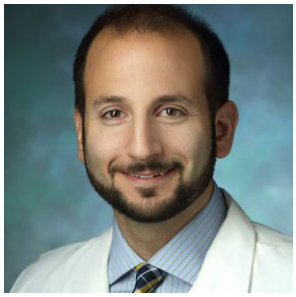

Joshua C. Doloff, Ph.D.

Titles & Department

Assistant Professor, Biomedical Engineering; Materials Science & Engineering

Specialization Area

Immunoengineering; regenerative medicine; biomaterials/biomedical devices; controlled drug delivery; synthetic and systems biology; autoimmune, cancer, and infectious disease models.

Unmet Need

Generates improved therapeutic platforms for multiple applications (e.g., autoimmunity, transplantation medicine, ophthalmology, cancer) using systems and synthetic biology approaches.

Summary of Research & Work

Dr. Doloff's work uses immunoengineering and regenerative medicine approaches to understand complex tissue dynamics and generate improved therapeutic platforms for multiple applications, including autoimmunity and transplantation medicine, ophthalmology, and cancer. His current research focuses in three areas: (1) modulating host responses to biomaterial/medical devices, where his work preventing immune-mediated host rejection of macroscale devices has enabled their expanded clinical use; (2) tissue engineering, where he seeks to improve regenerative and reconstructive medicine by engineering therapeutics for inflammatory diseases (e.g. autoimmune-induced Type 1 diabetes); and (3) drug delivery, where he develops long-term drug delivery formulations targeted towards immune modulation.

Value Proposition

- Technology for improved biocompatibility of implanted devices.
- Methods for localized, targeted, long-term (i.e., months-to-years) controlled drug release.
- First immunosuppressant-free, long-term, functional transplant of human SC-β cells in animal models of diabetes.
- Identification of optimal biomaterials for mRNA delivery vehicles.

Recent Publications

- Farah S*, Doloff JC*, Mueller P, Sadraei A, Han HJ, Olafson K, Tyas K, Tam HH, Hollister-Locke J, Griffin M, Meng A, McGarrigle J, Greiner DL, Weir G, Oberholzer J, Langer R, and Anderson DG. 2019. Long-Term Implant Fibrosis Prevention in Rodents and Non-Human Primates Using Crystallized Drug Formulations. Nature Materials. Aug;18(8):892-904. doi: 10.1038/s41563-019-0377-5.
- Bauer SJ and Doloff JC. 2021. Less fibrosis around softer silicone implants. Nature Biomed Eng. Dec;(20):1407-1408. doi: 10.1038/s41551-021-00830-w.

- Lai V, Neshat SY, Rakoski A, Pitingolo J, Sabedra J, Li S, Shodhan A, and Doloff JC. 2021. Crystallization of the Multi-Receptor Tyrosine Kinase Inhibitor Sorafenib for Controlled Long-Term Drug Delivery Following a Single Injection. CMBE (Young Innovators). Oct 18;14(5):471-486. doi: 10.1007/s12195-021-00708-6.
- Lai V, Neshat SY, Rakoski A, Pitingolo J, and Doloff JC. 2021. Drug delivery strategies in maximizing anti-angiogenesis and anti-tumor immunity. Adv Drug Deliv Rev. Dec;(179):113920. doi: 10.1016/j.addr.2021.113920.
- Doloff JC, Veiseh O, de Mezerville R, Sforza M, Perry TA,...& Langer R. 2021. The surface topography of silicone breast implants mediates the foreign body response in mice, rabbits and humans. Nat Biomed Eng. June 21; https://doi.org/10.1038/s41551-021-00739-4 (*: co-first, ^: co-corresponding).
- Doloff JC and Waxman DJ. 2012. VEGF receptor inhibitors block the ability of metronomically dosed cyclophosphamide to activate innate immunity-induced tumor regression, Cancer Research, Mar 1; 72(5): 1103-15

Awards & Honors

- Boston University MCBB Distinguished Young Alumni Rising Star Award, 2018
- BMES Session Co-Chair, Implantable Devices/Sensors, 2017
- Society for Biomaterials, 1st Place Prize, Immune Engineering SIG, 2017
- Juvenile Diabetes Research Foundation (JDRF) Postdoctoral Fellowship, 2015
- US-Japan Drug Delivery Symposium, Top poster, Selected speaker, 2013
- Koch Institute Joseph C. Jefferds, Jr. Research Travel Fellowship, 2013
- Frank A. Belamarich Award, Boston University, 2011