

# Karla P. Mercado-Shekhar, Ph.D.

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**Biological Engineering**  
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## CURRENT RESEARCH INTERESTS

Biomedical ultrasound, ultrasound elasticity imaging, high-frequency ultrasound tissue characterization

## ACADEMIC QUALIFICATIONS

2015	Ph.D. in Biomedical Engineering	University of Rochester, Rochester, NY
2010	M.S. in Biomedical Engineering	University of Rochester, Rochester, NY
2009	B.S. in Biomedical Engineering	Boston University, Boston, MA

## RESEARCH AND PROFESSIONAL EXPERIENCE

- 2019 – present **Assistant Professor**, Discipline of Biomedical Engineering, Indian Institute of Technology Gandhinagar  
Establishing a research laboratory focused on biomedical ultrasound imaging and tissue characterization along with teaching and mentoring students.
- 2014–2019 **Postdoctoral Research**  
Research focused on developing shear wave ultrasound elasticity imaging for guiding stroke treatment, and acoustic droplet vaporization as a therapy for reperfusion injury.  
Research Advisors: Christy K. Holland, Professor and Scientific Director of the Heart, Lung, and Vascular Institute, and Kevin J. Haworth, Assistant Professor, Department of Internal Medicine, University of Cincinnati, College of Medicine.
- 2010–2014 **Doctoral Dissertation**  
Title: Developing high-frequency quantitative ultrasound techniques to characterize three-dimensional engineered tissues  
Available at <http://hdl.handle.net/1802/29710>  
Research Advisor: Diane Dalecki, Ph.D., Distinguished Professor and Chair, Department of Biomedical Engineering, University of Rochester
- 2008-2009 **Undergraduate Research**  
Project title: Developing a portable device for ultrasound imaging of the brain for use in forward battlefield areas

Research Advisor: Caleb Farny, Ph.D., Focused Ultrasound Laboratory, Brigham and Women's Hospital, Harvard Medical School

## SPONSORED RESEARCH GRANTS

*United States National Institutes of Health, National Institute of Neurological Disorders and Stroke, Postdoctoral Research Supplement*

Grant number: R01NS047603-11S1

1 August 2016 - 30 September 2018

Total award amount: \$173,534

Project: Developing ultrasound shear wave imaging for predicting lytic susceptibility of thrombi to help guide stroke treatment.

## PEER-REVIEWED PUBLICATIONS

1. **Mercado-Shekhar, K.P.**, Su, H., Kalaikadal, D.S., Lorenz, J.N., Manglik, R.M., Holland, C.K., Redington, A.N., and Haworth, K.J. "Acoustic droplet vaporization-mediated scavenging of dissolved oxygen in physiological and blood-mimicking fluids." *Ultrasonics Sonochemistry*, 56:114-124, 2019. <https://doi.org/10.1016/j.ulsonch.2019.03.029>
2. Nguyen, K., Pan, H., Haworth, K., Mahoney, E., **Mercado-Shekhar, K. P.**, Lin, C., Zhang, Z., and Park, Y. "Multiple exposure drug release from stable nanodroplets by high-intensity focused ultrasound for a potential degenerative disc disease treatment," *Ultrasound in Medicine and Biology* 45(1):160-169, 2019. <https://doi.org/10.1016/j.ultrasmedbio.2018.09.014>.
3. **Mercado-Shekhar, K.P.**, Kleven, R., Aponte Rivera, H., Lewis, R., Karani, K.B., Vos, H.J., Abruzzo, T.A., Haworth, K.J., and Holland, C.K. "The effect of clot stiffness on rt-PA lytic susceptibility in vitro," *Ultrasound in Medicine and Biology* 44(12): 2710-2727, 2018. <https://doi.org/10.1016/j.ultrasmedbio.2018.08.005>.
4. Abadi, S., Haworth, K.J., **Mercado-Shekhar, K.P.**, and Dowling, D. "Frequency-sum beamforming for passive cavitation imaging," *The Journal Acoustical Society of America*, 144(1): 198-209, 2018. <https://doi.org/10.1121/1.5045328>.
5. **Mercado, K.P.**, Radhakrishnan, K., Stewart, K., Snider, L., Ryan, D., and Haworth, K.J. "Size-isolation of ultrasound-mediated phase transition perfluorocarbon droplets using differential centrifugation," *The Journal Acoustical Society of America*, 139(5): EL142-EL148, 2016. <https://doi.org/10.1121/1.4946831>.
6. Dalecki, D., **Mercado, K.P.**, and Hocking, D.C. "Quantitative ultrasound for nondestructive characterization of engineered tissues and biomaterials," *Annals of Biomedical Engineering*, 44(3): 636-648, 2016. <https://doi.org/10.1007/s10439-015-1515-0>. \*Invited review article
7. **Mercado, K.P.**, Langdon, J., McAleavey S.A., Hocking, D.C., and Dalecki, D. "Scholte wave generation during Single Tracking Location Shear Wave Elasticity Imaging of three-dimensional engineered tissues," *The Journal of the Acoustical Society of America*, 138(2): EL138-EL144, 2015. <https://doi.org/10.1121/1.4927633>.
8. **Mercado, K.P.**, Helguera, M., Hocking, D.C., and Dalecki, D. "Noninvasive quantitative imaging of collagen microstructure in three-dimensional hydrogels using high frequency quantitative ultrasound," *Tissue Engineering Part C, Methods*, 21(7): 671-682, 2015. <https://doi.org/10.1089/ten.TEC.2014.0527>.

