

Shipra Vaishnava Ph.D.

Molecular Microbiology & Immunology

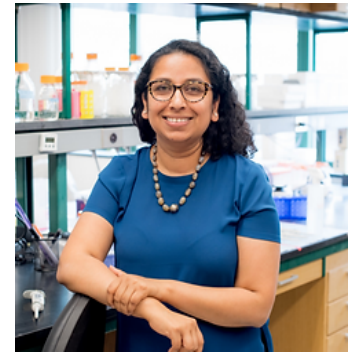
171 Meeting Street

Providence, RI, 02192

Phone: (401) 863 6403

Email: shipra_vaishnava@brown.edu

Website: <https://www.vaishnavalab.com/>



Profile Summary

As a tenured Associate Professor at Brown University, I lead an interdisciplinary team that explores the complex dynamics between host, diet, and microbiome, fostering a research environment that prioritizes mentorship, diversity, and innovation.

Academic Appointments

- 22-pres Esther Elizabeth Brintzenhoff Associate Professor, MMI, Brown University
- 19-22 Manning Assistant Professor, MMI, Brown University
- 15-19 Assistant Professor, MMI, Brown University

Education & Training

- 11-15 Instructor, Immunology Department, UTSW Medical Center, Dallas, TX, US
- 06-11 Post-doc, Immunology Department, UTSW Medical Center, Dallas, TX, US
- 00-06 Ph.D. in Cellular Biology, University of Georgia, GA, US
- 97-99 M.Sc. in Biotechnology, MS University, Baroda, India
- 93-96 B.Sc. in Botany, Delhi University, Delhi, India

Honors & Awards

- 20 American Association of Immunologist (AAI) Public Policy Fellow
- 17 Kavli Fellow, National Academy of Sciences
- 11 Young IBD Investigator Award, Crohn's and Colitis Foundation of America
- 04 American Society of Tropical Medicine and Hygiene Scientific Award

Research Funding

Ongoing

1. NIH R01DK113265-06 07/01/24-06/30/2030
Vitamin A metabolism at the host-microbiome interface
Role: PI
2. NIH/NIGMS/COBRE-Pilot Project 02/01/24-01/31/2025
Multiomics approach to define host adaptations to fungal commensal
Role: PI
3. Brown University/SEED fund 05/01/24-04/30/2025
Vitamin A metabolic potential of human gut microbiome

Completed

1. NIH R01DK113265 04/01/18-03/31/24
Role of epithelial cell intrinsic vitamin A metabolism in regulating immune function in the gut.
Role: PI
2. NIH R21AI168772 07/01/22- 06/30/24
Vitamin A metabolizing activity of the gut microbiome.
Role: PI
3. DoD W81XWH1810281 08/01/18-01/31/21
Mapping Gut microbiota composition *in-situ* using high-resolution spatial microdissection technique.
Role: PI
4. NIH/NIGMS/COBRE 06/01/16- 02/28/19
Spatial and Functional Organization of Intestinal Microbiome.
Role: Junior PI
5. URI/COBRE Pilot Project Program 06/01/16- 5/31/17
Role of vitamin A metabolism in immunity against intestinal bacteria.
Role: Co-PI
6. CCFA Career development Award 01/01/14- 12/31/16
Bacteria regulated vitamin A metabolism in the intestine.
Role: PI
7. Salomon Award, Brown University 02/01/16- 06/30/17
Regulation of gut microbiome biogeography.
Role: PI

Publications:

My lab focuses on the molecular underpinnings of host-microbiome crosstalk and its impact on health. We explore the relationship between gut microbes, dietary micronutrients, and immune function. Our work established that commensal bacteria in the gut are crucial regulators of vitamin A homeostasis in the host. Our findings delineated the previously unknown impact of commensal bacteria on vitamin A homeostasis, thus opening up questions regarding the role of microbially regulated RA synthesis on mucosal immunity and epithelial regeneration.

