

BIOGRAPHICAL SKETCH

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NAME: Sharma, Gaurav

eRA COMMONS USER NAME (credential, e.g., agency login): [REDACTED]

POSITION TITLE: Assistant Professor of Cardiovascular and Thoracic Surgery, Biomedical Engineering and Advanced Imaging Research

EDUCATION/TRAINING (*Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable.*)

INSTITUTION AND LOCATION	DEGREE (if applicable)	START DATE MM/YYYY	COMPLETION DATE MM/YYYY	FIELD OF STUDY
School of Life Sciences, Dr. B. R. Ambedkar University, Agra, Uttar Pradesh	MS	09/2007	11/2009	Biotechnology
All India Institute of Medical Sciences, New Delhi	PhD	07/2010	04/2016	Biomedical Sciences
Quantic School of Business & Technology, Washington, DC	MBA	07/2019	07/2020	Management, Leadership, etc.
UT Southwestern Medical Center, Dallas, TX	Postdoctoral Fellow	06/2016	06/2022	Intermediary Metabolism and Metabolic Imaging

A. Personal Statement

At the Sharma Lab at UT Southwestern, our research focuses on advancing metabolic imaging, stable isotope tracing, and multi-omics approaches to better understand cardiovascular disease and improve outcomes in heart failure and transplantation. A central area of our work is the development and application of hyperpolarized carbon-13 MRI (HP ¹³C-MRI), which enables real-time, noninvasive assessment of myocardial metabolism. By integrating metabolic imaging with clinical insight and systems biology, we aim to develop tools that support surgical decision-making, identify viable myocardium, and personalize therapy for ischemic cardiomyopathy. The Sharma Lab leads multiple translational studies, including clinical trials that combine HP ¹³C-MRI with FDG-PET imaging. In parallel, we are working to improve donor heart and lung preservation through optimized perfusion strategies and metabolic profiling. Our research is supported by the American Heart Association, UK Research and Innovation, the Australian National Health and Medical Research Council, and the Canadian Institutes of Health Research.

Most recently, we have expanded our efforts into artificial intelligence for medicine, using machine learning to analyze complex imaging and metabolic datasets. These AI-driven approaches are designed to improve outcomes in both transplant medicine and cardiometabolic disease.

The Sharma Lab is dedicated to training the next generation of scientists in translational imaging, computational biology, and AI-enabled medicine. We also contribute to peer review and editorial leadership across journals and funding agencies worldwide. Our mission is to translate innovations in metabolism, imaging, and AI into practical tools for improving cardiovascular care and transplantation outcomes.

Selected publications closely related to the proposed studies:

1. **Sharma G**, McNeil S, Lin SH, Harrison C, Park JM, Peltz M, Malloy CR, Jessen ME. Hyperpolarized Carbon-13 Metabolic Imaging Detects Changes in Mitochondrial Metabolism in Patients Before and After Coronary Artery Bypass Graft Surgery. *Circulation*. 150 (2024) doi: 10.1161/circ.150.suppl_1.4115015
2. **Sharma G**, McNeil S, Lin SH, Harrison C, Park JM, Peltz M, Malloy CR, Jessen ME. Hyperpolarized C Metabolic Imaging in Human Subjects with Advanced Coronary 13 Artery Disease: Initial Experience and Thoughts. *Proc. Intl. Soc. Mag. Res. Med.*, 4757 (2024)
3. **Sharma G.**, Park JM., Peltz M., Malloy CR, Jessen M E. *Hyperpolarized 13C Pyruvate MRI and PET in Single Exam Using PET-MR for Ischemic Heart Disease. Patent Cooperation Treaty (PCT) Application* No. PCT/US2024/061542. Filing Date: December 20, 2024.

