



Michael R. Howitt

Associate Professor of Pathology and of Microbiology and Immunology

Bio

ACADEMIC APPOINTMENTS

- Associate Professor, Pathology
- Associate Professor, Microbiology and Immunology
- Member, Bio-X
- Member, Maternal & Child Health Research Institute (MCHRI)
- Faculty Fellow, Sarafan ChEM-H

HONORS AND AWARDS

- Investigator in the Pathogenesis of Infectious Disease Award, Burroughs Wellcome Fund (2025)
- NIH K01 Career Development Award, NIDDK (2017-2022)
- Harvard Digestive Diseases Center P/F Award, Harvard (2017)
- Barry R. and Irene Tilenius Bloom Fellowship, HSPH (2016)

PROFESSIONAL EDUCATION

- Post Doctoral Fellowship, Harvard School of Public Health , Immunology and Infectious Diseases (2017)
- Ph.D., Stanford University , Microbiology and Immunology (2011)
- B.A., UC Berkeley , Molecular and Cell Biology (2002)

LINKS

- Howitt Lab website: <https://www.howittlab.com>

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

Our lab is broadly interested in how intestinal microbes shape our immune system to promote both health and disease. Recently we discovered that a type of intestinal epithelial cell, called tuft cells, act as sentinels stationed along the lining of the gut. Tuft cells respond to microbes, including parasites, to initiate type 2 immunity, remodel the epithelium, and alter gut physiology. Surprisingly, these changes to the intestine rely on the same chemosensory pathway found in oral taste cells. Currently, we aim to 1) elucidate the role of specific tuft cell receptors in microbial detection. 2) To understand how protozoa and bacteria within the microbiota impact host immunity. 3) Discover how tuft cells modulate surrounding cells and tissue.

Teaching

COURSES

2025-26

- Cellular and Molecular Immunology: An Introductory Course: BIO 230, IMMUNOL 200, MI 200 (Aut)

2024-25

- Cellular and Molecular Immunology: An Introductory Course: BIO 230, IMMUNOL 200, MI 200 (Aut)

2023-24

- Cellular and Molecular Immunology: An Introductory Course: BIO 230, IMMUNOL 200, MI 200 (Aut)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Filipe Araujo Hoffmann, Jasmine Arunachalam, Alyssa Cutter, Xariana Vales Torres, Pat Yan

Postdoctoral Faculty Sponsor

Yang Zang

Doctoral Dissertation Advisor (AC)

Gabe Barron, Radeesha Jayewickreme, Flora Tierney, Miles Tyner

GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Immunology (Phd Program)
- Microbiology and Immunology (Phd Program)

Publications

PUBLICATIONS

- **Metabolic diversity in commensal protists regulates intestinal immunity and trans-kingdom competition.** *Cell*
Gerrick, E. R., Zlitni, S., West, P. T., Carter, M. M., Mechler, C. M., Olm, M. R., Caffrey, E. B., Li, J. A., Higginbottom, S. K., Severyn, C. J., Kracke, F., Spormann, A. M., Sonnenburg, et al
2023
- **Tuft cells mediate commensal remodeling of the small intestinal antimicrobial landscape.** *Proceedings of the National Academy of Sciences of the United States of America*
Fung, C., Fraser, L. M., Barrón, G. M., Gologorsky, M. B., Atkinson, S. N., Gerrick, E. R., Hayward, M., Ziegelbauer, J., Li, J. A., Nico, K. F., Tyner, M. D., DeSchepper, L. B., Pan, et al
2023; 120 (23): e2216908120
- **Tuft cells, taste-chemosensory cells, orchestrate parasite type 2 immunity in the gut** *SCIENCE*
Howitt, M. R., Lavoie, S., Michaud, M., Blum, A. M., Tran, S. V., Weinstock, J. V., Gallini, C. A., Redding, K., Margolskee, R. F., Osborne, L. C., Artis, D., Garrett, W. S.
2016; 351 (6279): 1329-1333
- **Protective or pathogenic? Tuft cells shape divergent immune outcomes in helminth and viral infections.** *Current opinion in immunology*
Tyner, M. D., Howitt, M. R.
2025; 97: 102657
- **The Lost Kingdom: commensal protists in the gut microbiota.** *Trends in microbiology*
Gerrick, E. R., Howitt, M. R.
2025

