodium falciparum* hypoxanthine-guanine-xanthine phosphoribosyltransferase. *Chem Biol.* 2012;19(6): 721-730. PubMed PMID: 22726686 PMCID: PMC3397391

This project was the major part of my graduate school thesis. For this project I designed a series of small molecule inhibitors and pro-drugs that were synthesized by our organic chemistry collaborators, and then tested inhibitory activity against purified enzyme and in cell culture of live *P. falciparum*. This work discovered the strongest HG(X)PRT inhibitors described to date and led to a patent filing.

7. Clinch K, Crump DR, Evans GB, **Hazleton KZ**, Mason JM, Schramm VL, Tyler PC. Acyclic phosph(on)ate inhibitors of *Plasmodium falciparum* hypoxanthine-guanine-xanthine phosphoribosyltransferase. *Bioorg Med Chem.* 2013 21(17):5629-46. PubMed PMID: 23810424 PMCID: PMC3740065

This paper described the organic chemistry involved in synthesizing the compounds tested in previous publication. I designed all the compounds synthesized.

8. Zhang Y, Evans GB, Clinch K, Crump DR, Harris LD, Fröhlich RF, Tyler PC, **Hazleton KZ**, Cassera MB, Schramm VL. Transition state analogues of *Plasmodium falciparum* and human orotate phosphoribosyltransferases. *J Biol Chem.* 2013 Nov 29;288(48):34746-54 Pubmed PMID: 24158442 PMCID: PMC3843086

I conducted growth inhibition studies of the described inhibitors on the human malarial parasite, *P. falciparum*, with the inhibitor described in the manuscript.

9. Lomeli B, Galbraith H, Schettler J, Saviolakis G, El-Amin W, Osborn B, Ravel J, **Hazleton K**, Lozupone CA, Evans R, Bell S, Ochsner U, Jarvis T, Baqar S, and Janjic N. Multiple Ascending Dose Phase 1 Clinical Study of Safety, Tolerability and Pharmacokinetics of CRS3123, a Narrow Spectrum Agent with Minimal Disruption of Normal Gut Microbiota. *Antimicrob Agents Chemother.* 2019 Nov 4. pii: AAC.01395-19. PMID: 31685472 PMCID: PMC7187627

I performed analysis of the microbiome data produced from study participants in the Phase 1 trial. These analyses are presented as figures 5 and 6 in the manuscript.

10. Khalaf R, Ruan W, Orkin S, Wilsey M, Fishman DS, Mallon D, Pan Z, **Hazleton KZ**, Kramer RE, Walker T. Gastric injury secondary to button battery ingestions: a retrospective multicenter review. *Gastrointest Endosc.* 2020 Aug;92(2):276-283. PMID: 32334020 PMCID: PMC7422336

I contributed two cases to this series and assisted in writing the manuscript.

11. **Hazleton KZ**, Martin CG, Arnolds KL, Nusbacher NM, Moreno-Huizar N, Armstrong ML, Reisdorph N, Lozupone CA. Dietary fat promotes antibiotic-induced *Clostridioides difficile* mortality in mice. *NPJ Biofilms Microbiomes.* 2022 Apr 1;8(1):15. PMID: 35365681 PMCID: PMC8975876

This project was the major focus of my fellowship work. With Dr. Lozupone, I generated the hypothesis that a high-fat diet would increase disease severity in a mouse model of *C. difficile*, designed all experiments, conducted all mouse experiments, performed primary analysis of mortality and metabolite data, performed preliminary analysis of microbiome data, and wrote the manuscript.

12. Cotter JM, Stokes CL, Tong S, Birkholz M, Child J, Cost C, Coughlin R, Cox S, Dolan SA, Dorris K, **Hazleton KZ**, Lugo V, Norcross M, Pearce K, Dominguez SR. Quality Improvement Study to Reduce *C. difficile* Infectious and Stool Test Utilization. *Pediatrics*. 2024 Mar 1;153(3):e2023061981. doi: 10.1542/peds.2023-061981.PMID: 38352983

This work came out of a *C. difficile* task force that was assembled at Children's Hospital Colorado in response to rising *C. difficile* infection rates in the oncology population. I was a member of the treatment and testing committee representing the GI division. I provided expertise on diarrheal disease and input on clinical definitions that were used to restrict molecular testing on stool from patients that did not meeting criteria for a diarrheal illness. I participated in multiple PDSA cycles for the project to improve compliance with testing limitations and provided education to the GI division about the changes to clinical testing. Lastly, I reviewed the manuscript.