4. **Sharma G**, Wen W, Meptue NR Hever T, Malloy CR, Sherry AD, Khemtong C. Co-Polarized [1-¹³C]Pyruvate and [1,3-¹³C₂]Acetoacetate Provide a Simultaneous View of Cytosolic and Mitochondrial Redox in a Single Experiment. **ACS Sensors**. 2021. PMID: 34761912 **Featured on Journal Cover and Favorite Papers from the First 10 Years of ACS Sensors (DOI: 10.1021/acssensors.4c03746)*

B. Positions and Honors

Positions and Employment

2025- Present	Member, Harold C. Simmons Comprehensive Cancer Center, UT Southwestern Medical Center, Dallas, Texas, United States
2024 - present	Assistant Professor, Department of Biomedical Engineering (Secondary), UT Southwestern Medical Center, Dallas, TX, USA
2022 – present	Assistant Professor, Department of Cardiovascular and Thoracic Surgery (Primary), UT Southwestern Medical Center, Dallas, TX, USA
2022 – present	Assistant Professor, Advanced Imaging Research Center (Secondary), UT Southwestern Medical Center, Dallas, TX, USA
2016 - 2022	Postdoctoral Researcher, Advanced Imaging Research Center, UT Southwestern Medical Center, Dallas, TX, USA
2015 – 2016	Research Associate, Jawaharlal Nehru University, New Delhi, India
2012 – 2015	Senior Research Fellow, All India Institute of Medical Sciences, New Delhi, India
2010 - 2012	Junior Research Fellow, All India Institute of Medical Sciences, New Delhi, India

Other Experience and Professional Memberships

2024-present	Grant Reviewer, American Lung Association
2024-present	<i>Ad hoc</i> Grant Reviewer, National Science Foundation (NSF)
2024-present	ECR Grant Reviewer, NIH-Surgery, Anesthesiology and Trauma Study Section [SAT]
2024-present	<i>Ad hoc</i> Grant Reviewer, UK Research and Innovation (UKRI)
2024-present	Member, American College of Cardiology (ACC)
2024-present	Member, Radiological Society of North America
2024-present	Editorial Board Member, NPJ-Imaging (Springer Nature)
2023-present	Member, College of Reviewers, Canadian Institutes of Health Research (CIHR)
2023-present	Grant Reviewer, National Health and Medical Research Council, Australia
2023-present	Member, American Physiological Society (APS)
2023-present	Associate Editor, The Journal of Heart and Lung Transplantation-Open
2023-present	Member, Institutional Review Board (IRB), UT Southwestern Medical Center
2023-present	<i>Ad hoc</i> early career grant reviewer, National Institute of Health
2023-present	Grant Reviewer, Innovative Projects Award, American Heart Association
2022-present	Grant Reviewer, Career Development Award, American Heart Association
2022-present	Grant Reviewer, Cardiac Biology & Regulation, American Heart Association
2022-present	Member, The International Society for Heart and Lung Transplantation (ISHLT)
2020-present	Associate Editor, Medicine (LWW journals, Wolters Kluwer Health, Inc.)
2020-present	Associate Editor, BMC Research Notes (Springer Nature)
2020-present	Associate Editor, BMC Cardiovascular Disorders (Springer Nature)
2020-present	Member of Reviewer Board, International Journal of Molecular Sciences (MDPI), Journal of Imaging (MDPI), Metabolites (MDPI) and Biomolecules (MDPI)
2020-present	Review Editor, Frontiers in Cardiovascular Medicine (Frontiers Media S.A.)
2020-present	Academic Editor, PeerJ (O'Reilly and SAGE)
2020-present	Associate Editor, BMC Cancer (Springer Nature)
2020-present	Associate Editor, Journal of Translational Medicine (Springer Nature)
2020-present	Topic Editor, Bioengineering (MDPI)
2020-present	Member of Editorial Advisory Board, Heliyon (Cell Press)
2019-present	<i>Ad Hoc</i> Reviewer, manuscripts submitted in peer-reviewed indexed journals (>250)
2019-present	Review Editor, Frontiers in Molecular Biosciences (Frontiers Media S.A.)
2016-present	Life Member, ISMRM Indian Chapter
2016-2017	Member, American Association for the Advancement of Science (AAAS)

