Thesis Project Portfolio

Industrial Scale Production of the R21c/Matrix-M Malaria Vaccine for Sub-Saharan Africa

(Technical Report)

Discrimination Towards Women in the Health Industry: The Testing Fallacies that Led to the Thalidomide Tragedy

(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

My STS research paper and my technical work are connected as they are both focused on drug production and distribution tailored towards a specific group of people. There have often been drugs produced throughout history that are meant to target a specific demographic and solve a problem that ails them. My two works are different in that the drugs that are discussed are targeted towards two different groups of people. My technical work explores the industrial scale production of a new Malaria vaccine with a high efficacy rate that can be used to help children in Sub-Saharan Africa. On the other hand, my STS research focuses on the actors that led to the thalidomide tragedy of the late 1950s. While these two topics may differ in the groups each drug is meant for and the effects of the drug, the theme of tailoring drug production towards certain individuals is prevalent in both projects.

My technical paper designs a plant that can produce the R21c/Matrix-M malaria vaccine at an industrial scale. My capstone team designed the upstream, downstream, formulation, and fill-finish steps of the production facility. The upstream part of the process is designated to develop the R21c particle in Pichia Pastoris yeast cells. The downstream part of the process separates the necessary particles from the rest of the impurities in the solution, and the formulation and fill-finish of the drug involves finishing the drug and packaging it for distribution. The project is meant to produce 272 million vaccines per year. As each person requires 4 doses of the vaccine, this would ideally be able to treat 68 million children every year. This will account for 70% of newborn children every year along with 20% of all children under 5 years of age. This will help to match WHO's goal of producing and distributing a Malaria drug with at least 75% efficacy that can be administered to at least 70% of children under 5 years old every year.

My STS research explores the testing and distribution of the thalidomide drug in 1957 that led to birth defects in thousands of children. The drug was meant to help pregnant women with their morning sickness and proved very effective in doing so. However, the drug had a tragic side effect that caused severe birth defects in the children being born that could potentially lead to death. My claim is that certain actors in the thalidomide network were irresponsible in their testing procedures, and that this led to the birth defects in newborn babies. It has been seen throughout history that women have been unfairly treated in the healthcare system. This is reflected in the lack of testing and regulations that were followed when developing and distributing the drug commercially to thousands of women worldwide. The goal of my research is to highlight the treatment of women in this industry and to emphasize the need for change.

Working on the two projects simultaneously helped to give me insight to both. My STS paper helped me to understand the necessity of producing certain drugs and how important it is to ensure the safety of a specific group of people before marketing and distribution. This helped to determine certain social implications of distributing the malaria vaccine in Sub-Saharan Africa and how important it is to place emphasis on the safety of the product. My technical work gave me a better understanding of the actual typical procedure that goes into the research and development of a drug. This helped to understand the ways that a drug can be tested and how badly the actors failed in building a safe network for the thalidomide drug. Overall, working on the STS research paper and the technical work at the same time over this past year allowed me to understand the implications of producing a drug and how healthcare can affect certain groups.