(* Undergraduate Student, # Graduate Student, * Post-doctoral Fellow in my group)

28. Han, G* and Vaishnav, S. (2024). Complement-ary protection for all ages. *Immunity*. 2024 Mar 12;57(3):411-413. PMID: 38479358
27. Liang SH, Sircaik S, Dainis J, Kakade P, Penumutchu S, McDonough LD, Chen YH, Frazer C, Schille TB, Allert S, Elshafee O, Hänel M, Mogavero S, Vaishnav S, Cadwell K, Belenky P, Perez JC, Hube B, Ene IV, Bennett RJ (2024). The hyphal-specific toxin candidalysin promotes fungal gut commensalism. *Nature*. 2024 Mar;627(8004):620-627. PMID: 38448595
26. Han, G* and Vaishnav, S. (2023). Microbial underdogs: exploring the significance of low-abundance commensals in host-microbe interactions. *Exp Mol Med*. 2023 Dec;55(12):2498-2507. PMID: 38036729
25. Han, G* and Vaishnav, S. (2023). Mucin-binding adhesins: A key to unlocking the door of mutualism. *Cell Host & Microbe* 2023 Aug 09;31(8):1254-56.

24. Yunker, R[#], Bonakdar, M[#]. and **Vaishnava, S.** (2022). Out of destruction comes new growth: Pore-forming antimicrobials make pancreas grow. *Cell Metabolism* 2022 Nov 1;34(11):1611-1613.
23. Bonakdar, M.[#], Czuba, L., Han, G.^{*}, Zhong, G., Luong, T., Isoherranen, N., and **Vaishnava, S.** (2022). Gut bacteria significantly expand vitamin A metabolic capacity of the mammalian host. *Cell Host & Microbe* 2022 Aug 10;30(8):1084-1092.
22. Han, G.^{*}, Luong, T., and **Vaishnava, S.** (2021). Low abundance members of the gut microbiome exhibit high immunogenicity. *Gut Microbes*. 2022 Jan-Dec;14(1):2104086. doi: 10.1080/19490976.2022.2104086.
21. Duncan, K.[#], Carey-Ewend, K.[&], and **Vaishnava, S.** (2021). Spatial analysis of gut microbiome reveals a distinct ecological niche associated with the mucus layer. *Gut Microbes*. 2021 Feb 11:1-21. doi: 10.1080/19490976.2021.1874815.
20. Iyer, N.^{*}, Grizotte-Lake, M.[#], Duncan, K.[#], Gordon, S. R.[#], Palmer ACS, Calvin C, Zhong G, Isoherranen, N., and **Vaishnava, S.** (2020). Epithelium intrinsic vitamin A signaling co-ordinates pathogen clearance in the gut via IL-18. *PLoS Pathog.* 16(4): e1008360.
19. Iyer, N.^{*} and **Vaishnava, S.** (2019). Vitamin A at the interface of host-commensal-pathogen interactions. *PLoS Pathog.* 15(6): e1007750.
18. Grizotte-Lake, M.[#], Zhong G, Duncan, K.[#], Kirkwood, J., Iyer, N.^{*}, Smolenski, I, Isoherranen N, and **Vaishnava S** (2018). Commensals Suppress Intestinal Epithelial Cell Retinoic Acid Synthesis to Regulate Interleukin-22 Activity and Prevent Microbial Dysbiosis. *Immunity* 49(6):1103-1115.e6.
17. Grizotte-Lake, M.[#] and **Vaishnava, S.** (2018). Autophagy: Suicide prevention hotline for the gut epithelium. *Cell Host & Microbe* 23(2):147-148.
16. Iyer, N.^{*}, and **Vaishnava, S.** (2016). Alcohol Lowers Your (Intestinal) Inhibitions. *Cell Host & Microbe* 19, 131-133.
15. **Vaishnava, S.** (2016). The Intestinal Mucus Layer Comes of Age. *Trends in Immunology* 37, 3-4.

Post-doctoral Publications

During my post-doctoral training, I focused on understanding how epithelial cells sense intestinal bacteria and the immune responses they trigger. Using the novel antimicrobial protein RegIII γ as a model, I uncovered a key molecular mechanism by which epithelial cells detect commensal bacteria. This work provided significant insights into the mammalian immune system's interaction with bacterial communities and redefined our understanding of bacterial-epithelial interfaces.

