Thesis Project Portfolio

Encapsulation of Cells within Microporous Annealed Particle (MAP) Scaffold for a Tissue Engineered Brain Tumor Microenvironment

(Technical Report)

Impact of Race and Gender on Allocation of Cancer Research Funding

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science

University of Virginia • Charlottesville, Virginia

In Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

Zoe Apsel

Spring, 2023

Department of Biomedical Engineering

Table of Contents

Sociotechnical Synthesis

My capstone research addresses the issue of increasing the applicability of in vitro Glioblastoma (GBM) research to in vivo GBM behavior. This is done by recreating the tumor microenvironment, the cells, extracellular matrix, and other tissue components surrounding and interacting with tumor cells, to try and recreate in vivo GBM behavior in an in vitro setting. More specifically, this system uses a Microporous Annealed Particle (MAP) hydrogel scaffold encapsulated with neural cells including microglia, astrocytes, and endothelial cells, made to mimic brain tissue. It is important to consider the social and human factors of this technology because it has the possibility for reducing the need for risky and invasive clinical trials and patient testing by allowing for treatments to be tested more thoroughly for efficacy prior to being applied to patients. Moreover, this technology is being made to directly benefit cancer patients by advancing cancer research, specifically GBM, so it is necessary to the success of this technology for the effect on GBM patients to be considered. Additionally, brain cancers and more fatal cancers, such as GBM, are notably underfunded per life year lost, so increasing the accessibility of GBM research will hopefully improve outcomes and reduce research costs. One STS theory that might apply to this technical problem is technological determinism. When applied to this project it could be argued that advancing the technology of in vitro GBM research could alter the way society views distributing resources for cancer research by holding less importance to cancers with high incidence and more importance to cancers with worse prognoses.

To conduct my STS research, I am using a literature review of secondary sources, such as policy documents and literature, to collect my information. To analyze this data, I am performing a policy analysis by constructing a variety of policy alternatives and comparing their projected outcomes based on success factors derived from the literature review. Through my STS research I expect to find examples of disparities within cancer research funding based on race and sex, and one or more possible policy solutions to reduce or eliminate these disparities.

When considered together, my capstone and STS research aim to improve current cancer research both technically by making advances in technical research and structurally through improving the equity of funding distribution.