

Thesis Project Portfolio

**Design of A Sustainable Manufacturing Process to Produce Penicillin V Using Waste Paper
as a Glucose Feedstock**

(Technical Report)

The Publics of Pharmaceutical Activism

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science
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In Fulfillment of the Requirements for the Degree
Bachelor of Science, School of Engineering

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Sociotechnical Synthesis

Almost every single individual in the world will interact with medicine at some point in their lifetime, it is a truly cross-cultural experience. Having lived overseas, and observed various levels of access and cultures surrounding healthcare, the characteristics of one can severely affect the other. High levels of access to healthcare can surprisingly backfire, arising from a lack of experience with the negative effects of a lack of access; while lower levels of access can lead to higher levels of social value placed on these technologies due to the prevalence of various negative health effects. The following thesis explores the solution to a lack of access to healthcare technology, and a movement against access to healthcare technologies.

The technical project outlines the design of a waste paper processing plant for the enzymatic hydrolysis of cellulose to glucose and the fermentation of this glucose to penicillin and its associated downstream processing. The facility utilizes cellulase enzymes to convert waste paper to glucose, with the goal of providing an environmentally friendly pathway to produce the feedstock for the penicillin fermentation using *Penicillium chrysogenum*. The penicillin is then separated from the fermentation broth using a rotary drum vacuum filtration, centrifugation, crystallization, and a fluidized bed dryer. The selected location of the plant was South Africa, with the goal of increasing equitable access to antibiotics,

My STS project explored historical pharmaceutical activists and applied this lens to modern day vaccine skeptics. The document first looks at the historical women's movement fighting for the regulation of the patent drug industry in the 19th century U.S. This was then compared to two first hand interviews with members of the vaccine skeptic community to analyze the methods and characteristics of the movement, and see how that has affected its success. These successful methods and enabling characteristics were then utilized to make a

recommendation on how they can be exploited to successfully communicate science in the future.

Both of my projects increased my understanding of how to be a successful engineer. The technical project in particular opened my eyes to the engineering process by designing a plant that exceeded production goals, and was economically feasible. While the STS project showed me how groups can be mobilized to fight for what they believe is right, and how this can be utilized by myself as an engineer to push for policies that I believe in.

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