REFEREED CONFERENCE PROCEEDINGS:

1. Fuhler GM, Hecht GA; 2019 Gut Microbiota for Health World Summit Meeting Summary Writing Group [...Hazleton KZ...]. 2019 Gut Microbiota for Health World Summit. *Gastroenterology*. 2020 Jan;158(1):28-31. PubMed PMID: 31499039

As part of the travel award, I received for the Gut Microbiota for Health World Summit, I wrote a summary of two lecture sessions for this meeting recap. For middle-author publications, add a

REFEREED REVIEWS, CHAPTERS, AND EDITORIALS:

1. Cassera MB, Zhang Y, **Hazleton KZ**, Schramm VL. Purine and pyrimidine pathways as targets in *Plasmodium falciparum*. *Curr Top Med Chem*. 2011;11(16):2103-15. PubMed PMID: 21619511 PMCID: PMC3319363

I wrote the section on hypoxanthine-xanthine-guanine phosphoribosyltransferase and assisted in editing the final manuscript.

2. Kriss M**, **Hazleton KZ****, Nusbacher NM, Martin CG, Lozupone CA. Low Diversity Gut Microbiota Dysbiosis: Drivers, Functional Implications and Recovery. *Curr Op Micro*. 2018; 44, 34-40. PubMed PMID: 30036705 PMCID: PMC6435260

I worked with Dr. Kriss to write much of this review. I wrote the section "Drivers of Low-diversity dysbiosis", co-wrote the introduction and conclusions, and edited the manuscript for publication.

3. Castro M, Silver HJ, **Hazleton K**, Lozupone C, Nicholson MR. The Impact of Diet on *Clostridioides difficile* Infection: A Review. *J Infect Dis*. 2025 Jul 11;231(6):e1010-e1018. doi: 10.1093/infdis/jiaf233. PubMed PMID: 40321029.

I wrote with the section on animal models in collaboration with Dr. Lozupone and the rest of the group and edited the final manuscript.

ORAL PRESENTATION ABSTRACTS:

1. Immucillin Phosph(on)ates as Potent Inhibitors of *Plasmodium falciparum* Hypoxanthine-Guanine-Xanthine Phosphoribosyltransferase. Molecular Parasitology Meeting, Woods Hole, MA, Sept. 2010

2. Diet modulates *Clostridioides difficile* pathogenesis through host and microbe bile acid metabolism. Front Range Microbiome Symposium, Fort Collins, CO. April 2019

POSTER ABSTRACTS:

1. **Hazleton KZ**, MC Ho, Cassera MB, Greatrex B, Legentil L, Evans GB, Gulab SA, Tyler PC, Almo SC, Schramm VL. Structure-based analysis of inhibitor design elements for *Plasmodium* spp. hypoxanthine-guanine-xanthine phosphoribosyltransferase. Research Advances in Malaria, Johns Hopkins School of Public Health. May 2009
2. **Hazleton KZ**, Cassera MB, Ho MC, Evans GB, Tyler PC, Almo SC, Schramm VL. Targeting purine salvage as an anti-malarial strategy: transition states, structures and trials. Gordon Research Conference on Malaria, Oxford, UK. Sept. 2009
3. **Hazleton KZ**, Lozupone CA. Which antibiotics drive gut microbiome compositions towards those typical of individuals with recurrent *Clostridium difficile* infection?: a meta-analysis and template for antibiotic development. North American Society of Pediatric Gastroenterology, Hepatology and Nutrition National Meeting, Las Vegas, NV. Nov 2017
4. **Hazleton KZ**, Nusbacher NM, Lozupone CA. Using early succession butyrate-producers to limit antibiotic dysbiosis and protect against *Clostridium difficile* infection. Keystone Symposia Conference: Microbiome, Host Resistance and Disease, Banff, Alberta. March 2018
5. **Hazleton KZ**, Nusbacher NM, Moreno-Huizar N, Lozupone CA. Dietary determinants of *Clostridium difficile* infection in mice. North American Society of Pediatric Gastroenterology, Hepatology and Nutrition National Meeting, Fort Lauderdale, FL. October 2018
6. **Hazleton KZ**, Nusbacher NM, Moreno-Huizar N, Lozupone CA. Diet modulates *Clostridioides difficile* pathogenesis through host and microbe bile acid metabolism. Gut Microbiota for Health World Summit, Miami, FL: March 2019 – Winner of travel award
7. Kriss M, Siebert J, **Hazleton KZ**, Klawitter J, Dran R, Pomfret E, Pomposelli J, Nydam T, Colgan S, Lozupone CA. A novel multi-omics analysis (VOLARE) reveals liver-disease specific associations between gut microbiome, portal metabolome, and hepatic gene expression in humans. The Liver Meeting, Boston, MA: November 2019 – Poster of Distinction
8. Jimenez Espinoza I*, Midura-Kiela M, Bernardazzi M Azevedo C, Nusbacher NM, Lozupone CA, **Hazleton KZ**, High-Fiber Diet Regime As Protection Against *Clostridioides Difficile* Infection, North American Society of Pediatric Gastroenterology, Hepatology and Nutrition National Meeting, Orlando, FL. Oct 2022
9. Rosen SH*, Vu MH, Mindanao R, **Hazleton KZ**, A retrospective cohort study of long-acting octreotide in pediatric patients with portal hypertension to prevent variceal bleeding, Digestive Diseases Week, San Diego, CA, May 2025