

**Encapsulation of Cells in Microporous Annealed Particle Hydrogel
for Type 1 Diabetes Treatment
(Technical Report)**

**Understanding the Negative Effects of Big Pharma's Profit-Motivated Drug Price Inflation
(STS Thesis)**

A Thesis Paper in STS 4600

Presented to The Faculty of the School of Engineering and Applied Science
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In Partial Fulfillment of the Requirements for the Degree
Bachelor of Science in Biomedical Engineering

By
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On my honor as a University student, I have neither given nor received unauthorized aid
on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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Sociotechnical Synthesis Assignment

The focus of my senior thesis and technical project centers on addressing the following question: How has Big Pharma, as a conglomeration of the world's largest pharmaceutical companies, played a role in creating inaccessible and unaffordable medical drugs particularly for those who are uninsured. While many of these drugs are effective in treating patients afflicted with a particular disease, the hidden political implications of these drugs and the current economy the drugs reside in leads to inaccessible medication for numerous individuals.

Within my STS project, I analyzed the problem of how many medical drugs, as a political technology, created power relations in a community within the framework of "Technological Politics" (TP). This framework was addressed within two case studies. One of the studies was the high pricing of "orphan drugs". These drugs are highly priced because Big Pharma claims that the market is profitable for these drugs. My analysis has proven that the opposite is the case. The second case study is an analysis of the price gouging occurring on insulin. This will delve deep into a particular example where a lawsuit was filed in Mississippi against various pharmaceutical companies and Pharmacy Benefit Managers (PBMs) claiming the intentionality of the price gouging of insulin. Pharmaceutical companies, as the sole manufacturers and producers of insulin, are in a position of power, maintaining virtually complete control over its pricing due to prescription drugs being at the will of a free market economy in the United States and having minimal regulations. This further exacerbates existing socio-economic inequities in the United States with lower income and uninsured, marginalized communities being hurt the most by corporate greed. This leads to the need for a more equitable, cost-efficient, and sustainable T1D treatment.

Accordingly, the proposed solution of my technical project is to develop such an alternative. For my technical project I encapsulated islet cells within a hydrogel that can be

transplanted into a diabetic patient to restore endogenous insulin secretion. These will serve as an alternative cost-efficient treatment to insulin injections. In essence, we are developing a mini-pancreas transplant. These encapsulated cells will also be capable of retaining functionality following a freeze and thaw cycle which will demonstrate its capability to be transported to different hospitals around the country.

While the cost of insulin and other drug prices in the United States is recognized to be solved by government regulation, minimal improvements have occurred. This lack of government intervention was displayed in my STS project where a lawsuit against pharmaceutical companies did not end in government action or any penalty. This is why I decided to look for a solution through a technical, innovative initiative that would best serve the population. If it proved to be effective, this new treatment would force the prices of insulin to decrease due to the competitive free market. As an engineer, these two projects have led me to realize the need to understand the politics of corporate power structures and its contribution to unjust technological social impacts.