



Maayan Levy

Assistant Professor of Pathology

Bio

BIO

Dr. Maayan Levy received her Ph.D. in Immunology from the Weizmann Institute of Science. After completion of her PhD, Dr. Levy became an Assistant Professor at the Microbiology Department of the Perelman School of Medicine at the University of Pennsylvania. Dr. Levy has recently joined the Stanford Medicine Department of Pathology as an Assistant Professor and the Arc Institute as an Innovation Investigator in Residence.

Dr. Maayan Levy's scientific mission is to understand, develop, and apply the concept of metabotherapy—the use of metabolites as vehicles and targets to prevent and treat disease. Her lab's primary focus is on inflammatory diseases, neurological diseases, and cancer. Maayan is particularly interested in the metabolite landscape of the gastrointestinal tract, which serves as a major metabolite source for many other tissues and as an ideal entry point for the introduction of new metabolites into the organism. She is exploring the repertoire of these intestinal metabolites, their impact on whole-body physiology, and the possibility of targeting them for therapeutic interventions.

Among the recognitions that Dr. Levy's work has received are the NIH Director's New Innovator Award, Pew Biomedical Scholar Award, Searle Scholar Award, and Burroughs Wellcome Fund Investigator in the Pathogenesis of Infectious Disease Award.

ACADEMIC APPOINTMENTS

- Assistant Professor, Pathology
- Member, Bio-X
- Member, Maternal & Child Health Research Institute (MCHRI)
- Member, Wu Tsai Neurosciences Institute

ADMINISTRATIVE APPOINTMENTS

- Innovation Investigator, Arc Institute, (2025- present)

LINKS

- Arc Lab Webpage: <https://arcinstitute.org/labs/levylab>
- X (Twitter): https://x.com/maayanlevy_lab?lang=en

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

The Levy Lab at Stanford Pathology and the Arc Institute investigates how the microbiome communicates with the brain to regulate metabolism, behavior, and overall health. Their research focuses on uncovering how microbial signals influence neural circuits that control hunger, energy balance, and decision-making. By exploring these pathways, the lab aims to understand how disruptions in microbiome-brain communication contribute to diseases like obesity, diabetes, and psychiatric disorders.

A central goal of the Levy Lab is to identify the molecular mechanisms linking microbiome imbalances to disease states. By using cutting-edge tools such as optogenetics, imaging, and circuit mapping, they map how microbial metabolites and immune signals affect brain function. These insights offer a clearer understanding of how gut dysbiosis can drive metabolic dysfunction and mental health disorders.

The lab also investigates how restoring healthy microbiome-brain communication can reverse disease processes. By identifying key neural circuits and microbial pathways involved in disease, they work toward developing microbiome-targeted therapies. Potential applications include personalized treatments for obesity, metabolic syndrome, and anxiety or depression.

In addition, the Levy Lab emphasizes the importance of individual variability in microbiome composition. Their research explores how differences in microbial ecosystems may explain why some individuals are more susceptible to disease than others. This personalized approach informs the development of tailored therapies designed to restore health by targeting specific microbiome-related pathways.

Through its interdisciplinary approach, the Levy Lab provides valuable insights into the microbiome's role in health and disease. Its discoveries offer promising avenues for innovative treatments and preventive strategies, paving the way for microbiome-based therapies that address a range of metabolic and neurological disorders.

Teaching

STANFORD ADVISEES

Postdoctoral Faculty Sponsor

Dana Binyamin, Marina Domingo-Vidal, Deanna Pepin, Galor Raviv Sharabi, Christina Stankey, Jing Zhang

Doctoral Dissertation Co-Advisor (AC)

Hye Won Kim

Publications

PUBLICATIONS

- **β -hydroxybutyrate enhances the metabolic fitness of CAR T cells in cancer.** *Cell*
Liu, S., Guruprasad, P., Ramasubramanian, R., Madhu, B., Paruzzo, L., Han, K., Kelly, A., Shestov, A., Xu, H. N., Carturan, A., Zhou, C., Amses, K. R., Afriat, et al
2026
- **Metabotherapy for intestinal disease: using metabolites to prevent and treat disorders of the gut.** *Nature reviews. Gastroenterology & hepatology*
Liu, S., Domingo-Vidal, M., Madhu, B., Binyamin, D., Thaiss, C. A., Levy, M.
2026

