Claudia Elena Varela, Ph.D.

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Education and Training

Boston University, Biomedical Engineering *(July 2023-present)*
Postdoctoral Fellow
Prof. Christopher Chen's Group

MIT, Institute for Medical Engineering and Science *(August 2023-present)*
Visiting scientist
Prof. Ellen Roche's Group

MIT, Institute for Medical Engineering and Science *(June 2022-July 2023)*
Postdoctoral Fellow/Research Specialist
Prof. Ellen Roche's Group

MIT-Harvard University, Program of Health Sciences and Technology (*September 2016- May 2022)*
Medical Engineering and Medical Physics Ph.D.
Concentration: Mechanical Engineering

University of California San Diego (*September 2011- June 2016)*
Bioengineering B.S.; Dance B.A. (with honors) *Cum Laude*

Research Experience

Massachusetts Institute of Technology- Ellen Roche Ph.D. *(January 2017-present)*
- Develop a 3D printed, sutureless epicardial platform for custom modulation of infarct biomechanics.
- Optimize in vivo performance and biocompatibility of novel tissue adhesive hydrogels.
- Analyze host response and bioagent delivery from a subcutaneously implanted dynamic reservoir.
- Evaluate cardiac function and bioagent transport from a refillable epicardial delivery device.

Massachusetts Institute of Technology- Hugh Herr Ph.D. *September 2016-January 2017)*
- Developed a capture ELISA assay for analysis of optogenetic-related immunogenicity in rat serum.

University of California San Diego- Francisco Villarreal M.D, Ph.D. *(August 2012-June 2016)*
- Investigated the effects of *(-)-Epicatechin* in cultured adipocytes from obese humans.
- Researched the effects of *Aronia Melanocarpa* extract on endothelial cell nitric oxide production.
- Analyzed the biomechanical properties of healing and scarred myocardium via two dimensional epicardial strains in mice treated with 11βHSD1 inhibitor compound and 11βHSD1-KO mice.
- Examined collagen deposition in GFP-mice treated with high glucose/fructose.

University of California San Diego- Pedro Cabrales Ph.D. *(September 2015-June 2016)*
- Designed a physical therapy assistive device that restrains rotary motion and increases patient stability to avoid injury due to exercise malperformance.

Stanford University- Marc Levenston Ph.D. *(June 2015-August 2015)*
- Developed a device and protocol to image meniscal tissue samples to examine the relationship between osmotic swelling stress in meniscus and T_2 MRI relaxation time.

Columbia University- Michael Shadlen M.D, Ph.D. *(June 2014-August 2014)*
- Analyzed the influence that temporal and spatial displacements of dots in a Random-Dot-Kinematogram stimulus have in human subjects' performance during a visual discrimination task.

University of California San Diego- Antonio de Maio Ph.D. *(October 2011-February 2012)*

- Basic methodology training laboratory (Bovine Serum Albumin assay, Polymerase Chain Reaction protocol, Western Blotting, Molecular Cloning, Flow Cytometry)

