



Haopeng Xiao

Assistant Professor of Biochemistry

CONTACT INFORMATION

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Bio

BIO

Understanding mechanisms of metabolic regulation in physiology and disease forms the basis for developing therapies to treat diseases in which metabolism is perturbed. We devise novel mass spectrometry (MS)-based proteomics technologies, combined with data science, to systematically discover mechanisms of metabolic regulation over protein function. Our strategies established the first tissue-specific landscape of protein cysteine redox regulation during aging, elucidating mechanisms of redox signaling in physiology that remained elusive for decades. We also leverage the genetic diversity of outbred populations to systematically annotate protein function and protein-metabolite co-regulation. The aim of our research program is to develop next-generation MS-based strategies to understand mechanisms of metabolic regulation in aging, metabolic disease, and cancer, and to use this knowledge as a basis to develop translational therapeutics.

ACADEMIC APPOINTMENTS

- Assistant Professor, Biochemistry
- Member, Bio-X
- Member, Wu Tsai Human Performance Alliance
- Faculty Fellow, Sarafan ChEM-H

HONORS AND AWARDS

- CASMS Young Investigator Award, Chinese American Society for Mass Spectrometry (2024)
- The V Scholar Award, The V Foundation for Cancer Research (2025)
- Baxter Foundation Faculty Scholars Award, Donald E. and Delia B. Baxter Foundation (2025)

PROFESSIONAL EDUCATION

- B.S., Peking University , Pharmaceutical Sciences (2013)
- B.A., Peking University , Chinese Language and Literature (2013)
- Ph.D., Georgia Institute of Technology , Chemical Proteomics (2018)
- Postdoctoral Fellow, Dana-Farber Cancer Institute/Harvard Medical School , Molecular Metabolism (2024)

LINKS

- Lab Website: <http://www.xiaolab.space>

Teaching

COURSES

2025-26

- Biochemistry Department Minicourse: BIOC 202 (Aut)

STANFORD ADVISEES

Postdoctoral Faculty Sponsor

Junyi Chen, Bowen Yang

Publications

PUBLICATIONS

- **Diverse bacterial pattern recognition receptors sense the conserved phage proteome.** *bioRxiv : the preprint server for biology*
Lee, H., Luengo-Woods, S., Zhang, J., Makarova, K. S., Wolf, Y. I., Chiu, C., Evans, S. A., Chen, J., Xiao, H., Feng, L., Koonin, E. V., Gao, A.
2026
- **Mitochondrial complex III-derived ROS amplify immunometabolic changes in astrocytes and promote dementia pathology.** *Nature metabolism*
Barnett, D., Zimmer, T. S., Booraem, C., Palaguachi, F., Meadows, S. M., Xiao, H., Wong, M. Y., Luo, W., Gan, L., Chouchani, E. T., Orr, A. G., Orr, A. L.
2025
- **Covariation MS uncovers a protein that controls cysteine catabolism.** *Nature*
Xiao, H., Ordonez, M., Fink, E. C., Covington, T. A., Woldemichael, H. B., Chen, J., Jain, M. S., Rohatgi, M. H., Wei, S. M., Burger, N., Sharif, M. A., Jan, J., Wang, et al
2025
- **The human zinc-binding cysteine proteome.** *Cell*
Burger, N., Mittenbühler, M. J., Xiao, H., Shin, S., Wei, S. M., Henze, E. K., Schindler, S., Mehravar, S., Wood, D. M., Petrocelli, J. J., Sun, Y., Sprenger, H. G., Latorre-Muro, et al
2024
- **Parallel control of cold-triggered adipocyte thermogenesis by UCP1 and CKB** *CELL METABOLISM*
Rahbani, J. F., Bunk, J., Lagarde, D., Samborska, B., Roesler, A., Xiao, H., Shaw, A., Kaiser, Z., Braun, J. L., Geromella, M. S., Fajardo, V. A., Koza, R. A., Kazak, et al
2024; 36 (3): 526-540.e7
- **Monocarboxylate transporters facilitate succinate uptake into brown adipocytes.** *Nature metabolism*
Reddy, A., Winther, S., Tran, N., Xiao, H., Jakob, J., Garrity, R., Smith, A., Ordonez, M., Laznik-Bogoslavski, D., Rothstein, J. D., Mills, E. L., Chouchani, E. T.
2024; 6 (3): 567-577
- **Lactate regulates cell cycle by remodeling the anaphase promoting complex.** *Nature*
Liu, W., Wang, Y., Bozi, L. H., Fischer, P., Jedrychowski, M. P., Xiao, H., Wu, T., Darabedian, N., He, X., Mills, E. L., Burger, N., Shin, S., Reddy, et al
2023
- **Isolation of extracellular fluids reveals novel secreted bioactive proteins from muscle and fat tissues.** *Cell metabolism*
Mittenbühler, M. J., Jedrychowski, M. P., Van Vranken, J. G., Sprenger, H. G., Wilensky, S., Dumesic, P. A., Sun, Y., Tartaglia, A., Bogoslavski, D., A. M., Xiao, H., Blackmore, K. A., Reddy, et al
2023; 35 (3): 535-549.e7