2013-present Member, World Molecular Imaging Society (WMIS)
 2017-present Member, American Heart Association (AHA)
 2013-present Member, International Society for Magnetic Resonance in Medicine (ISMRM)

Honors

2025 Fellow, CV Section, American Physiology Society, USA
 2024 CVSA Early Career Investigator Abstract Award, American Heart Association, Dallas, USA
 2024 Fellow, American College of Cardiology, Washington, D.C, USA
 2024 Honored Listee, Marquis Who's Who in America, NY, USA
 2023 Second Century Early Faculty Independence Award, American Heart Association, Dallas, TX
 2021 EBM of the month, BMC Cardiovascular Disorders (Springer Nature)
 2019 1st place in the Scientific Poster Award, National Center for In Vivo Metabolism, Dallas, USA
 2018 – 2020 AHA Postdoctoral Award, American Heart Association, Dallas, TX, USA
 2017, 2019 Educational Stipend, International Society of Magnetic Resonance in Medicine
 Travel award' to attend the Annual scientific meeting of WMIC, Seoul, Republic of Korea, Indian Council of Medical Research (ICMR), New Delhi, India
 2014 'Travel award' to attend the Annual scientific meeting of ISMRM, USA, Indian Council of Medical Research (ICMR), New Delhi, India
 2013 ICMR Junior/Senior Research Fellowship (highly coveted, ~1% success rate), Indian Council of Medical Research (ICMR), New Delhi, India
 2010 – 2016 Graduate Aptitude Test for Engineering (GATE) in Life Sciences (1) and Biotechnology (2), Medical Research (ICMR), New Delhi, India
 2009-2011 Jointly by the Indian Institute of Science (IISc) and the Indian Institute of Technology (IITs)

C. Contribution to Science

1. Novel hyperpolarized ¹³C methods for the non-invasive assessment of metabolism: I have been engaged in developing and deploying new technologies to access high-impact metabolic diseases. Hyperpolarized ¹³C MR spectroscopy (MRS) using dynamic nuclear polarization (DNP) is an emerging technique to noninvasively assess mitochondrial metabolism in real-time. I have studied altered in-vivo and ex-vivo real-time metabolism in disease models using hyperpolarized ¹³C MRS. Studies are underway to explore the utility of using hyperpolarized [¹³C] metabolites to analyze metabolism in-vivo and in perfused isolated organs from rodent models of diseases. My current research is focused on translating these agents and technologies into in-vivo imaging applications. Key advancements from ongoing work are reported in:

- a. **Sharma G**, Maptue N, Rahim M, Trigo Mijes ML, Wen W, Hever T, Funk AM, Malloy CR, Young JD, Khemtong C. Oxidation of hyperpolarized [1-¹³C]pyruvate in isolated rat kidneys. **NMR Biomed.** **2023**. PubMed PMID: 36285844***Featured on Journal Cover**
- b. **Sharma G**, Wen W, Meptue NR Hever T, Malloy CR, Sherry AD, Khemtong C. Co-Polarized [1-¹³C]Pyruvate and [1,3-¹³C₂]Acetoacetate Provide a Simultaneous View of Cytosolic and Mitochondrial Redox in a Single Experiment. **ACS Sensors.** **2021**. PMID: 34761912 ***Featured on Journal Cover**
- c. **Sharma G**, Wu CY, Wynn RM, Gui W, Malloy CR, Sherry AD, Chuang DT, Khemtong C. Real-time hyperpolarized ¹³C magnetic resonance detects increased pyruvate oxidation in pyruvate dehydrogenase kinase 2/4-double knockout mouse livers. **Sci Rep.** **2019** Nov 11;9(1):16480. PubMed PMID: 31712597; PubMed Central PMCID: PMC6848094.
- d. Chen W, **Sharma G**, Jiang W, Maptue NR, Malloy CR, Sherry AD, Khemtong C. Metabolism of hyperpolarized ¹³C-acetoacetate to β-hydroxybutyrate detects real-time mitochondrial redox state and dysfunction in heart tissue. **NMR Biomed.** **2019** Jun;32(6):e4091. PubMed PMID: 30968985; PubMed Central PMCID: PMC6525062.