Peer-Reviewed Research Publications

1. **Varela C.E.,** Yuk H., Quevedo-Moreno D., Bonnemain J., Mendez K., Tagoe J., Zhao X., Roche E.T. "An atraumatic epicardial patch platform for customizable in vivo modulation of infarct strain" (*in preparation)*
2. **Varela C.E.*,** Monahan D.S.*, Islam S., Whyte W., Bonnemain J., Duffy G., Roche E.T. (2022) "Multidose delivery of exogenous FSTL1 enabled by an epicardial reservoir leads to improved cardiac function and angiogenesis" *bioRxiv*. https://doi.org/10.1101/2022.11.02.513725
3. Whyte, W., Goswami, D., Wang S.X., Fan, Y., Ward, N.A., Levey R.E., Beatty, R., Robinson, S.T., Sheppard, D., O'Connor, R., Monahan, D.S., Trask, L., Mendez, K.L., **Varela C.E.,** Horvath, M.A., Wylie, R., O'Dwyer, J., Domingo-Lopez, D.A., Rothman, A.S., Duffy, G.P., Dolan, E.B.*, Roche E.T.*. (2022) "Dynamic actuation enhances transport and extends therapeutic lifespan in an implantable drug delivery platform" *Nat.Comms*. https://doi.org/10.1038/s41467-022-32147-w
4. Deng, J.*, Chen, X., Wu J., Sarrafian, T., **Varela C.E.**, Whyte, W., Guo, C.F., Roche, E.T., Griffiths, L.G., Yuk, H.*, Nabzdyk, C.S.*, Zhao, X.* (*in revision*) "Bioadhesive Electronics for Atraumatic Cardiac Monitoring and Pacing in Vivo".
5. Yuk, H.*, Wu, J., Sarrafian, T.L. Mao, X., **Varela C.E.,** Roche, E.T., Griffiths, L.G., Nabzdyk, C.*, Zhao, X.* (2021) "Rapid and coagulation-independent hemostatic sealing by a paste inspired by barnacle glue" *Nat Biomed Eng*. https://doi.org/10.1038/s41551-021-00769-y
6. Singh M., **Varela C.E.,** Whyte W., Horvath M.A., Tan N.C.S., Ong C.B., Liang P., Schermerhorn M.L., Roche E.T., Steele T.W.J. (2021) "Minimally invasive electroceutical catheter for endoluminal defect sealing" *Science Advances.* Vol. 7, no. 14, eabf6855 https://doi.org/10.1126/sciadv.abf6855
7. Deng J., Yuk H., Wu J., **Varela C.E.,** Chen X., Roche E.T., Guo C.F. Zhao X. (2020) "Electrical bioadhesive interface for bioelectronics". *Nat. Mater*. https://doi.org/10.1038/s41563-020-00814-2.
8. Yuk H.*, **Varela C.E.*,** Nabzdyk C.S., Padera R.F., Roche E.T., Zhao X. (2019) "Dry Double-sided Tape for Instant Strong Adhesion of Wet Tissues and Devices", *Nature.* https://doi.org/10.1038/s41586-019-1710-5.
9. Dolan E.B., **Varela C.E.,** Mendez K., Whyte W., Levey R.E., Robinson S.T., Rothenbucher S.E., Maye E., Fan Y., Wylie R., Monaghan M., Dockery P., Duffy G.P.*, Roche E.T.* (2019) "An actuatable soft reservoir modulates host foreign body response", *Science Robotics.* https://doi.org/10.1126/scirobotics.aax7043.
10. **Varela C.E.,** Fan Y., Roche E.T. (2019) "Optimizing Epicardial Restraint and Reinforcement Following Myocardial Infarction: Moving Towards Localized, Biomimetic, and Multitherapeutic Options", *Biomimetics*. https://doi.org/10.3390/biomimetics4010007.
11. Shirazi R.N., Islam S., Weafer F.M., Whyte W., **Varela C.E.,** Villanyi A., Ronan W., McHugh P., Roche E.T. (2019) "Multiscale Experimental and Computational Modeling Approaches to Characterize Therapy Delivery to the Heart from an Implantable Epicardial Biomaterial Reservoir", *Advanced Healthcare Materials.* https://doi.org/10.1002/adhm.201900228.
12. Fan Y., Ronan W., Teh I., Schneider J. E., **Varela C.E.,** Whyte W., McHugh P., Leen S., Roche E.T. (2019) "A comparison of two quasi-static computational models for assessment of intra-myocardial injection as a therapeutic strategy for heart failure", *International Journal for Numerical Methods in Biomedical Engineering.* https://doi.org/10.1002/cnm.3213.
13. Whyte W.*, Roche E.T.*, **Varela C.E.**, Mendez K., O'Neill H., Weafer F., Shirazi R.N., Vasilyev N.V., Murphy B., Duffy G.P., Walsh C.J., Mooney D.J. (2018) "Sustained release of targeted cardiac therapy with a replenishable, implantable reservoir", *Nature Biomedical Engineering.* https://doi.org/10.1038/s41551-018-0247-5.

