Title: Tissue- and Cell-Responsive Materials for Medical Applications

Abstract:

One-size fits all mentality in biomaterial design ignores the profound changes in tissue surface chemistry and biology, resulting in suboptimal material performance when applied to different tissue types and states (healthy and diseased). My lab devised materials that respond to cues from tissues and cells to maximize therapeutic efficacy and tolerability. At the tissue scale, we developed adhesive hydrogels that can be formulated to respond to tissue type and pathologic state to improve material performance, adhesion strength, and biocompatibility. At the cellular level, nanoparticle structures were engineered to respond to intracellular states, enhance nanoparticle potency and stability, and expand the therapeutic window—allowing studying the drug mechanism of action. The lab is particularly interested in engineering biomaterials to overcome barriers to the controlled spatiotemporal distribution of immunotherapies and enabling their subsequent combination with existing and novel therapeutic modalities to revolutionize the care of patients with cancer and autoimmune diseases. Recently, we have used these technologies to enable generating a 'living' therapeutics by local and sustained delivery of chemoimmunotherapy to brain tumors that reprogram the immune system. We show that material design and structure influence therapeutic outcomes and alter the spatiotemporal characteristics of the incited immunomodulatory responses in the treatment of solid tumors, enabling studying basic questions in immunobiology. We also show that with the aid of polymeric microneedles, we can release factors that can help recruit and expand endogenous regulatory T cells right at the lesion site that can counteract the autoreactive immune cells, which will revolutionize treatment outcomes in patients with autoimmune skin diseases such as alopecia areata, vitiligo, psoriasis, and other common skin diseases.

Biography:

Dr. Artzi is an Associate Professor of Medicine at Harvard Medical School. She is a Principal Research Scientist at MIT, Associate Faculty at the Wyss Institute for Biologically Inspired Engineering, Head of Structural Nanomedicine at Mass General Brigham's Gene and Cell Therapy Institute (GCTI), and an Associate Member of the Broad Institute of Harvard and MIT. She completed her postdoctoral studies at MIT focusing on studying tissue:biomaterial interactions and designing smart biomaterials for therapy and diagnosis applications.

Dr. Artzi is the recipient of multiple grants and awards, including an ARPA-H grant, and prestigious awards including the inaugural Kabiller Rising Star Award in Nanotechnology and Nanomedicine, the Acta Biomaterialia Silver Medal, Society for Biomaterials Clemson Award for Applied Research, One Brave Idea Award, Stepping Strong Innovator, Mid-Career Award from the Society for Biomaterials, Bright Futures Prize, and the Massachusetts Life Science Center for Women Entrepreneurs. Dr. Artzi was recently inducted to the Controlled Release Society College of Fellows and the American Institute for Medical and Biological Engineering.

Currently, Dr. Artzi directs multiple research venues aiming to integrate science, engineering, and medicine to rationally design personalized materials to improve human health, and has co-founded a startup company, BioDevek, which develops next-generation biomaterials to improve outcomes following internal surgeries. She also founded Araneus Bio, a company that aims to take technology from the lab to the clinic for the treatment of patients with Glioblastoma.