- ***β*-hydroxybutyrate metabolism enhances CAR T cell function via transcriptional and epigenetic reprogramming**
Liu, S., Guruprasad, P., Ramasubramanian, R., Madhu, B., Paruzzo, L., Han, K., Shestov, A., Zhou, C., Lin, J., Carturan, A., Porazzi, P., Chong, E., Schuster, et al
ELSEVIER.2025: 5903-5904
- **Effect of obesity on the acute response to SARS-CoV-2 infection and development of post-acute sequelae of COVID-19 (PASC) in nonhuman primates.** *PLoS pathogens*
Sauter, K. A., Webb, G. M., Bader, L., Kreklywich, C. N., Takahashi, D. L., Zaro, C., McGuire, C. M., Lewis, A. D., Colgin, L. M., Kirigiti, M. A., Blomenkamp, H., Pessoa, C., Humkey, et al
2025; 21 (7): e1012988
- **Gut metagenomes reveal interactions between dietary restriction, ageing and the microbiome in genetically diverse mice.** *Nature microbiology*
Litichevskiy, L., Considine, M., Gill, J., Shandar, V., Cox, T. O., Descamps, H. C., Wright, K. M., Amses, K. R., Dohnalová, L., Liou, M. J., Tetlak, M., Galindo-Fiallos, M. R., Wong, et al
2025
- **Ketogenic Diet Enhances CAR T Cell Antitumor Function Via β -Hydroxybutyrate**
Liu, S., Guruprasad, P., Han, K., Paruzzo, L., Shestov, A., Kelly, A., Amses, K. R., Afriat, A., Madhu, B., Litichevskiy, L., Dubowitz, E., Tangal, N., Mcsween, et al
ELSEVIER.2024: 4-5
- **Microbial colonization programs are structured by breastfeeding and guide healthy respiratory development.** *Cell*
Shenhav, L., Fehr, K., Reyna, M. E., Petersen, C., Dai, D. L., Dai, R., Breton, V., Rossi, L., Smieja, M., Simons, E., Silverman, M. A., Levy, M., Bode, et al
2024; 187 (19): 5431-5452.e20
- **From intestinal metabolites to the brain: Investigating the mysteries of Long COVID** *CLINICAL AND TRANSLATIONAL MEDICINE*
Liu, S., Devason, A. S., Levy, M.
2024; 14 (3): e1608
- **Serotonin reduction in post-acute sequelae of viral infection.** *Cell*
Wong, A. C., Devason, A. S., Umana, I. C., Cox, T. O., Dohnalová, L., Litichevskiy, L., Perla, J., Lundgren, P., Etwebi, Z., Izzo, L. T., Kim, J., Tetlak, M., Descamps, et al
2023; 186 (22): 4851-4867.e20
- **Single-cell analysis and spatial resolution of the gut microbiome** *FRONTIERS IN CELLULAR AND INFECTION MICROBIOLOGY*
Madhu, B., Miller, B. M., Levy, M.
2023; 13: 1271092
- **A subpopulation of lipogenic brown adipocytes drives thermogenic memory** *NATURE METABOLISM*
Lundgren, P., Sharma, P. V., Dohnalova, L., Coleman, K., Uhr, G. T., Kircher, S., Litichevskiy, L., Bahnsen, K., Descamps, H. C., Demetriadou, C., Chan, J., Chellappa, K., Cox, et al
2023; 5 (10): 1691+
- **The enteric nervous system relays psychological stress to intestinal inflammation.** *Cell*
Schneider, K. M., Blank, N., Alvarez, Y., Thum, K., Lundgren, P., Litichevskiy, L., Sleeman, M., Bahnsen, K., Kim, J., Kardo, S., Patel, S., Dohnalová, L., Uhr, et al
2023; 186 (13): 2823-2838.e20
- **Hierarchical contribution of individual lifestyle factors and their interactions on adenomatous and serrated polyp risk** *JOURNAL OF GASTROENTEROLOGY*
Kim, J., Nath, K., Schmidlin, K., Schaufelberger, H., Quattropiani, C., Vannini, S., Mossi, S., Thumshirn, M., Manz, M., Litichevskiy, L., Fan, J., Dmitrieva-Posocco, O., Li, et al
2023; 58 (9): 856-867
- **Preterm birth is associated with xenobiotics and predicted by the vaginal metabolome** *NATURE MICROBIOLOGY*
Kindschuh, W. F. F., Baldini, F., Liu, M. C. C., Liao, J., Meydan, Y., Lee, H. H. H., Heinken, A., Thiele, I., Thaiss, C. A. A., Levy, M., Korem, T.
2023; 8 (2): 246+
- **A microbiome-dependent gut-brain pathway regulates motivation for exercise.** *Nature*