14. Horvath M.*, **Varela C.E.*,** Dolan E.B.*, Whyte W., Monahan D.S., Payne C.J., Wamala I.W., Vasilyev N.V., Pigula F.A., Mooney D.J., Walsh C.J., Duffy G.P., Roche E.T. (2018) "Towards alternative approaches for coupling of a soft robotic sleeve to the heart", *Annals of Biomedical Engineering*. https://doi.org/10.1007/s10439-018-2046-2.
15. Maimon B., Diaz M., Revol E., Schneider A., Leaker B., **Varela C.E.,** Srinivasan S., Weber M., and Herr H. (2018) "Optogenetic Peripheral Nerve Immunogenicity" *Scientific Reports.* https://doi.org/10.1038/s41598-018-32075-0.
16. **Varela C.E.***, Rodriguez A.*, Romero-Valdovinos M., Mendoza-Lozano P., Mansour C., Ceballos G., Villarreal F., Ramirez-Sanchez I. (2017) "Browning effects of *(-)- Epicatechin* in adipocytes and white adipose tissue", *European Journal of Pharmacology*. ISSN 0014-2999, http://dx.doi.org/10.1016/j.ejphar.2017.05.051.
17. **Varela C. E.**, Fromentin E., Roller M., Villarreal F., Ramirez-Sanchez I. (2016) "Effects of a natural extract of *Aronia melanocarpa* berry on endothelial cell nitric oxide production", *Journal of Food Biochemistry*. https://doi.org/10.1111/jfbc.12226.

*Co-first authors or Co-corresponding authors

Honors and Awards

Postdoctoral Awards
- Sci Foo 2023, invitation-only *unconference* attendee, Google X *(July 2023)*
- Ford Foundation/NASEM Postdoctoral Fellowship *(April 2023)*
- T32 Fellowship, MGH Cardiovascular Research Center *(July 2022)*
- NextProf NEXUS 2022, selected attendee, UC Berkeley *(September 2022)*

Doctoral Awards
- Rising Stars in Mechanical Engineering 2021 selected attendee, MIT MechE. Dept. *(October 2021)*
- MIT Path of Professorship 2019 selected attendee, MIT Office of Graduate Education *(November 2019)*
- Editor's Choice Awards for 2018, Annals of Biomedical Engineering Journal *(June 2019)*
- MIT Bridge Builder Award (Group), MIT Institute Awards *(May 2019)*
- MIT Graduate Women of Excellence, MIT Office of Graduate Education *(April 2019)*
- Athanasiou ABME Student Award, Annals of Biomedical Engineering Journal *(September 2018)*
- NSF Graduate Research Fellowship *(March 2018)*
- UNITEC BioFund Fellowship, MIT Competitive Fellowships *(August 2017)*
- Ford Foundation/NASEM Predoctoral Fellowship (*March 2017*)
- GEM Fellowship Finalist (*March 2017*)

Teaching Experience

- Boston University
  CELL-MET Science Communication Fellow *(Sept 2023-present)*
  Year-long program to become proficient in effective science communication techniques and refine supporting materials to three different target audiences.

- Massachusetts Institute of Technology
  Kaufman Teaching Certificate Program *(Sept-Dec 2021)*
  Eight-workshop series to learn and apply evidence-based teaching techniques through course/syllabus development and micro-teaching sessions.