9. **Mercado, K.P.**, Helguera, M., Hocking, D.C., and Dalecki, D. “Estimating cell concentration in three-dimensional engineered tissues using high frequency quantitative ultrasound,” *Annals of Biomedical Engineering*, 42(6): 1292-1304, 2014. <https://doi.org/10.1007/s10439-014-0994-8>.

## CONFERENCE PROCEEDINGS

Haworth, K.J., Goldstein, B., **Mercado-Shekhar, K.P.**, Holland, C.K., and Redington, A. “Dissolved oxygen scavenging by acoustic droplet vaporization using Intravascular Ultrasound,” *2017 IEEE International Ultrasonics Symposium (IUS)*. (Peer-reviewed) DOI: 10.1109/ULTSYM.2017.8091704

## CONFERENCE ABSTRACTS

1. Su, H., Benton, R.P., Srivastava, R., **Mercado-Shekhar, K.P.**, Zhang, B., and Haworth, K.J. “Impact of droplet polydispersity in ultrasound-mediated oxygen scavenging,” *19<sup>th</sup> International Symposium of ISTU and 5<sup>th</sup> European Symposium of EUFUS*, June 13-15, 2019, Barcelona, Spain.
2. Jahanpanah, N., Sharma, S., **Mercado-Shekhar, K.P.**, Su, H., Palcich, H., Wanek, A., and Haworth, K.J. “Ascertaining the relationship between acoustic droplet vaporization, inertial cavitation, and hemolysis,” *177<sup>th</sup> Meeting of the Acoustical Society of America*, May 13-17, 2019, Louisville, Kentucky, U.S.A.
3. Su, H., **Mercado-Shekhar, K.P.**, Benton, R. P., Sharma, S., Zhang, B., and Haworth, K.J. “Feeling Gassy? Modifying the oxygen partial pressure of a fluid using acoustic droplet vaporization and different droplet concentrations,” *176<sup>th</sup> Meeting of the Acoustical Society of America and 2018 Acoustics Week*, November 5-9, 2018, Victoria, Canada.
4. Nguyen, K., Pan, H.-Y., Haworth, K.J., Mahoney, E., **Mercado-Shekhar, K.P.**, Lin, C.-Y., Zhang, Z., and Park, Y. “Multiple Exposure Drug Release from Stable Nanodroplets by High-Intensity Focused Ultrasound For a Potential Degenerative Disc Disease Treatment,” *Biomedical Engineering Society (BMES) Annual Meeting*, October 17-20, 2018, Atlanta, Georgia, U.S.A.
5. **Mercado-Shekhar, K.P.**, Kleven, R., Aponte Rivera, H., Lewis, R., Karani, K.B., Vos, H., Abruzzo, T.A., Haworth, K.J., and Holland, C.K. “Clot elasticity is inversely correlated with rt-PA thrombolytic susceptibility *in vitro*,” *16<sup>th</sup> International Tissue Elasticity Conference*, September 9-12, 2018, Avignon, France. (Peer-reviewed)
6. **Mercado-Shekhar, K.P.**, Kleven, R., Aponte Rivera, H., Lewis, R., Karani, K.B., Vos, H., Abruzzo, T.A., Haworth, K.J., and Holland, C.K. “Clot stiffness is inversely correlated with rt-PA thrombolytic efficacy *in vitro*,” *The Journal of the Acoustical Society of America*, 143: 1928, 2018 (presented at the *175<sup>th</sup> Meeting of the Acoustical Society of America*, May 7-11, 2018, Minneapolis, Minnesota, U.S.A.). DOI: 10.1121/1.5036298.
7. Su, H., Zhang, B., **Mercado-Shekhar, K.P.**, Sharma, S., and Haworth, K. “Modulating the partial pressure of oxygen using acoustic droplet vaporization,” *American Institute of Ultrasound in Medicine (AIUM) Convention*, March 24-28, 2018, New York City, New York, U.S.A.
8. Su, H., **Mercado-Shekhar, K.P.**, Srivastava, R., Arunkumar, P., Zhang, B., Holland, C., and Haworth, K. “Tunable oxygen scavenging using acoustic droplet vaporization,” *23<sup>rd</sup> European Symposium on Ultrasound Contrast Imaging*, January 18-19, 2017, Rotterdam, Netherlands.
9. **Mercado, K.P.**, Kalaikadal, D.S., Lorenz, J.N., Manglik, R.M., Holland, C.K., Redington, A.N., and Haworth, K.J. “Effect of diluent fluid viscosity on acoustic droplet vaporization-mediated dissolved