2. Understanding the intermediary metabolism in cardiovascular pathophysiology: The vast majority of cardiovascular diseases are associated with disruption of metabolic pathways. Although research in cell biology has produced key information about how metabolic pathways and dependencies are regulated but provides limited information about altered oxidative metabolism in diseases. Tracing intermediary metabolism with isotope infusions/perfusion is safe and highly informative in rodents and humans. I have been currently involved in the understanding role of altered intermediary metabolism in rodent disease models using ¹³C NMR spectroscopy, and mathematical modeling. Ongoing work demonstrates that ¹³C

isotopomer analysis can be used to study the substrate competition and metabolic state in gene knockouts. Key findings from ongoing work are:

- a. Li Q, Li C, Elnwasany A, **Sharma G**, An YA, Zhang G, Elhelaly WM, Lin J, Gong Y, Chen G, Wang M, Zhao S, Dai C, Smart CD, Liu J, Luo X, Deng Y, Tan L, Lv SJ, Davidson SM, Locasale JW, Lorenzi PL, Malloy CR, Gillette TG, Vander Heiden MG, Scherer PE, Szweda LI, Fu G, Wang ZV. PKM1 Exerts Critical Roles in Cardiac Remodeling Under Pressure Overload in the Heart. *Circulation*. **2021**. Aug 31;144(9):712-727. PMID: 34102853; PMCID: PMC8405569.
- b. Dai C, Li Q, May HI, Li C, Zhang G, **Sharma G**, Sherry AD, Malloy CR, Khemtong C, Zhang Y, Deng Y, Gillette TG, Xu J, Scadden DT, Wang ZV. Lactate Dehydrogenase A Governs Cardiac Hypertrophic Growth in Response to Hemodynamic Stress. *Cell Rep*. **2020** Sep 1;32(9):108087. PubMed PMID: 32877669.
- c. Cardoso AC, Lam NT, Savla JJ, Nakada Y, Pereira AHM, Elnwasany A, Menendez-Montes I, Ensley EL, Petric UB, **Sharma G**, Sherry AD, Malloy CR, Khemtong C, Kinter MT, Tan WLW, Anene-Nzelu CG, Foo RS, Nguyen NUN, Li S, Ahmed MS, Elhelaly WM, Abdisalaam S, Asaithamby A, Xing C, Kanchwala M, Vale G, Eckert KM, Mitsche MA, McDonald JG, Hill JA, Huang L, Shaul PW, Szweda LI, Sadek HA. Mitochondrial Substrate Utilization Regulates Cardiomyocyte Cell Cycle Progression. *Nat Metab*. **2020** Feb;2(2):167-178. PubMed PMID: 32617517; PubMed Central PMCID: PMC7331943.
- d. Makarewich CA, Baskin KK, Munir AZ, Bezprozvannaya S, **Sharma G**, Khemtong C, Shah AM, McAnally JR, Malloy CR, Szweda LI, Bassel-Duby R, Olson EN. MOXI Is a Mitochondrial Micropeptide That Enhances Fatty Acid β -Oxidation. *Cell Rep*. **2018** Jun 26;23(13):3701-3709. PubMed PMID: 29949755; PMCID: PMC6066340.

3. Assessment of therapeutic interventions on metabolism in obesity or diabetes: The impaired regulation of carbohydrate and lipid metabolism is intricately linked with obesity. I investigated in vivo intermediary metabolism of glycerol in the liver, substrate competition, and therapeutic efficacy of drugs targeting mitochondrial pyruvate dehydrogenase kinases 1–4 (PDKs1–4) for obesity and type 2 diabetes using ^{13}C NMR isotopomer analysis and hyperpolarized ^{13}C -labeled substrates in diet-induced obese rodent models.

