Stanford

Naima G. Sharaf

Assistant Professor of Biology and, by courtesy, of Structural Biology

Bio

BIO

Dr. Naima Gabriela Sharaf graduated from the University of North Carolina at Chapel Hill with a bachelor's degree in chemistry. She earned her Ph.D. in Dr. Angela Gronenborn's lab at the University of Pittsburgh, where she investigated inhibitor-induced conformational changes in HIV-1 reverse transcriptase using fluorine solution NMR. She completed her postdoctoral training at Caltech in Dr. Doug Rees' lab, where she used x-ray crystallography and single-particle cryo-EM to characterize the structure and function of the Neisseria meningitidis methionine ABC transport system. This study sparked Dr. Sharaf's current interest in lipoproteins, specifically their roles in bacterial physiology and potential in vaccine design. The Sharaf Lab conducts research that bridges biochemistry, biology, microbiology, and immunology in order to translate lipoprotein research into therapeutics.

Keywords: Biochemistry, bioengineering, biophysics, biotechnology, drug discovery, microbiology, protein engineering, structural biology, x-ray crystallography, cryoEM, nanoparticles

ACADEMIC APPOINTMENTS

- Assistant Professor, Biology
- Assistant Professor (By courtesy), Structural Biology
- Member, Bio-X
- Member, Cardiovascular Institute
- Faculty Fellow, Sarafan ChEM-H

LINKS

- My Lab website: http://www.sharaflab.com

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

Bacterial lipoproteins are characterized by a covalently attached lipid moiety that anchors the protein to cellular membranes. In bacteria, these lipoproteins play key roles in bacterial physiology, including signaling, nutrient acquisition, and host-pathogen interactions. Our lab is divided into two research areas related to lipoproteins:

Area 1: To characterize the structure and function of bacterial lipoproteins in the bacterium Borrelia burgdorferi, the causative agent of Lyme disease.

Area 2: To develop and characterize lipoprotein-based nanoparticles, materials, and therapeutics.

Keywords: Biochemistry, bioengineering, biophysics, biotechnology, drug discovery, microbiology, protein engineering, structural biology, x-ray crystallography, cryoEM, nanoparticles

Teaching

COURSES

2025-26

- How Bacteria Hunt for Food: BIO 17N (Spr)
- Integrative and Experimental Microbiology: BIO 120, BIO 220 (Spr)

2024-25

- Frontiers in Biology: BIO 301 (Aut)
- Integrative and Experimental Microbiology: BIO 120, BIO 220 (Spr)

2023-24

- Frontiers in Biology: BIO 301 (Aut, Win)
- Integrative and Experimental Microbiology: BIO 120, BIO 220 (Spr)

2022-23

- Frontiers in Biology: BIO 301 (Aut, Win)
- Integrative and Experimental Microbiology: BIO 120, BIO 220 (Spr)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Hisham Alsohybe, Nana Akua Duah, Angelika Hirsch, Cesar Mena, Meghan Nolan, Jacob Summers, Jiawei Sun, Chuofan Yu

Postdoctoral Faculty Sponsor

Qianqiao Liu, Claire Stewart

Doctoral Dissertation Advisor (AC)

Victor Nuñez, Francesca Starvaggi, Seiji Yokota

Publications

PUBLICATIONS

- **Structural basis for selective thymidine binding by the Borrelia burgdorferi substrate-binding protein BmpA.** *The Journal of biological chemistry*
  Liu, Q., Nun Ez, V. A., Fernandez, D., Stewart, C. J., Sharaf, N. G.
  2026: 113206
- **Development of novel bacterial lipoprotein-based nanoparticle for Rose Bengal delivery**
  Liu, Q., Arslanian, M. A., Trevino, M. A., Starvaggi, F., Sharaf, N. G.
  CELL PRESS.2026
- **Insights into nucleoside transport in lyme disease: structure and function of Borrelia Burgdorferi Bmp proteins**
  Liu, Q., Fernandez, D., Alexandrova, L., Sharaf, N. G.

WILEY.2025

- **Crystal structure and ligand-binding specificity of the Borrelia burgdorferi proteins BmpA and BmpB**
  Sharaf, N., Liu, Q., Fernandez, D.
  ELSEVIER.2025

- **Expression, Purification, and Characterization of Escherichia Coli Diacylated Lipoprotein Ycjn**
  Sharaf, N., Trevino, M. A., Amankwah, K., Fernandez, D., Weston, S., Stewart, C. J., Gallardo, J. M.
  WILEY.2024: 118-119

- **Expression, purification, and characterization of diacylated Lipo-YcjN from Escherichia coli.** *The Journal of biological chemistry*
  Trevino, M. A., Amankwah, K. A., Fernandez, D., Weston, S. A., Stewart, C. J., Gallardo, J. M., Shahgholi, M., Sharaf, N. G.
  2024: 107853

- **Characterization of the ABC methionine transporter from Neisseria meningitidis reveals that lipidated MetQ is required for interaction** *ELIFE*
  Sharaf, N. G., Shahgholi, M., Kim, E., Lai, J. Y., VanderVelde, D. G., Lee, A. T., Rees, D. C.
  2021; 10

- **SARS-CoV-2 neutralizing antibody structures inform therapeutic strategies.** *Nature*
  Barnes, C. O., Jette, C. A., Abernathy, M. E., Dam, K. A., Esswein, S. R., Gristick, H. B., Malyutin, A. G., Sharaf, N. G., Huey-Tubman, K. E., Lee, Y. E., Robbiani, D. F., Nussenzweig, M. C., West, et al
  2020; 588 (7839): 682-687

- **Structures of Human Antibodies Bound to SARS-CoV-2 Spike Reveal Common Epitopes and Recurrent Features of Antibodies.** *Cell*
  Barnes, C. O., West, A. P., Huey-Tubman, K. E., Hoffmann, M. A., Sharaf, N. G., Hoffman, P. R., Koranda, N., Gristick, H. B., Gaebler, C., Muecksch, F., Lorenzi, J. C., Finkin, S., Hägglöf, et al
  2020; 182 (4): 828-842.e16

- **NMR structure of the HIV-1 reverse transcriptase thumb subdomain** *JOURNAL OF BIOMOLECULAR NMR*
  Sharaf, N. G., Brereton, A. E., Byeon, I. L., Karplus, P., Gronenborn, A. M.
  2016; 66 (4): 273-280