- oxygen scavenging,” *The Journal of the Acoustical Society of America*, 141: 3954, 2017 (presented at *Acoustics '17*, June 25-29, 2017, Boston, Massachusetts, U.S.A.). DOI: 10.1121/1.4988984.
10. Abadi, S.H., Haworth, K.J., **Mercado, K.P.**, and Dowling, D.R. “Using frequency-sum beamforming in passive cavitation imaging,” *The Journal of the Acoustical Society of America*, 141: 3613, 2017 (presented at *Acoustics '17*, June 25-29, 2017, Boston, Massachusetts, U.S.A.). DOI: 10.1121/1.4987745.
  11. Mahoney, E., Pan, H., Beiersdorfer, A., **Mercado, K.P.**, Haworth, K.J., Park, Y., and Lin, C. “Release of simvastatin to treat degenerative disc disease using nanodroplet targeted ultrasound,” *Orthopedic Research Society Annual Meeting*, March 19-22, 2017, San Diego, California, U.S.A.
  12. **Mercado, K.P.**, Radhakrishnan, K., Holland, C., and Haworth, K.J. “Reduction in Dissolved Oxygen Resulting from Acoustic Droplet Vaporization,” *22<sup>nd</sup> European Symposium on Ultrasound Contrast Imaging*, January 19-20, 2017, Rotterdam, Netherlands.
  13. Park, Y., Taylor, M., Zhang, Z. Collins, C., Pan, H., Mahoney, E., **Mercado, K.P.**, Haworth, K.J., and Lin, C. “Stable nanodroplets for controlled drug release and monitoring using ultrasound,” *Biomedical Engineering Society (BMES) Annual Meeting*, October 5-8, 2016, Minneapolis, Minnesota, U.S.A.
  14. **Mercado, K.P.**, Snider, L., Radhakrishnan, K., and Haworth, K.J. “An empirical model of size-isolated ultrasound-triggered phase shift emulsions,” *The Journal of the Acoustical Society of America*, 138: 1821, 2015 (presented at the *170<sup>th</sup> meeting of the Acoustical Society of America*, Jacksonville, Florida, U.S.A.). DOI: 10.1121/1.4933781.
  15. Abadi, S.H., Leckta, D.C., **Mercado, K.P.**, Haworth, K.J., and Dowling, D.R. “Frequency-sum beamforming in a random scattering environment,” *The Journal of the Acoustical Society of America*, 138: 1925, 2015 (presented at the *170<sup>th</sup> meeting of the Acoustical Society of America*, Jacksonville, Florida, U.S.A.). DOI: 10.1121/1.4934060.
  16. Langdon, J., **Mercado, K.P.**, Dalecki, D., and McAleavey, S. “Compensating for scholte waves in Single Track Location Shear Wave Elasticity Imaging,” *The Journal of the Acoustical Society of America*, 137: 2364, 2015 (presented at the *169<sup>th</sup> meeting of the Acoustical Society of America*, Pittsburgh, Pennsylvania, U.S.A.). DOI: 10.1121/1.4920590.
  17. Haworth, K.J., Radhakrishnan, K., **Mercado, K.P.**, Stewart, K., and Holland, C.K. “Ultrasound-mediated scavenging of dissolved oxygen.” *Translational Science 2015*, Washington D.C., U.S.A.
  18. **Mercado, K.P.**, Helguera, M., Hocking, D.C., and Dalecki, D. “Characterizing collagen microstructure using high frequency ultrasound,” *The Journal of the Acoustical Society of America*, 135: 2373, 2014 (presented at the *167<sup>th</sup> meeting of the Acoustical Society of America*, Providence, Rhode Island, U.S.A.). DOI: 10.1121/1.4877831.
  19. **Mercado, K.P.**, Helguera, M., Hocking, D.C., and Dalecki, D. “Parametric imaging of three-dimensional engineered tissues using high frequency ultrasound,” *The Journal of the Acoustical Society of America*, 132(3): 2066, 2012 (presented at the *164<sup>th</sup> meeting of the Acoustical Society of America*, Kansas City, Missouri, U.S.A.).

