ALEX B. MILLER

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EDUCATION

Harvard Medical School-Massachusetts Institute of Technology Cambridge, MA
Ph.D. candidate in Medical Engineering and Medical Physics Sept 2018- present

Harvard University Cambridge, MA
B.S. *magna cum laude with Highest Honors* in Engineering Sciences (Bioengineering); GPA 3.795/4.0 May 2015
Minor in Computer Science
Coursework: Physiology, engineering design, materials, mechanics, statistics, differential equations, thermodynamics, computer science

RESEARCH EXPERIENCE

Massachusetts Institute of Technology 2018-present
- Optimized microfluidic device to detect and isolate circulating tumor cells *Scott R. Manalis, Ph.D.*
- *In vivo* experience with genetically engineered mouse models of lung and pancreatic cancer

Broad Institute & Massachusetts Institute of Technology 2015-2018
- Developed miniaturized micropatterned hepatocyte-fibroblast co-culture (MPCC) in 384 well format *Sangeeta N. Bhatia, Ph.D.*
- Characterized long-term functionality of new 384 well MPCC system
- Showed capacity for malaria and hepatitis B infection in new 384 well MPCC system
- Automated image acquisition and data analysis of MPCC platform for malaria infection
- Tested antimalarial properties of over 350 vaccinated patient-derived antibodies
- Dissected and isolated parasites from over 3000 *P. vivax*, *P. falciparum*, and *P. berghei* infected mosquitoes
- Performed infection, invasion, and gliding assays of 3 malaria species at sites in Boston, D.C., Bangkok, Thailand, and Goa, India
- Developed 3D hepatocyte organoid "ectopic liver" susceptible to malaria infection for *in vivo* assessment of infection
- Assisted with siRNA knockdown studies to determine novel host factors for malaria infection

Cell types cultured: Primary human hepatocytes, primary rat hepatocytes, fibroblasts, HepG2
Equipment used: Integra Viaflo & Viaflo Assist, Phenix Opera microscope, confocal microscope, vacuum plasma chamber
Tests/Assays: Mosquito dissection & malaria sporozoite isolation, ELISA, CYP induction, qPCR, Western Blot

Harvard University & Wyss Institute 2012-2015
- Designed and developed drug refillable vascular graft using DNA toehold exchange *David J. Mooney, Ph.D.*
- Tested efficacy of DNA-based hydrogels
- Optimized the chemistry of DNA-alginate complexes
- Characterized toxicity of DNA-doxorubicin conjugate on anderocarcenoma cells
- Performed sprouting assays with human umbilical vein endothelial cells (HUVECs)
- Tested and analyzed differences in growth factor effects on HUVECs with and without presence of serum

Cell types cultured: HUVEC, anderocarcenoma, HMVEC, fibroblasts
Equipment used: Confocal/fluorescent microscopes, LCMS, Nanodrop, Plate reader
Tests/Assays: Sprouting assay, toxicity study, drug release study, dialysis, hydrogel formation (alginate and DNA)

Academic Experiences
Cell types cultured: D1 mouse mesenchymal stem cells, osteoblasts, HUVEC
Tests/Assays: PCR, electrophoresis, ELISA, 3D printing, microfluidics, hydrogel formation

TEACHING EXPERIENCE

Axiom Learning, Inc. 2015-2017
- Tutored local high school students in SAT/ACT Prep, geometry, and pre-calculus

Harvard Bureau of Study Counsel 2012-2015
- Tutored Harvard University students in Multivariable Calculus, Linear Algebra and Differential Equations

LANGUAGE/PROGRAMS

Labview, MatLab, GraphPad, ImageJ, C, Javascript, COMSOL, SolidWorks, Zen Imaging (Zeiss), Nikon Imaging

PUBLICATIONS

Grazia Camarda, Piyaporn Jirawatcharadech, Richard Priestley, Ahmed Saif, Sandra March, Michael Wong, Suet Leung, **Alex B. Miller**, David Baker, Pietro Alano, Mark Paine, Sangeeta N. Bhatia, Paul O'Neill, Stephen Ward, Gaiancarlo Biagini. Antimalarial activity of primaquine operates via a two-step biochemical relay. *Nature Communication*. In Press

