Plant-Scale Manufacturing Method for Covaxin, A Novel Inactivated COVID-19 Vaccine

(Technical Report)

An Actor Network Theory Analysis of Social Media's Role in the Reduction of HPV Vaccinations

(STS Research Paper)

An Undergraduate Thesis Portfolio

Presented to the Faculty of the
School of Engineering and Applied Science
University of Virginia, Charlottesville, Virginia

In Partial Fulfillment of the Requirements for the Degree
Bachelor of Science in Chemical Engineering

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May 11, 2021

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My technical work and Science Technology and Society (STS) paper are both centered around the topic of vaccines and how the improve access to the public. In my technical work, I discuss the design of a manufacturing plant that would produce doses of a SARS-CoV-2 vaccine. My STS paper instead focuses on how vaccination rates for HPV are decreasing because of Facebook. While both projects have a similar overarching theme of vaccines, they approach the issue of getting people vaccinated in different ways. The technical work looks to provide availability of vaccines to more people through improved manufacturing while the STS paper investigates why vaccines that are produced are not being taken. These projects together illuminate problems and future direction for global vaccinations.

The technical work completed by my design team involves scale up of an inactivated SARS-Cov-2 vaccine by Bharat Biotech. Specifically, the project will include design of a manufacturing process involving improved growth of viral antigen in bioreactors and the subsequent optimized filtration to separate the virus for vaccine use. The project goes further to address social, environmental, and safety considerations for the product as well as economic viability if pursued. The goal of the project was to produce 570 million doses of a vaccine to help end the spread of COVID-19.

My STS research paper also looks at vaccines but instead of manufacturing it focuses on acceptance of taking a produced vaccine. My STS paper explores how Facebook is affecting the vaccination rates of the human papillomavirus (HPV) and the competing influences from doctors and anti-vaxxers have on Facebook. Using Actor Network Theory, I claim that doctors build a network using HPV vaccines and Facebook to get patients vaccinated but that anti-vaxxers influence is destabilizing this network causing vaccination rates to fall. The paper explores these ideas and discusses how Facebook as a technology used for information can change how

knowledge is spread now compared to the past. The purpose of the research is to make people think about how they can interact with social media in a positive way to improve vaccination rates which are vital for global health.

There was a lot of value in working on the technical work and STS paper at the same time. While working on the STS paper I gained a better understanding of common arguments anti-vaxxers would make to indicate vaccines were unsafe such as toxic chemicals in the formulation. This prompted me to ensure all added components in the final formulation were proven to be safe in the technical design. Specifically, I changed the purity of water to be Water for Injection (WFI) grade that is required for vaccines. The extra safety considerations brought up in the STS paper helped me find a potentially overlooked piece in my technical design. Furthermore, my technical work improved my technical knowledge which helped to provide context for my research paper when doing the background research. Ultimately working on the technical work and STS paper together helped me look at each project from different perspectives and with more overall knowledge which improved the quality of both papers.