

Shuo Han, Ph.D.
Department of Biochemistry
Duke University School of Medicine

Education

- 2009-2017 **Ph.D. in Genetics**
Stanford University School of Medicine, Stanford, CA
- 2005-2009 **B.S. in Biology**
Massachusetts Institute of Technology, Cambridge, MA

Employment and Research Experience

- 2022 **Assistant Professor, Department of Biochemistry, Duke University School of Medicine**
Deciphering the chemical language of gut bacteria in host longevity
- My laboratory's research integrates the following approaches to define the mechanistic roles of gut bacteria and their metabolites in host aging physiology:
- High-resolution mass spectrometry to map the metabolism of gut bacteria and their host organisms
 - Systems approaches to identify bacterial genetic and biochemical pathways associated with candidate metabolites
 - Genetically tractable bacterial and host models to dissect intra-organismal pathways underlying gut bacterial signaling in healthspan and lifespan
- 2017-2022 **Postdoctoral Research, Stanford University School of Medicine**
Advisor: Dr. Justin Sonnenburg
Mechanistic interrogation of the human gut microbiome
- Built a microbiome-focused mass-spectrometry reference library and analytical pipeline (Python) to identify 800+ metabolites in diverse bacterial and host biofluids
 - Created a web-based Metabolomics Data Explorer (JavaScript) for dynamic user interactions with the metabolomics datasets with 3000+ samples
 - Democratized this metabolomics pipeline through tutorial workshops and collaborations at and outside Stanford University
 - Discovered novel metabolic patterns across microbial phylogeny by coupling strain-resolved comparative genomics and metabolomics
 - Constructed gnotobiotic mouse models to modulate health-relevant metabolites via gut bacterial manipulations
- 2009-2017 **Ph.D. Dissertation Research, Stanford University School of Medicine**
Advisor: Dr. Anne Brunet
Epigenetic regulation of fat metabolism and longevity
- Discovered a novel role of bioactive lipids (e.g., mono-unsaturated fatty acids), which link H3K4me3 chromatin modifiers to lifespan extension in *C. elegans*
 - Identified the molecular details responsible for the synthesis of these lipids in the intestine and for the communication between the germline and the intestine
 - Demonstrated that dietary intake of mono-unsaturated lipids extends lifespan in the physiological context, highlighting their potential health benefits in mammals
- 2007-2009 **Undergraduate Research, MIT/Whitehead Institute**
Advisor: Dr. Gerald Fink
Mechanism of fungal evasion from the host
- Identified several chromatin-modifying factors that modulate cell surface antigen variations in budding yeast *S. cerevisiae*

Selected Awards and Honors

2023	Mallinckrodt Grant, Edward Mallinckrodt Jr. Foundation
2023	Butler-Williams Scholar, National Institute on Aging (NIA)
2023	Junior Faculty Award, American Federation for Aging Research and Glenn Foundation
2023	Whitehead Scholar, Whitehead Charitable Foundation
2022	Duke Science and Technology Scholar
2019-2022	NIA Ruth L. Kirschstein National Research Service Award Postdoctoral Fellowship
2018-2019	Stanford University School of Medicine Dean's Postdoctoral Fellowship
2014-2015	Stanford University Mass Spectrometry Seed Grant
2014	CSHL Molecular Genetics of Aging Conference Fellowship
2010-2013	National Science Foundation Graduate Research Fellowship
2009-2014	Stanford Graduate Fellowship in Science and Engineering
2009	MIT John L. Asinari Award for Outstanding Research in Life Sciences
2008	HHMI EXROP Undergraduate Research Fellowship
2008	MIT Hope Babette Tang Scholarship
2008	S. Klein Prize in Technical Writing, MIT Ilona Carmel Writing Competition
2005-2008	Robert C. Byrd Honors Scholarship

Publications

As a PI (faculty appointment began on Sept 1, 2022):

1. **Han S[^]**, Guiberson ER, **Li Y**, and Sonnenburg JL[^]. High-throughput identification of gut microbiome-dependent metabolites. **Nature Protocols** 19, 2180-2205 (2024). [^]Corresponding author.
2. **Li Y**, **Han S**. Metabolomic applications in gut microbiota-host interactions in human diseases. **Gastroenterology Clinics of North America** 53, 383-397 (2024).