- a. Jin ES, Malloy CR, **Sharma G**, Finn E, Fuller KNZ, Reyes YG, Lovell MA, Derderian SC, Schoen JA, Inge TH, Cree MG. Glycerol as a precursor for hepatic de novo glutathione synthesis in human liver. *Redox Biology*. **2023**:102749. PubMed PMID: 37224695.
- b. Wu CY, Satapati S, Gui W, Wynn RM, **Sharma G**, Lou M, Qi X, Burgess SC, Malloy C, Khemtong C, Sherry AD, Chuang DT, Merritt ME. A novel inhibitor of pyruvate dehydrogenase kinase stimulates myocardial carbohydrate oxidation in diet-induced obesity. *J Biol Chem*. **2018** Jun 22;293(25):9604-9613. PubMed PMID: 29739849; PubMed Central PMCID: PMC6016455.
- c. Wu CY, Tso SC, Chuang JL, Gui WJ, Lou M, **Sharma G**, Khemtong C, Qi X, Wynn RM, Chuang DT. Targeting hepatic pyruvate dehydrogenase kinases restores insulin signaling and mitigates ChREBP-mediated lipogenesis in diet-induced obese mice. *Mol Metab*. **2018** Jun;12:12-24. PubMed PMID: 29656110; PMCID: PMC6001905.
- d. Thapa B, Suh EH, Parrott D, Khalighinejad P, **Sharma G**, Chirayil S, Sherry AD. Imaging β -Cell Function Using a Zinc-Responsive MRI Contrast Agent May Identify First Responder Islets. *Front Endocrinol (Lausanne)*. **2022** Jan 31;12:809867. doi: 10.3389/fendo.2021.809867. PMID: 35173681; PMCID: PMC8842654.

4. Improving Donor Heart Preservation through Advanced Metabolic and Molecular strategies: My research has focused on enhancing the preservation of donor human hearts intended for transplantation by utilizing novel preservation systems and analyzing their metabolic profiles. I have investigated the effects of advanced hypothermic perfusion systems on donor heart metabolism and transcriptomics, contributing to better preservation strategies to translate for transplantation outcomes. Key findings include:

- a. **Sharma G**, Vela R, Powell L, Malloy CR, Jessen M, Peltz M. Transcriptomic Signatures of Human Donor Hearts Preserved Using a Hypothermic Perfusion System. *The Journal of Heart and Lung Transplantation*. 2024;43(4):S248-S9. doi: 10.1016/j.healun.2024.02.1146.

- b. **Sharma G**, Vela R, Powell L, Malloy CR, Jessen ME, Peltz M. Metabolic Analysis of Human Hearts Preserved with a Novel Hypothermic Perfusion System. ***The Journal of Heart and Lung Transplantation***. 2023;42(4):S185. doi: 10.1016/j.healun.2023.02.1696.
- c. **Sharma G**, Vela R, Powell L, Malloy CR, Jessen M, Peltz M. Transcriptomic Response of Human Donor Hearts to Temperature-Controlled Storage. ***The Journal of Heart and Lung Transplantation***. 2024;43(4):S159. doi: 10.1016/j.healun.2024.02.321.
- d. **Sharma G**, Vela R, Powell L, Mizerska M, Deja S, Burgess S, Malloy CR, Jessen ME, Peltz M. Metabolic Indicators in Donor Hearts Following Conventional and Temperature Controlled Storage. ***The Journal of Heart and Lung Transplantation***. 2023;42(4, Supplement):S378. doi: <https://doi.org/10.1016/j.healun.2023.02.883>.

Complete List of Published Work in My Bibliography:

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Bibliography: [My Bibliography - NCBI \(nih.gov\)](#)