## INTELLECTUAL PROPERTY

Kevin J. Haworth, Christy K. Holland, **Karla P. Mercado-Shekhar**, Andrew Redington, Bryan Goldstein, “Dissolved Oxygen Scavenging by Acoustic Droplet Vaporization Using Intravascular Ultrasound,” U.S. Provisional Patent Application No. 62509313, filed 22 May 2017.

## HONORS AND RECOGNITION

### *Fellowships/Scholarships:*

- 2019-2022 ***Excellence in Research Fellowship***, Indian Institute of Technology Gandhinagar, India Fellowship awarded to faculty members of IIT Gandhinagar based on potential for excelling in research.
- 2015 ***Therapeutic Ultrasound Winter School Attendance Scholarship*** from the Focused Ultrasound Foundation, held at Les Houches, France.
- 2014 ***ASA School Attendance Scholarship*** from the Acoustical Society of America, held at Providence, Rhode Island, U.S.A.
- 2012 ***Physical Acoustics Summer School (PASS) Attendance Scholarship*** from the Acoustical Society of America and the National Center for Physical Acoustics, held at the University of Mississippi, Oxford, Mississippi, U.S.A.
- 2009–2014 ***Provost's Doctoral Fellowship***, University of Rochester, Rochester, New York, U.S.A. 1 of 7 fellows selected from the entire university in 2009.

### *Presentation Awards:*

- 2015 ***1<sup>st</sup> Place, Best Student Paper Award in Biomedical Acoustics***, second author of paper, 169<sup>th</sup> Meeting of the Acoustical Society of America.
- 2014 ***2<sup>nd</sup> Place, Best Student Paper Award in Biomedical Acoustics***, 167<sup>th</sup> Meeting of the Acoustical Society of America.
- 2014 ***3<sup>rd</sup> Place, Best Student Poster***, IEEE Rochester Section Joint Chapters Meeting, Rochester, New York, U.S.A.
- 2013 ***Best Student Poster Award (Biomedical Engineering)***, University of Rochester Graduate Research Showcase.
- 2012 ***3<sup>rd</sup> Place, Best Student Paper Award in Biomedical Acoustics***, 164<sup>th</sup> Meeting of the Acoustical Society of America.

### *Conference Travel Awards:*

- 2018 ***Young Investigator Travel Grant***, awarded by the Committee on Women in Acoustics to attend the 175<sup>th</sup> Meeting of the Acoustical Society of America (ASA), Minneapolis, Minnesota, U.S.A.
- 2017, 2018 ***Early Career Travel Awards***, awarded by the ASA, to attend the Acoustics '17 meeting, Boston, Massachusetts, and the 175<sup>th</sup> meeting of the ASA, Minneapolis, Minnesota, U.S.A.
- 2014 ***Student Travel Awards***, awarded by the Office of the Dean of Graduate Studies and the Graduate Student Association at the University of Rochester, to attend the 167<sup>th</sup> meeting of the ASA, Providence, Rhode Island, U.S.A.
- 2012, 2014 ***Student Conference Transportation Subsidy*** from the ASA.
- 2012 ***Student Travel Award***, awarded by the Graduate Organizing Group, University of Rochester, to attend the 164<sup>th</sup> Meeting of the ASA, Kansas City, Missouri, U.S.A.

