Thesis Project Portfolio

Novel Wheat-Germ Agglutinin Barcoding Approach for Diverse Mass Cytometry Samples

(Technical Report)

Reviewing Efforts to Tackle Commercial Determinants of Health

(STS Research Paper)

An Undergraduate Thesis

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In Fulfillment of the Requirements for the Degree

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Sociotechnical Synthesis

Introduction:

While my technical and ethical topics are not directly related to each other, they are loosely similar in addressing the negative health effects associated with corporate profit efforts. The creation of a novel live-cell barcoding method was purposed towards reducing monetary and time costs specifically for academic labs running mass cytometry experiments, freeing up resources for other assays. Discussing the negative health effects of commercial determinants of health related to this in that the research efforts of major corporations focus on profit rather than maximizing health benefits, whereas academic labs are much more likely to work towards solving niche diseases that affect a smaller and therefore less profitable portion of the population. In reducing cost for smaller and underfunded labs and tackling the decisions behind commercial determinants of health, the health of the general public stands to gain a great deal of benefit.

Project Summaries:

The technical portion of my thesis produced a live-cell barcoding method for use in mass cytometry (CyTOF) applications that allows for higher throughput as well as sample mixing across cell types. While CyTOF samples are normally run individually, barcoding allows for samples to be tagged by isotope conjugates, run together, and then separated in post processing. My capstone group, in concert with the Sturek Lab, created a barcoding method using wheat germ agglutinin, which not only allows for 20 samples to be run together, but also ubiquitously binds to a wide variety of cell types. In reducing the time/money spent on CyTOF runs by a factor of 20, as well as allowing samples from experiments on different cells to be run together, labs are able to focus resources on further research before needing to worry about acquiring further funding. This method will be released as a protocol for academic labs to use freely, and

for corporations to license if they choose to use it, helping in at least a small way to bridge the gap between funding sources and research ability of academic vs. corporate labs.

My STS research focuses on the health detriments associated with commercial determinants of health (CDOH). 70% of global deaths are caused by just four main risk factors: physical inactivity, alcohol/tobacco use, and unhealthy diets, all of which are influenced by corporate business decisions in their quest for maximizing profit margins. Through marketing, lobbying, and sponsorships, companies with unhealthy products protect their interests and convince the public that the products are not so bad for them. There have been myriad efforts to limit corporate influence on the public's health, ranging from legislative motions to research and educational strategies to better understand the issue. Through examining evidence and commentary on different limiting efforts, I was able to determine that a research oriented position combined with a legislative approach would best combat this issue. Research would be done to broadly define all the factors involved in CDOH, and a "soft law" legislative approach that provides a framework for countries to follow in order to reduce corporate influence on government and the masses would need to be implemented.

Conclusion:

While my STS research and technical project efforts were not directly related, through completing both my eyes were opened to the level of influence that business and money in general have on the health of the public. The barcoding project started as a method to be used within my lab to increase efficiency and lower cost, but quickly became something that could be disseminated to help other academic research groups, as the never-ending search for funding sources has always been a plague on academia. While corporate labs do not have this issue, they only work on projects designed to make the company money, and so smaller diseases and

conditions are neglected by all but the small academic research labs, contributing to a care disparity for those with rare conditions. Investigating the other commercial determinants of health furthered my understanding of the extent of the issue as well as the good that my technical project could bring, and so I believe my technical and research projects improved the quality of each other's final product.

Finally, I would like to thank my capstone project partner, Brendan Cox, my technical advisor, Riley Hannan, and Professor Richard Jacques for all their help and guidance this year.