- Massachusetts Institute of Technology/Harvard Medical School
  Teaching Assistant
  HST.500 "Frontiers of Biomedical Engineering" (Feb-May 2021)
  HST.S57 "Cardiovascular Bioengineering" (January 2021, Sept-Dec 2021)

HST.100 "Respiratory Pathophysiology" (Feb-May 2020)

- Clubes de Ciencia México
  Instructor of 1-week intensive science course
  "Robocomplexity: Visualizing your physiology through complexity and robotics" (August 2019) "Robots and complexity to mend broken hearts" (August 2018)

Leadership Experience

Graduate-level

- Harvard- MIT Division of Health Sciences and Technology (HST)
  Prof. Ellen Roche's Group, **Research Supervisor** *(January 2019-present)*
  - Supervise and mentor 2 students' undergraduate thesis projects titled "Development and Analysis of a Minimally Invasive Post-Infarction Epicardial Patch Delivery Device" and "Customizable 3D-printed cardiac patches to evaluate the therapeutic efficiency of mechanical reinforcement on the infarcted heart"
  - Consult, edit, and provide feedback on these students' graduate school application packages.

  Admissions Committee, **Student Interviewer** *(January 2019-present)*
  - Conduct individual or panel interviews of perspective PhD students after holistic application review.
  - Participate in implicit bias and application review training prior to review process.

  Diversity, Equity and Inclusion (DEI) Committee, **Elected Student Representative** *(September 2020-present)*
  - Present student perspectives and advise on the implementation of programs to advance DEI.

  HST Joint Council, **Elected Student Representative** *(September 2020-present)*
  - Liaise for student needs in the HST/IMES Committee for Academic Programs.

  HST Student Diversity Ambassadors, **Founding Member** *(June 2017-2020)*
  - Advocate for resources to increase recruitment and retention of underrepresented minority students
  - Crafted a proposal to HST leadership to hire a full-time employee as a Director of Diversity, Equity, and Inclusion for HST
  - Implemented the MEMP Application Assistance Program to provide peer-support to applicants without traditional social network connections to Harvard and MIT

  Big Buddy Mentoring Program, **Mentor** *(August 2017-present)*
  - Advised 2 incoming HST students during their transition into graduate school.

- Massachusetts Institute of Technology
  MIT's Summer Research Program, **Research Supervisor** *(June 2018-August 2018)*
  - Supervised and mentored a summer full-time student on the development of a soft robotic mechanical stimulation platform for myocardial slice in vitro culture.

  *MIT's Summer Research Program***, Application Review Committee** *(January 2018- present)*
  - Evaluated prospective summer student applications following training by the Office of Graduate Education

  Graduate Students of Color Advisory Council to Vice-Chancellor Ian Waitz, **Member** *(Sept. 2018-20)*
  - Provide input to the Office of Graduate education and MIT leadership on how to enhance the experiences of Graduate Students of color at MIT.

  MIT Mexican Student Association, **Board member** *(July 2017-present)*
  - Organize events for the MIT community and lead meetings to organize fundraising.

- Clubes de Ciencia México
  Leadership Team, **Academic Logistics Committee** *(November 2017-present)*
  - Assist in the selection process of science instructors and the development of selected courses' curricula.

Scientific Presentations

Graduate-level

- **Varela CE**, Mendez K, Roche ET. "Acute *In Vivo* Characterization of Customized Adhesive Epicardial Patches for Mechanical Reinforcement"
  - Biomedical Engineering Society, *Poster Presentation*, October 2021
- **Varela CE**, Quevedo-Moreno DA, Roche ET. "An Adhesive Epicardial Platform For Customizable Mechanical Reinforcement"
  - IEEE EMBS Universidad de Monterrey, *Virtual*, September 2021
  - Biomedical Engineering Society, *Virtual*, October 2020
- **Varela CE,** Roche ET. "Directo al corazón: desarrollando plataformas epicárdicas para el suministro de terapias"
  - Universidad Autónoma de Yucatán, *Virtual*, November 2020
- **Varela CE,** Roche ET. "Directo al corazón: desarrollando plataformas epicárdicas para el suministro de terapias"
  - Centro de Biotecnología Genética-Instituto Politécnico Nacional, Reynosa, MEX, November 2019

Other Skills and Activities

Bilingual (Spanish-English)

Professional dancer with *Danza Orgánica*; social justice-oriented dance-theater company *(July 2017-present)*