### ***Undergraduate Awards:***

- 2006–2008     ***Dean’s List***, College of Engineering, Boston University.
- 2008           ***Excellence in Engineering Book Award***, College of Engineering, Boston University.
- 2005–2009     ***Boston University Undergraduate Full Tuition Scholarship***.
- 2005           ***Congressional Award for Leadership and Academic Excellence***, Guam, U.S.A.

## **TEACHING EXPERIENCE**

### ***Post-doctorate***

- 2017           ***Guest Lecturer***, Biomedical Ultrasound, University of Cincinnati. Delivered a lecture on the principles and clinical applications of ultrasound elastography.

### ***Graduate***

- 2014           ***Guest Lecturer***, Biomedical Signals and Measurements, University of Rochester. Delivered a lecture on continuous and discrete-time signals, and wave propagation.
- 2013–2014     ***Guest Lecturer***, Biomedical Ultrasound, University of Rochester. Delivered lectures on acoustic attenuation, and ultrasound tissue characterization methods and applications.
- 2013           ***Guest Lecturer***, Non-Conventional Imaging, Rochester Institute of Technology. Delivered lectures on the physics and applications of ultrasound.
- 2011-2012     ***Graduate Teaching Assistant***, Biomedical Ultrasound, University of Rochester. Delivered lectures on ultrasound-induced cavitation, graded assignments, and held office hours.
- 2011           ***Graduate Assistant for Laboratory***, Advanced Biomedical Ultrasound, University of Rochester.
- 2010           ***Graduate Teaching Assistant***, Biomedical Computation, University of Rochester. Supervised lab sections, held exam review sessions, graded assignments, and held office hours.

\* Overall TA Assessment Rating: Biomedical Computation 4.5/5.0 (2010), Biomedical Ultrasound 4.7/5.0 (2011-2012) (Average rating for TAs in the Department of Biomedical Engineering at the University of Rochester was 4.0/5.0)

### ***Undergraduate Teaching Assistantships***

Control Systems in Biomedical Engineering (Spring 2009), Signals and Systems in Biomedical Engineering (Fall 2009), Principles of Molecular Cell Biology and Biotechnology (Spring 2008), Boston University.

## **CAREER DEVELOPMENT**

- 2018           ***Teach Me To Teach workshop***, held by the Graduate Association for Teaching Enhancement at the University of Cincinnati, Cincinnati, Ohio, U.S.A.
- 2017           ***National Institutes of Health (NIH) Career Development Award Seminar and Write Winning Grant Proposals Seminar***, held by Grant Writers’ Seminars & Workshops, LLC, at the University of Cincinnati, Cincinnati, Ohio, U.S.A.

- 2015, 2016 *Selected participant, Young Investigator's Meeting (YIM)*, held at the Massachusetts Institute of Technology, Cambridge, Massachusetts, U.S.A. and the University of Chicago, Chicago, Illinois, U.S.A.
- 2014 *NextProf Future Faculty Workshop*, sponsored by the University of Michigan College of Engineering, held at the University of Michigan, Ann Arbor, Michigan, U.S.A.  
\* Full financial support was provided by the University of Michigan.
- 2011–2014 *Future Faculty Initiative, Graduate Writing Project Workshops, and the Leadership in Education Initiative* at the University of Rochester, Rochester, New York, U.S.A.

## SERVICE

- 2017 *Outreach volunteer and speaker, Acoustical Society of America Waves and Sound Workshop*, hosted by the American Association of Physics Teachers, Cincinnati, Ohio, U.S.A.
- 2015–present *Journal reviewer\**:
- Scientific Reports
  - Annals of Biomedical Engineering
  - Ultrasound in Medicine and Biology
  - Physics in Medicine and Biology
  - Ultrasonic Imaging
  - Acta Biomaterialia
  - Cancers
  - Journal of the Acoustical Society of America
  - Sensors
  - Applied Sciences
  - Current Bionanotechnology
  - Diagnostics
  - Biomedical Physics & Engineering Express
- \* Verified peer review record: <https://publons.com/author/1353448/karla-p-mercado-shekhar#profile>
- 2017 *Judge, Biomedical acoustics best student paper competition, Acoustics '17* at Boston, Massachusetts, U.S.A.
- 2012 *Graduate Student Mentor, Xerox Fellows Professional Development Series*, University of Rochester.

## PROFESSIONAL MEMBERSHIPS

- 2016–2018 *Full member, Sigma Xi, The Scientific Research Society.*
- 2015–present *Associate member, Acoustical Society of America.*
- 2012–2014 *Student member, Acoustical Society of America.*