14. Derebe, M.G., Zlatkov, C.M., Gattu, S., Ruhn, K.A., **Vaishnava, S.**, Diehl, G.E., MacMillan, J.B., Williams, N.S., and Hooper, L.V. (2014). Serum amyloid A is a retinol binding protein that transports retinol during bacterial infection. *eLife* 3, e03206.
13. Raetz, M., Hwang, S.H., Wilhelm, C.L., Kirkland, D., Benson, A., Sturge, C.R., Mirpuri, J., **Vaishnava, S.**, Hou, B., Defranco, A.L., Yarovinsky, F., Hooper, L.V. (2013). Parasite-induced TH1 cells and intestinal dysbiosis cooperate in IFN-gamma-dependent elimination of Paneth cells. *Nature Immunology* 14, 136-142.
12. **Vaishnava, S.**, Yamamoto, M., Severson, K.M., Ruhn, K.A., Yu, X., Koren, O., Ley, R., Wakeland, E.K., and Hooper, L.V. (2011). The antibacterial lectin RegIII γ promotes the spatial segregation of microbiota and host in the intestine. *Science* 334, 255-258.

11. **Vaishnava, S.**, and Hooper, L.V. (2011). Eat your carrots! T cells are RARing to go. *Immunity* 34, 290-292.
10. Ismail, A.S., Severson, K.M., **Vaishnava, S.**, Behrendt, C.L., Yu, X., Benjamin, J.L., Ruhn, K.A., Hou, B., DeFranco, A.L., Yarovinsky, F., Hooper, L.V. (2011). Gammadelta intraepithelial lymphocytes are essential mediators of host-microbial homeostasis at the intestinal mucosal surface. *Proc. Natl. Acad. Sci.* 108, 8743-8748.
9. Duerkop, B.A., **Vaishnava, S.**, and Hooper, L.V. (2009). Immune responses to the microbiota at the intestinal mucosal surface. *Immunity* 31, 368-376.
8. **Vaishnava, S.**, Behrendt, C.L., Ismail, A.S., Eckmann, L., and Hooper, L.V. (2008). Paneth cells directly sense gut commensals and maintain homeostasis at the intestinal host-microbial interface. *Proc. Natl. Acad. Sci.* 105, 20858-20863.
7. **Vaishnava, S.**, and Hooper, L.V. (2007). Alkaline phosphatase: keeping the peace at the gut epithelial surface. *Cell Host & Microbe* 2, 365-367.

Graduate School and Earlier Publications

During my graduate studies, I discovered that apicomplexan parasites lack genes for plastid division typically found in plants and algae. Through cell biological studies in *Toxoplasma* and *Sarcocystis*, I demonstrated that these organelles divide via centrosome association rather than using a bacterial-like ftsZ fission ring. I identified a novel eukaryotic fission ring that partitions both the nucleus and plastid simultaneously. Additionally, I investigated plastid genome dynamics, revealing that genome replication still relies on prokaryotic genes and proteins, unlike organelle segregation and fission.

6. Reiff, S.B., **Vaishnava, S.**, and Striepen, B. (2012). The HU protein is important for apicoplast genome maintenance and inheritance in *Toxoplasma gondii*. *Eukaryotic Cell* 11, 905-915.
5. **Vaishnava, S.**, and Striepen, B. (2006). The cell biology of secondary endosymbiosis: how parasites build, divide and segregate the apicoplast. *Molecular Microbiology* 61, 1380-1387.
4. Gubbels, M.J., **Vaishnava, S.**, Boot, N., Dubremetz, J.F., and Striepen, B. (2006). A MORN-repeat protein is a dynamic component of the *Toxoplasma gondii* cell division apparatus. *Journal of Cell Science* 119, 2236-2245.
3. Gaji, R.Y., Zhang, D., Breathnach, C.C., **Vaishnava, S.**, Striepen, B., and Howe, D.K. (2006). Molecular genetic transfection of the coccidian parasite *Sarcocystis neurona*. *Molecular and Biochemical Parasitology* 150, 1-9.
2. **Vaishnava, S.**, Morrison, D.P., Gaji, R.Y., Murray, J.M., Entzeroth, R., Howe, D.K., and Striepen, B. (2005). Plastid segregation and cell division in the apicomplexan parasite *Sarcocystis neurona*. *Journal of Cell Science* 118, 3397-3407.
1. White, M.W., Jerome, M.E., **Vaishnava, S.**, Guerini, M., Behnke, M., and Striepen, B. (2005). Genetic rescue of a *Toxoplasma gondii* conditional cell cycle mutant. *Molecular Microbiology* 55, 1060-1071.