- **Depletion of creatine phosphagen energetics with a covalent creatine kinase inhibitor.** *Nature chemical biology*
Darabedian, N., Ji, W., Fan, M., Lin, S., Seo, H. S., Vinogradova, E. V., Yaron, T. M., Mills, E. L., Xiao, H., Senkane, K., Huntsman, E. M., Johnson, J. L., Che, et al
2023
- **Gasdermin D pore-forming activity is redox-sensitive** *CELL REPORTS*
Devant, P., Borsic, E., Ngwa, E. M., Xiao, H., Chouchani, E. T., Thiagarajah, J. R., Hafner-Bratkovic, I., Evavold, C. L., Kagan, J. C.
2023; 42 (1): 112008
- **Architecture of the outbred brown fat proteome defines regulators of metabolic physiology.** *Cell*
Xiao, H., Bozi, L. H., Sun, Y., Riley, C. L., Philip, V. M., Chen, M., Li, J., Zhang, T., Mills, E. L., Emont, M. P., Sun, W., Reddy, A., Garrity, et al
2022
- **Simultaneously Identifying and Distinguishing Glycoproteins with O-GlcNAc and O-GalNAc (the Tn Antigen) in Human Cancer Cells.** *Analytical chemistry*
Xu, S., Zheng, J., Xiao, H., Wu, R.
2022; 94 (7): 3343-3351
- **Cysteine 253 of UCP1 regulates energy expenditure and sex-dependent adipose tissue inflammation** *CELL METABOLISM*
Mills, E. L., Harmon, C., Jedrychowski, M. P., Xiao, H., Gruszczuk, A., Bradshaw, G. A., Tran, N., Garrity, R., Laznik-Bogoslavski, D., Szpyt, J., Prendeville, H., Lynch, L., Murphy, et al
2022; 34 (1): 140+
- **Glycogen metabolism links glucose homeostasis to thermogenesis in adipocytes** *NATURE*
Keinan, O., Valentine, J. M., Xiao, H., Mahata, S. K., Reilly, S. M., Abu-Odeh, M., Deluca, J. H., Dadpey, B., Cho, L., Pan, A., Yu, R. T., Dai, Y., Liddle, et al
2021; 599 (7884): 296+
- **UCP1 governs liver extracellular succinate and inflammatory pathogenesis.** *Nature metabolism*
Mills, E. L., Harmon, C., Jedrychowski, M. P., Xiao, H., Garrity, R., Tran, N. V., Bradshaw, G. A., Fu, A., Szpyt, J., Reddy, A., Prendeville, H., Danial, N. N., Gygi, et al
2021; 3 (5): 604-617
- **IRF3 reduces adipose thermogenesis via ISG15-mediated reprogramming of glycolysis** *JOURNAL OF CLINICAL INVESTIGATION*
Yan, S., Kumari, M., Xiao, H., Jacobs, C., Kochumon, S., Jedrychowski, M., Chouchani, E., Ahmad, R., Rosen, E. D.
2021; 131 (7)
- **AIDA and UCP1 snuggle up to prevent hypothermia** *NATURE CELL BIOLOGY*
Mills, E. L., Xiao, H., Chouchani, E. T.
2021; 23 (3): 216-218
- **pH-Gated Succinate Secretion Regulates Muscle Remodeling in Response to Exercise.** *Cell*
Reddy, A., Bozi, L. H., Yaghi, O. K., Mills, E. L., Xiao, H., Nicholson, H. E., Paschini, M., Paulo, J. A., Garrity, R., Laznik-Bogoslavski, D., Ferreira, J. C., Carl, C. S., Sjøberg, et al
2020; 183 (1): 62-75.e17
- **Proteomics illuminates fat as key tissue in aging** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
Long, J. Z.
2020; 117 (19): 10111-12
- **Sample multiplexing for targeted pathway proteomics in aging mice.** *Proceedings of the National Academy of Sciences of the United States of America*
Yu, Q., Xiao, H., Jedrychowski, M. P., Schweppe, D. K., Navarrete-Perea, J., Knott, J., Rogers, J., Chouchani, E. T., Gygi, S. P.
2020; 117 (18): 9723-9732
- **Systematic quantification of the dynamics of newly synthesized proteins unveiling their degradation pathways in human cells.** *Chemical science*
Tong, M., Smeekens, J. M., Xiao, H., Wu, R.
2020; 11 (13): 3557-3568