As a postdoctoral fellow:

3. Guthrie L, Spencer SP, Perelman D, Van Treuren W, **Han S**, Yu FB, Sonnenburg ED, Fischbach MA, Meyer TW, and Sonnenburg JL. Impact of 7-day homogenous diet on interpersonal variation in human gut microbiomes and metabolomes. **Cell Host Microbe** 30, 863-874 (2022).
4. **Han S^{*}**, Van Treuren W^{*}, Fischer CR, Merrill BD, DeFelice BC, Sanchez JM, Higginbottom, SK, Guthrie, L, Fall LA, Dodd D, Fischbach MA, and Sonnenburg JL. A metabolomics pipeline for the mechanistic interrogation of the gut microbiome. **Nature** 595, 415-420 (2021). ^{*}Equal contribution
 - Article featured in News and Views: Kindschuh WF and Korem T. Deciphering metabolism, one microbe at a time. **Nature** 595, 355-357 (2021).
5. Wastyk HC, Fragiadakis GK, Perelman D, Dahan D, Merrill BD, Yu FB, Topf M, Gonzalez CG, Van Treuren W, **Han S**, Robinson JL, Elias JE, Sonnenburg ED, Gardner CD, and Sonnenburg JL. Gut-microbiota-targeted diets modulate human immune status. **Cell** 184, 4137-4153 (2021).
6. Mars RAT, Yang Y, Ward Y, Houtti M, Priya S, Lekatz HR, Tang X, Sun Z, Krishna RK, Korem T, Bhattarai Y, Zheng T, Bar N, Frost G, Johnson AJ, Van Treuren W, **Han S**, Ordog T, Grover M, Sonnenburg J, D'Amato M, Camilleri M, Elinav E, Segal E, Blekhman R, Farrugia G, Swann JR, Knights D, and Kashyap PC. Longitudinal multi-omics reveals subset-specific mechanisms underlying irritable bowel syndrome. **Cell** 182, 1460-1473 (2020).

As a graduate student:

7. **Han S**, Schroeder EA, Silva-García CG, Hebestreit K, Mair WB, Brunet A. Mono-unsaturated fatty acids link H3K4me3 modifiers to longevity in *C. elegans*. **Nature** 544,185-190 (2017).
- Article featured in Research Highlights: Baumann K. Ageing: Is fat a key to longevity? *Nat Rev Mol Cell Biol* 18, 341 (2017).
8. Bieging-Rolett KT, Johnson TM, Brady CA, Beaudry VG, Pathak N, **Han S**, Attardi LD. p19(Arf) is required for the cellular response to chronic DNA damage. **Oncogene** 35, 4414-4421 (2016).
9. **Han S**, Brunet A. Lysosomal lipid lengthens life span. **Science** 347, 32-33 (2015).
10. **Han S**, Brunet A. Histone methylation makes its mark on longevity. **Trends Cell Biol** 22, 42-49 (2012).
11. Greer EL, Maures TJ, Hauswirth AG, Green EM, Leeman DS, Maro GS, **Han S**, Banko MR, Gozani O, Brunet A. Members of the H3K4 trimethylation complex regulate lifespan in a germline-dependent manner in *C. elegans*. **Nature** 466, 383-387 (2010).

Invited Talks

2024	Gerontological Society of America BioSci Symposium: Aging and the Microbiome, Seattle
2024	Activity Metabolomics and Mass Spectrometry Short Course, Scripps Research, Virtual
2024	Seminar series, University Program in Genetics and Genomics, Duke University
2024	Microbiome Seminar, University of North Carolina-Chapel Hill
2024	Seminar series, Duke Claude D. Pepper Older Americans Independence Center
2023	Masoro-Barshop Conference on Aging, Bandera, Texas
2023	Duke GI Research Conference, Duke University
2022	Duke Aging Center Annual Conference, Duke University
2022	Seminar series, Department of Molecular Genetics and Microbiology, Duke University
2022	7 th Microbiome Movement - Drug Development Summit, Virtual
2021	Metabolomics Association of North America-Microbiome Interest Group Seminar, Virtual
2020	8 th Microbiome Probiotics R&D and Business Collaboration Forum, Virtual
2019	Chan Zuckerberg Biohub Microbiome Initiative Meeting, San Francisco
2019	Department of Microbiology & Immunology Annual Conference, Stanford University
2017	Stanford ChEM-H Metabolomics Knowledge Center Meeting, Stanford University
2016	Mass Spectrometry Research Applications Symposium, Stanford University
2015	Current Issues in Genetics Seminar, Stanford University
2014	CSHL meeting on the Molecular Genetics of Aging, New York