Invited Talks

Keynotes

04/23

MIT Annual Microbiome Symposium

08/19 NERIC Conference, Bretton Woods, NH
09/17 Student invited seminar, Cell and Molecular Biology program, URI, RI
08/13 Department of Cellular Biology Annual Retreat, University of Georgia, GA

National & International

09/24 Gastrointestinal Tract XXI: Life, Death, and Disease. Banff, Calgary, Canada
08/24 Impact of Diet on Mucosal Immunity and Immune-mediated Digestive Diseases Workshop, NIH, Rockville, MD
07/24 FASEB 7th International Retinoid Meeting, St. Paul, MN
06/24 Mount Sinai's Precision Immunology Institute (PrISM), New-York, NY
10/23 Department of Veterinary Biosciences, The Ohio State University
10/23 Department of Molecular and Structural Biochemistry Seminar, North Carolina State University.
09/23 Diet & Optimum Health Conference, Linus Pauling Institute, Oregon State University.
07/23 Salmonella GRC, Tuscany, Italy
03/23 Hepatology and Gastroenterology Department Research Seminar, University of Illinois
02/23 Immunology Institute Seminar, Medical School, University of Alabama at Birmingham
01/23 FASEB Carotenoids Meeting, Ventura, CA
05/21 University of Pennsylvania, Prok Seminar Series (Virtual Seminar)
03/21 The University of Toledo College of Medicine and Life Sciences, (Virtual Seminar)
01/21 Rutgers Center for Lipid Research Seminar Series (Virtual seminar)
01/20 UCSD Program in Immunology Seminar Series, La Jolla, CA
11/19 Microbiology seminar Series, Dartmouth College, Hanover, NH
11/19 Microbiome Innovation Summit, The Jackson Laboratory in Farmington, CT
10/19 Mucosal Immunology Seminar Series at Mass General Hospital (MGH), Boston, MA
10/19 Immunology Interest Group (IIG) Seminar Series at the National Institutes of Health
06/18 FASEB Nutritional Immunology Conference, Leesburg, VA
11/16 EMBO Innate Lymphocyte Cell Symposium, Berlin
08/16 Mucosal Immunology Course and Symposium (MICS), Toronto
03/16 Department of Biology Seminar Series, Boston College, MA
04/14 School of Life Science, Ecole Polytechnique Federale de Lausanne (EPFL), Switzerland
03/14 Food Science Department, University of Nebraska, NE
03/14 Microbiology & Immunology Department, University of British Columbia, Canada
02/14 Molecular Microbiology and Immunology department, Brown University, RI
01/14 Department of Molecular Microbiology, UC Davis, CA
12/13 Department of Biology, Carnegie Mellon University, PA
04/13 Department of Microbiology and Immunology, University of Tennessee
03/13 Department of Molecular Biology, Princeton, NJ
02/13 Microbiology and Immunology Department, UCSF
01/13 Molecular and Cell Biology Department, Berkeley, CA
01/13 Department of Immunology, Duke University, NC
01/13 Department of Pathology, Microbiology & Immunology, Vanderbilt University, TN
05/11 Gut Microbiota in Health and Disease Symposium, EPFL, Switzerland

Regional & Institutional

11/21	New England Immunology Conference (NEIC), Woods Hole, MA
04/19	COBRE Center for Computational Biology of Human Disease, Brown University
05/16	Pediatric Research Colloquium, Rhode Island Hospital, RI, 5/16
08/15	Molecular & Cellular Biology, Brown University

Teaching

My teaching philosophy is rooted in the concept of learning by discovery, mirroring my research approach. I aim to inspire students with a drive to uncover new knowledge, fostering a deeper understanding of the material. This is achieved by establishing a foundation of primary results and current knowledge, then addressing knowledge gaps through real-world projects. This approach not only benefits students but also enhances my understanding as an educator. In my lectures I emphasize critical thinking, public communication, and innovative research, encouraging students to engage with contemporary scientific challenges and discussions.