- **A Quantitative Tissue-Specific Landscape of Protein Redox Regulation during Aging.** *Cell*
Xiao, H., Jedrychowski, M. P., Schweppe, D. K., Huttlin, E. L., Yu, Q., Heppner, D. E., Li, J., Long, J., Mills, E. L., Szpyt, J., He, Z., Du, G., Garrity, et al
2020; 180 (5): 968-983.e24
- **Comprehensive Analysis of Protein Glycation Reveals Its Potential Impacts on Protein Degradation and Gene Expression in Human Cells.** *Journal of the American Society for Mass Spectrometry*
Sun, F., Suttapitugsakul, S., Xiao, H., Wu, R.
2019; 30 (12): 2480-2490
- **Global and site-specific analysis of protein glycosylation in complex biological systems with Mass Spectrometry.** *Mass spectrometry reviews*
Xiao, H., Sun, F., Suttapitugsakul, S., Wu, R.
2019; 38 (4-5): 356-379
- **Author Correction: Factors of the bone marrow microniche that support human plasma cell survival and immunoglobulin secretion.** *Nature communications*
Nguyen, D. C., Garimalla, S., Xiao, H., Kyu, S., Albizua, I., Galipeau, J., Chiang, K. Y., Waller, E. K., Wu, R., Gibson, G., Roberson, J., Lund, F. E., Randall, et al
2019; 10 (1): 372
- **Factors of the bone marrow microniche that support human plasma cell survival and immunoglobulin secretion.** *Nature communications*
Nguyen, D. C., Garimalla, S., Xiao, H., Kyu, S., Albizua, I., Galipeau, J., Chiang, K. Y., Waller, E. K., Wu, R., Gibson, G., Roberson, J., Lund, F. E., Randall, et al
2018; 9 (1): 3698
- **Mass Spectrometry-Based Chemical and Enzymatic Methods for Global Analysis of Protein Glycosylation.** *Accounts of chemical research*
Xiao, H., Suttapitugsakul, S., Sun, F., Wu, R.
2018; 51 (8): 1796-1806
- **Mass spectrometric analysis of the N-glycoproteome in statin-treated liver cells with two lectin-independent chemical enrichment methods.** *International journal of mass spectrometry*
Xiao, H., Hwang, J. E., Wu, R.
2018; 429: 66-75
- **An enrichment method based on synergistic and reversible covalent interactions for large-scale analysis of glycoproteins.** *Nature communications*
Xiao, H., Chen, W., Smeekens, J. M., Wu, R.
2018; 9 (1): 1692
- **Extracellular vesicles from bone marrow-derived mesenchymal stromal cells support ex vivo survival of human antibody secreting cells.** *Journal of extracellular vesicles*
Nguyen, D. C., Lewis, H. C., Joyner, C., Warren, V., Xiao, H., Kissick, H. T., Wu, R., Galipeau, J., Lee, F. E.
2018; 7 (1): 1463778
- **Evaluation and optimization of reduction and alkylation methods to maximize peptide identification with MS-based proteomics.** *Molecular bioSystems*
Suttapitugsakul, S., Xiao, H., Smeekens, J., Wu, R.
2017; 13 (12): 2574-2582
- **Simultaneous Quantitation of Glycoprotein Degradation and Synthesis Rates by Integrating Isotope Labeling, Chemical Enrichment, and Multiplexed Proteomics.** *Analytical chemistry*
Xiao, H., Wu, R.
2017; 89 (19): 10361-10367
- **Evidence for the importance of post-transcriptional regulatory changes in ovarian cancer progression and the contribution of miRNAs.** *Scientific reports*
Zhang, M., Matyunina, L. V., Walker, L. D., Chen, W., Xiao, H., Benigno, B. B., Wu, R., McDonald, J. F.
2017; 7 (1): 8171
- **Targeting cancer cell integrins using gold nanorods in photothermal therapy inhibits migration through affecting cytoskeletal proteins** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*

