Thesis Project Portfolio

Assessing Microvascular Cell Behavior in an in vitro PEG-DA Hydrogel Cell Culture Assay of Idiopathic Pulmonary Fibrosis (IPF)

(Technical Report)

Addressing Inequality in American Healthcare: How Agencies Have Advocated for Reducing Healthcare Disparities

(STS Research Paper)

An Undergraduate Thesis Portfolio
Presented to the Faculty of the
School of Engineering and Applied Science
University of Virginia

In Partial Fulfillment of the Requirements for the Degree
Bachelor of Science, Biomedical Engineering

by

Anna Kittel

May 9, 2023

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Sociotechnical Synthesis

Chronic lung diseases such as chronic obstructive pulmonary disease (COPD), asthma, and idiopathic pulmonary fibrosis (IPF) impact millions of people worldwide. These conditions are often marked by inflammation that makes breathing and lung oxygen exchange difficult. How can incidence of chronic lung diseases be reduced in the United States?

Idiopathic pulmonary fibrosis (IPF) is a chronic lung condition of unknown cause that presents as excess formation of scar tissue in the lungs that makes breathing and oxygen update difficult; there is no cure and patients generally survive 2-5 years following diagnosis. To investigate how microenvironmental changes from IPF affect behavior of lung cells, IPF conditions were modeled outside the body. A hydrogel was used to mimic the increase in lung tissue stiffness during disease progression. This research has demonstrated that cells involved in lung vasculature behave uniquely in these different stiffness conditions; this finding may shed light on the causes of IPF progression. A better understanding of IPF pathology may help researchers develop treatments.

Prevalence and fatality of health conditions in the United States vary widely across social groups. These disparities are most salient across categories of race, ethnicity, and income. To redress disparities, advocacies, research foundations, hospital associations, community health centers, medical schools, large employers, and state and local public health agencies demand a diversification of medical data, better education, and a reallocation of resources. Smaller agencies connect communities to larger institutions capable of promoting reform. To achieve systemic reform in the US healthcare system, small advocacies must collaborate with large institutions.