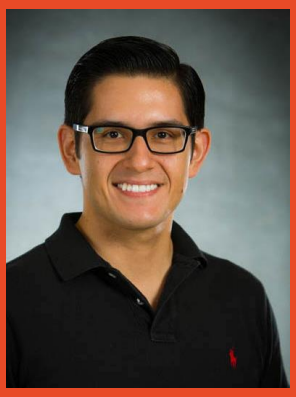

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Development of modular hydrogel bioinks for 3D tissue printing applications

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ABSTRACT:

Glioblastoma (GBM) is the most common, aggressive, and deadly form of brain cancer, and spreads diffusively through the brain *via* processes of invasion. Our central hypothesis is that gradients in biophysical cues and perivascular signals which exist across the margins of GBM tumors uniquely prime a sub-population of GBM cells to avoid current generation treatments. Our efforts involve the development of advanced fabrication approaches to examine processes associated with GBM cell invasion across the GBM tumor margins within perivascular niche (PVN) zones. I will specifically focus on utilizing extrusion-based 3D-bioprinting (EBB) to generate a three-dimensional GBM-laden hydrogel construct. EBB offers an unmatched capability to finely control spatial patterning of biological, biophysical, and biochemical components to create a more complex tissue-mimetic 3D construct, difficult to generate *via* conventional biomaterials fabrication. My efforts aim to develop GelMA-based hydrogel bioinks for 3D-printing GBM cells and to explore a range of orthogonal chemistries to form cell-laden hydrogels with minimal disruption (*e.g.*, orthogonal UV/thiol-ene methods). The topology and physical properties of the hydrogel-based bioinks will be adjusted to maximize bioprintability and GBM cell viability. EBB will be subsequently used to investigate the invasion response/cell migration of GBM cells across co-printed bioinks with different PVN zones. Improved biomaterial mimics of the tumor margins may reveal a deeper understanding of the role played by the gradient environment in the tumor margins on GBM invasion and eventually therapeutic resistance, and may underlie a framework for identifying and validating combinations of therapeutic agents as personalized antitumor therapies.

AWARDS/PUBLICATIONS:

- NCI Diversity Supplement (R01, 2018-2020)