Liliana Mancio-Silva, Heather E. Fleming, **Alex B. Miller**, Stuart Milstein, Abigail Liebow, Patrick Haslett, Laurar Sepp-Lorenzino, Sangeeta N. Bhatia. Improving drug discovery by nucleic acid delivery in engineered human microlivers. *Cell Metabolism.* 2019

Nil Gural, Liliana Mancio-Silva, **Alex B. Miller**, Ani Galstian, Vincent L. Butty, Stuat S. Levine, Rapatbhorn Patrapuvich, Salil P. Desai, Sebastian A. Mikolajczak, Stefan H.I. Kappe, Heather E. Fleming, Sandra March, Jetsumon Sattabongkot, Sangeeta N Bhatia. In Vitro Culture, Drug Sensitivity, and Transcriptome of Plasmodium Vivax Hypnozoites. *Cell Host and Microbe*. 2018.

Neville K. Kisalu, Azza H. Idris, Connor Weidle, Yevel Flores-Garcia, Barbara J. Flynn, Brandon K. Sack, Sean Murphy, Arne Schön, Ernesto Freire, Joesph R. Francica, **Alex B. Miller**, Jason Gregory, Sandra M. Riera, Hua-Xin Liao, Barton F. Haynes, Kevin Wiehe, Ashley M. Trama, Kevin O. Saunders, Morgan A. Gladden, Anthony Monroe, Mattia Bonsignori, Masaru Kanekiyo, Adam K. Wheatley, Adrian B. McDermott, S. Katie Farney, Gwo-Yu Chuang, Baoshan Zhang, Natasha K C, Aumana Chakravarty, Peter D. Kwong, Photini Sinnis, Sangeeta N. Bhatia, Stefan H. I. Kappe, B. Kim Lee Sim, Stephen L. Hoffman, Fidel Zavala, Marie Pancera, Robert A. Seder. A human monoclonal antibody prevents malaria infection and defines a site of vulnerability on Plasmodium falciparum circumsprozoite protein. *Nature Medicine*. 2018.

Yevgeny Brudno, Eduardo A Silva, Cathal J Kearney, Sarah A Lewin, **Alex Miller**, Kathleen D Martinick, Michael Aizenberg, David J Mooney. Refilling Drug Delivery Depots Through the Blood. *PNAS.* 2014.

CONFERENCE PRESENTATIONS

Gural, N.*, **Miller, A.**, Galstian, A., March, S., Sattabongkot, J.,Bhatia, S.N. "Deciphering the Biology of the Dormant Malaria, Plasmodium vivax, via an in vitro platform" NIH/NIAID Symposium: Molecular Mechanisms and Immune Consequences of Pathogen Reservoirs. North Bethesda, MD, USA, 2017.

Gural, N.*, **Miller, A.**, Galstian, A., March, S., Sattabongkot, J.,Bhatia, S.N. "Deciphering the Biology of the Dormant Malaria, Plasmodium vivax, via an in vitro platform" Gordon Research Conference. Les Diablerets, Switzerland, 2017.

Gural, N.*, Stillo, B., Galstian, A., **Miller, A.**, Patrapuvich, R., March, S., Sattabongkot, J and Bhatia, S.N. "Developing an in vitro Platform to Study the Dormant Liver Stages of Plasmodium vivax Malaria" BMES. Minneapolis, USA, 2016.

* designates presenter

AWARDS AND HONORS

- Dean's Award for Outstanding Engineering Project Honorable Mention- 2015
- Herschel Smith Harvard Undergraduate Science Research Fellow- Summer 2014
- Harvard College Program for Research in Science and Engineering Fellow- Summer 2014
- Harvard College Research Program Fellow – Spring 2013 & Spring 2014
- Eagle Scout