- **Distinct epigenomic landscapes underlie tissue-specific memory T cell differentiation.** *Immunity*
Buquicchio, F. A., Fonseca, R., Yan, P. K., Wang, F., Evrard, M., Obers, A., Gutierrez, J. C., Raposo, C. J., Belk, J. A., Daniel, B., Zareie, P., Yost, K. E., Qi, et al
2024
- **Tuft cell-derived acetylcholine promotes epithelial chloride secretion and intestinal helminth clearance.** *Immunity*
Billipp, T. E., Fung, C., Webeck, L. M., Sargent, D. B., Gologorsky, M. B., Chen, Z., McDaniel, M. M., Kasal, D. N., McGinty, J. W., Barrow, K. A., Rich, L. M., Barilli, A., Sabat, et al
2024
- **Intestinal tuft cell immune privilege enables norovirus persistence.** *Science immunology*
Strine, M. S., Fagerberg, E., Darcy, P. W., Barron, G. M., Filler, R. B., Alfajaro, M. M., D'Angelo-Gavrih, N., Wang, F., Graziano, V. R., Menasche, B. L., Damo, M., Wang, Y., Howitt, et al
2024; 9 (93): eadi7038
- **Commensal protists in reptiles display flexible host range and adaptation to ectothermic hosts.** *mBio*
Gerrick, E. R., DeSchepper, L. B., Mechler, C. M., Joubert, L. -, Dunker, F., Colston, T. J., Howitt, M. R.
2023: e0227323
- **The abundance and morphology of human large intestinal goblet and tuft cells during chronic schistosomiasis.** *Parasite immunology*
Gologorsky, M. B., Mechler, C. M., Forgó, E., Charville, G. W., Howitt, M. R.
2023: e12981
- **Succinate and tuft cells: how does this sensory process interface with food allergy?** *The Journal of allergy and clinical immunology*
Nico, K. F., Tyner, M. D., Howitt, M. R.
2022
- **The Taste Receptor TAS1R3 Regulates Small Intestinal Tuft Cell Homeostasis.** *ImmunoHorizons*
Howitt, M. R., Cao, Y. G., Gologorsky, M. B., Li, J. A., Haber, A. L., Biton, M., Lang, J., Michaud, M., Regev, A., Garrett, W. S.
2020; 4 (1): 23–32
- **A Tuft Act to Follow: Leukotrienes Take the Stage in Anti-worm Immunity.** *Immunity*
Fung, C. n., Howitt, M. R.
2020; 52 (3): 426–28
- **Tropism for tuft cells determines immune promotion of norovirus pathogenesis.** *Science (New York, N.Y.)*
Wilén, C. B., Lee, S., Hsieh, L. L., Orchard, R. C., Desai, C., Hykes, B. L., McAllaster, M. R., Balce, D. R., Feehley, T., Brestoff, J. R., Hickey, C. A., Yokoyama, C. C., Wang, et al
2018; 360 (6385): 204-208
- **A single-cell survey of the small intestinal epithelium.** *Nature*
Haber, A. L., Biton, M., Rogel, N., Herbst, R. H., Shekhar, K., Smillie, C., Burgin, G., Delorey, T. M., Howitt, M. R., Katz, Y., Tirosh, I., Beyaz, S., Dionne, et al
2017; 551 (7680): 333-339
- **Helicobacter pylori CheZHP and ChePep form a novel chemotaxis-regulatory complex distinct from the core chemotaxis signaling proteins and the flagellar motor.** *Molecular microbiology*
Lertsethtakarn, P., Howitt, M. R., Castellon, J., Amieva, M. R., Ottemann, K. M.
2015; 97 (6): 1063-1078
- **The Microbial Metabolites, Short-Chain Fatty Acids, Regulate Colonic T-reg Cell Homeostasis** *SCIENCE*
Smith, P. M., Howitt, M. R., Panikov, N., Michaud, M., Gallini, C. A., Bohlooly-Y, M., Glickman, J. N., Garrett, W. S.
2013; 341 (6145): 569-573
- **Exploring host-microbiota interactions in animal models and humans** *GENES & DEVELOPMENT*
Kostic, A. D., Howitt, M. R., Garrett, W. S.
2013; 27 (7): 701-718
- **A complex microworld in the gut Gut microbiota and cardiovascular disease connectivity** *NATURE MEDICINE*
Howitt, M. R., Garrett, W. S.

2012; 18 (8): 1188-1189

- **ChePep Controls *Helicobacter pylori* Infection of the Gastric Glands and Chemotaxis in the Epsilonproteobacteria** *MBIO*
Howitt, M. R., Lee, J. Y., Lertsethtakarn, P., Vogelmann, R., Joubert, L., Ottemann, K. M., Amieva, M. R.
2011; 2 (4)