- Dohnalová, L., Lundgren, P., Carty, J. R., Goldstein, N., Wenski, S. L., Nanudorn, P., Thiengmag, S., Huang, K. P., Litichevskiy, L., Descamps, H. C., Chellappa, K., Glassman, A., Kessler, et al
2022; 612 (7941): 739-747
- **Ketogenic Diet and Beta-Hydroxybutyrate in Colorectal Cancer** *DNA AND CELL BIOLOGY*
Khoziainova, S., Rozenberg, G., Levy, M.
2022; 41 (12): 1007-1011
 - **Editorial: Women in microbiome in health and disease 2021** *FRONTIERS IN CELLULAR AND INFECTION MICROBIOLOGY*
Pereira, M., Levy, M., Nissapatorn, V., de Oliveira, G.
2022; 12: 1054190
 - **Second trimester short cervix is associated with decreased abundance of cervicovaginal lipid metabolites** *AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY*
Gerson, K. D., Yang, N., Anton, L., Levy, M., Ravel, J., Elovitz, M. A., Burris, H. H.
2022; 227 (2): 273.e1-273.e18
 - **β -Hydroxybutyrate suppresses colorectal cancer.** *Nature*
Dmitrieva-Posocco, O., Wong, A. C., Lundgren, P., Golos, A. M., Descamps, H. C., Dohnalová, L., Cramer, Z., Tian, Y., Yueh, B., Eskiocak, O., Egervari, G., Lan, Y., Liu, et al
2022; 605 (7908): 160-165
 - **A non-optimal cervicovaginal microbiota in pregnancy is associated with a distinct metabolomic signature among non-Hispanic Black individuals** *SCIENTIFIC REPORTS*
Gerson, K. D., Liao, J., McCarthy, C., Burris, H. H., Korem, T., Levy, M., Ravel, J., Elovitz, M. A.
2021; 11 (1): 22794
 - **Microbial memories** *IMMUNITY*
Wong, A. C., Levy, M.
2021; 54 (2): 201-204
 - **High-Throughput Screen Identifies Host and Microbiota Regulators of Intestinal Barrier Function** *GASTROENTEROLOGY*
Grosheva, I., Zheng, D., Levy, M., Polansky, O., Lichtenstein, A., Golani, O., Dori-Bachash, M., Moresi, C., Shapiro, H., Del Mare-Roumani, S., Valdes-Mas, R., He, Y., Karbi, et al
2020; 159 (5): 1807-1823
 - **Weak Microbial Metabolites: a Treasure Trove for Using Biomimicry to Discover and Optimize Drugs** *MOLECULAR PHARMACOLOGY*
Dvorak, Z., Klapholz, M., Burris, T. P., Willing, B. P., Gioiello, A., Pellicciari, R., Galli, F., March, J., O'Keefe, S. J., Sartor, R., Kim, C. H., Levy, M., Mani, et al
2020; 98 (4): 343-349
 - **Small molecules, big effects: microbial metabolites in intestinal immunity** *AMERICAN JOURNAL OF PHYSIOLOGY-GASTROINTESTINAL AND LIVER PHYSIOLOGY*
Glottelty, L. G., Wong, A. C., Levy, M.
2020; 318 (5): G907-G911
 - **The bidirectional nature of microbiome-epithelial cell interactions** *CURRENT OPINION IN MICROBIOLOGY*
Solis, A. G., Klapholz, M., Zhao, J., Levy, M.
2020; 56: 45-51
 - **The biogeography of colonization resistance** *NATURE MICROBIOLOGY*
Solis, A. G., Levy, M.
2020; 5 (2): 234-235
 - **The gut microbiota regulates white adipose tissue inflammation and obesity via a family of microRNAs** *SCIENCE TRANSLATIONAL MEDICINE*
Virtue, A. T., McCright, S. J., Wright, J. M., Jimenez, M. T., Mowel, W. K., Kotzin, J. J., Joannas, L., Basavappa, M. G., Spencer, S. P., Clark, M. L., Eisennagel, S. H., Williams, A., Levy, et al
2019; 11 (496)
 - **New Approaches to Microbiome-Based Therapies** *MSYSTEMS*

Wong, A. C., Levy, M.
2019; 4 (3)