Classes directed

16-pres	Co-director Biol1600, Development of Vaccines to Infectious Diseases, Enrollment capped at 90 students
17-pres	Co-director Biol1250, Host-Microbiome Interactions in Health and Disease, Enrollment capped at 20 students

Guest lecturer

15-pres	Biol1520, Innate Immunity
18-pres	Biol0100, Living Biology
20	Biol0520, Immunology

Mentoring

Junior Faculty

2022- pres	Faculty mentor for Dr. Sanghyun Lee (Assistant Professor MMI)
2023-pres	Faculty mentor for Dr. Karthikeyani Chellappa (Assistant Professor MMI)

Postdocs

18-pres	Geon Goo Han
15-19	Namrata Iyer Currently: Marie Curie Fellow, Trinity College, Dublin

Graduate Students

21-pres	Rebecca Yunker (Patho)
19-24	Maryam Bonakdar (Patho) Currently: In job market
17-22	Sarah Gordon (MCB) Currently: Science Editor
15-20	Mayara Grizotte-Lake (Patho) Currently: Scientist, Taconic Farms
15-20	Kellyanne Duncan (Patho) Currently: Scientist, Seres Therapeutics, Boston

Undergraduate students

21- 23	Shoshana Markel	Independent Study
21-23	Meera Singh	Honors thesis Currently: Graduate Student, Columbia
19-22	Theodoros Karanikolas	Independent study Currently: MD program at
19-22	Masha Glik	Independent study
17-21	Gracie Whelan	Honors thesis Currently: MD program at Columbia
17-19	Douglas Wu	Research assistant Currently: MD program at OSU
16-19	Kelly Carey-Ewend	Honors thesis Currently: MD/Ph.D. program at UNC
15-16	Joshua Hackney	Research assistant Currently: Grad student, JHU
15	Monica Thapaliya	Leadership Alliance Currently: Grad student, U Penn

Advising

Ph.D. Thesis Committee Membership

Name	Period	Advisor
Ryan Xu	15-18	Amanda Jamieson
Jenna Perry	15-19	Chris de Graffenried
Aislinn Rowan	16-19	Peter Belenky
Gregory Thomson	17-20	Richard Bennett
Angela Tata	17-21	Laurent Brossay
Gregory Serpa	17-21	Amanda Jamieson
Jenna Wurster	18-22	Peter Belenky
Swathi Penumutch	19-pres	Peter Belenky
Miles Mundy	20-pres	Laurent Brossay
Alex Jordan	21-pres	Laurent Brossay
Ying Li	23-	Lalit Buera
Shade Rodrigues	23-	Craig LeFort

Honors Thesis Committee

Name	Period	Advisor
Michelle Zabat	17	Peter Belenky
Zemplen Pataki	17	Chris de Graffenried
Emma Diamond	20-21	Peter Belenky
Katharine Hewlett	20-21	Peter Belenky

Undergraduate Advising

16-pres	Concentration advisor in Human Health & Biology (total 20 students)
16-pres	Freshman and Sophomore advisor (total 20 students)

Service

Intramural

16-pres	Trainer in MCB Graduate Program
15-pres	Trainer in Pathobiology Graduate Program

16, 18 Pathobiology Graduate Student Admissions Committee
17-20 Brown University Community Council (BUCC), 2017-2020
18-pres Trainer in CCMB Graduate Program
19-pres MMI Seminar Series speaker selection committee
19 MMI Tenure Track Faculty Recruitment Committee
20-pres Pathobiology Graduate Program Steering Committee
22-pres Biomed Space Committee

Extramural

05/18 Co-Chair, Mucosal Immunology Block-Symposium, AAI Meeting, Austin Texas.
03/19-03/21 Review panel for Research Fellowship Award, Crohn's and Colitis Foundation of America (CCFA)
04/19 *Ad hoc* NIDDK (ZDK1 GRB-7 O1)
04/19 *Ad hoc* NIH NIAID R13
10/19 *Ad hoc* NIDDK (ZDK1 GRB-7 O1)
06/20 *Ad hoc* NIDDK ZRG1 DKUS-P (02)
12/20 *Ad hoc* NIDDK ZRG1 DKUS-P (02)
03/21 *Ad hoc* NIDDK, DNPD study section
06/21-03/25 Standing member NIDDK, DNPD study section
06/21-05/24 Committee member, AAI Education Committee
15-pres *Ad hoc* reviewer for Cell, Cell Host & Microbe, Immunity, J Ex. Medicine, Nature Communications, Elife, PLOS Pathogen. Gut Microbes, NPJ Biofilms & Microbiome, Science Advances.