Ali, M. R. K., Wu, Y., Tang, Y., Xiao, H., Chen, K., Han, T., Fang, N., Wu, R., El-Sayed, M. A.

2017; 114 (28): E5655-E5663

- **Specific Identification of Glycoproteins Bearing the Tn Antigen in Human Cells.** *Angewandte Chemie (International ed. in English)*
Zheng, J., Xiao, H., Wu, R.
2017; 56 (25): 7107-7111
- **Efficacy, long-term toxicity, and mechanistic studies of gold nanorods photothermal therapy of cancer in xenograft mice** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
Ali, M. R. K., Rahman, M., Wu, Y., Han, T., Peng, X., Mackey, M. A., Wang, D., Shin, H., Chen, Z. G., Xiao, H., Wu, R., Tang, Y., Shin, et al
2017; 114 (15): E3110-E3118
- **Global and Site-Specific Analysis Revealing Unexpected and Extensive Protein S-GlcNAcylation in Human Cells.** *Analytical chemistry*
Xiao, H., Wu, R.
2017; 89 (6): 3656-3663
- **Global Analysis of Secreted Proteins and Glycoproteins in *Saccharomyces cerevisiae*.** *Journal of proteome research*
Smeekens, J. M., Xiao, H., Wu, R.
2017; 16 (2): 1039-1049
- **Quantitative investigation of human cell surface N-glycoprotein dynamics.** *Chemical science*
Xiao, H., Wu, R.
2017; 8 (1): 268-277
- **Simultaneous Time-Dependent Surface-Enhanced Raman Spectroscopy, Metabolomics, and Proteomics Reveal Cancer Cell Death Mechanisms Associated with Gold Nanorod Photothermal Therapy** *JOURNAL OF THE AMERICAN CHEMICAL SOCIETY*
Ali, M. R. K., Wu, Y., Hang, T., Zang, X., Xiao, H., Tang, Y., Wu, R., Fernandez, F. M., El-Sayed, M. A.
2016; 138 (47): 15434-15442
- **Quantification of tunicamycin-induced protein expression and N-glycosylation changes in yeast.** *The Analyst*
Xiao, H., Smeekens, J. M., Wu, R.
2016; 141 (12): 3737-45
- **Site-Specific Quantification of Surface N-Glycoproteins in Statin-Treated Liver Cells.** *Analytical chemistry*
Xiao, H., Tang, G. X., Wu, R.
2016; 88 (6): 3324-32
- **Systematic investigation of cellular response and pleiotropic effects in atorvastatin-treated liver cells by MS-based proteomics.** *Journal of proteome research*
Xiao, H., Chen, W., Tang, G. X., Smeekens, J. M., Wu, R.
2015; 14 (3): 1600-11