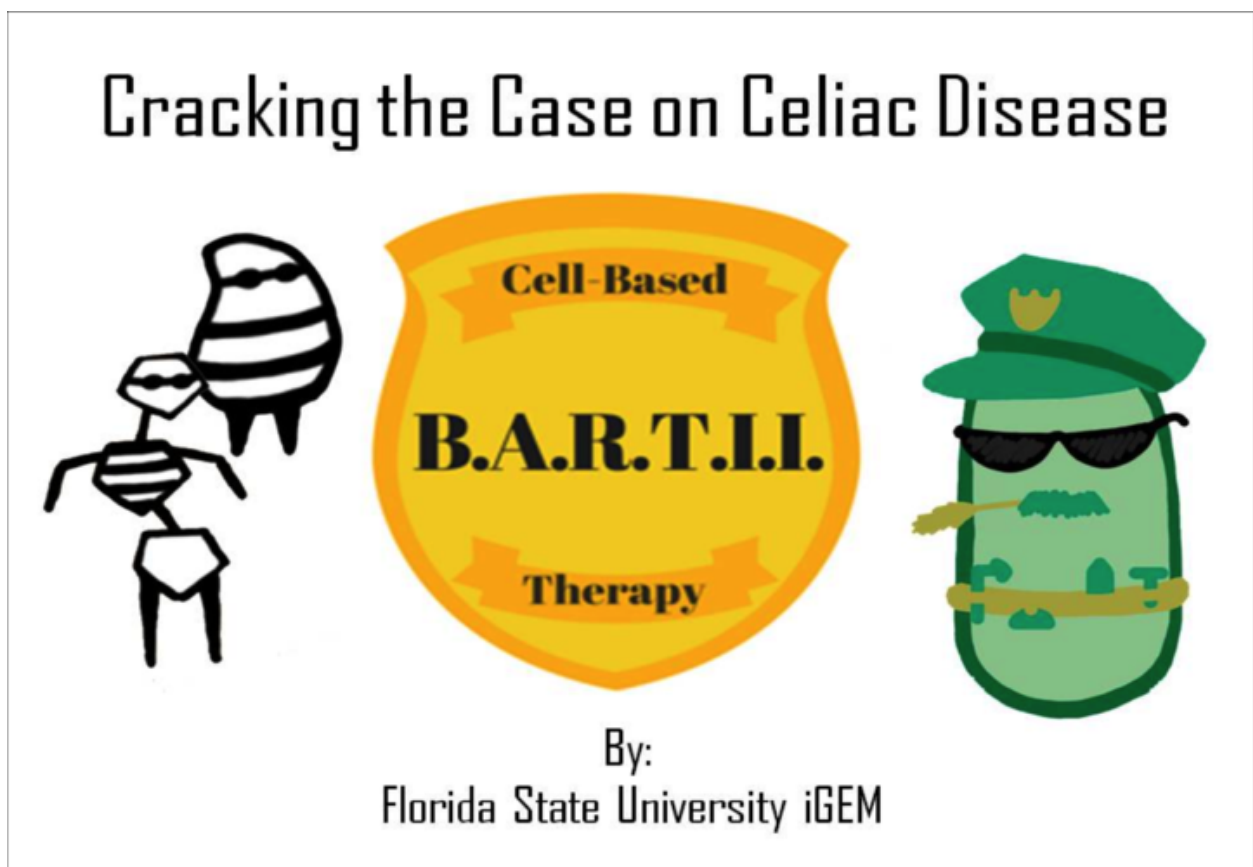


Public Engagement

Celiac Disease is a condition that effects roughly 70 million people worldwide. Within this statistic, the largest growing population of patients diagnosed each year are children. Beyond that, the lack of public knowledge on this autoimmune condition has resulted in many undiagnosed and therefore untreated cases. This becomes a problem because the health risks associated with untreated Celiac Disease can result in malnutrition, infertility, ataxia, early onset osteoporosis, and death. For this reason, we felt that it was particularly necessary to make community outreach a large component of our project.

In an effort to make Celiac Disease and cell-based therapies easily accessible to young children, we were able to write and illustrate a children's book about a child with Celiac Disease, Jaime, and his helpful friend, BARTII.



By explaining symptoms and current treatments in a way that gives context to young children, Celiac Disease goes from being an abstract concept to a condition that can be identified by certain characteristics, the need for a Gluten-Free diet, health risks when gluten is consumed, and symptoms like intestinal irritation and pain. Next, we described cells and their function. From here, we explained that a cell-based therapy is possible in the future in the form of an anthropomorphic cell, BARTII. This cell was then able to gain pieces of exposition on from a doctor, describe how a BARTII would mediate the symptoms of Celiac Disease, and touch on practices used in Synthetic Biology (including SBOL symbols!). This assists in explaining the process of developing BARTII as a safe engineered cell for Celiac Disease, as well as, giving insight into the basics of Synthetic Biology without explicitly

describing it. This resulted in a means of communicating both our project, Celiac Disease, and Synthetic Biology to children in a way that is easily understood by a wide age range.

To test this, as well as to have an opportunity to increase awareness, we presented our book, “Cracking the Case on Celiac Disease”, to a class of Second Graders at Hawks Rise Elementary School in Tallahassee, FL.



We presented the book with a particular emphasis on Celiac Disease, Cells, Synthetic Biology, and how our project relates to these topics. Before we began the book, we asked the class if they knew what Celiac Disease is. Understandably, there were few responses. However, once we began the book and presented the symptoms and required Gluten-Free diet, the children were able to identify cases of Celiac Disease or gluten intolerance in their relatives or friends. Likewise, by basing the book on a child who enjoys many of the same thing the children in the class did, they could empathize with Jaime. Next, we introduced a cell-based therapy by clarifying exactly what cells are and how they behave in the body. To ensure they had a good understanding of cells before we described Synthetic Biology, we asked the class to explain, in their words, what we had just described. In elucidating Synthetic Biology, we used BARTII to show the process of designing a solution based on information gained by patients and experts, to gain genetic parts, and to ultimately help mediate Jaime’s symptoms. The questions that followed were surprisingly insightful; they asked what type of cell BARTII is, the exact processes necessary to make BARTII, what equipment is needed in Synthetic biology, and how Engineering practices are applied to our research. The children were able to synthesize the information we presented to ask candid questions about our topics of focus. This exhibition of active learning confirms that we were able to increase awareness and teach new topics in a way that was understandable for young children.

Another effort we made as both a component of collaboration and public engagement was our YouTube series with the University of Florida's iGEM team (UF) called "iGEM Florida". On this platform we were not only able to describe our projects, explain Synthetic Biology practices and technology, and collaborate with UF but also increase awareness about our project on a public forum. This means of communicating our projects, practices, and dialogues incorporates the "open source" spirit of iGEM while also giving us the opportunity to create the first state-wide effort to introduce iGEM to Florida. We then were able to share our work with teachers around the state as a means of further engaging with the community and gaining feedback/opportunities for conversation with groups that cannot easily be reached in either Tallahassee or Gainesville.



In another effort to introduce our community to Synthetic Biology and our project, we had a component of Moonshot Night that focused on seeing how the public perception of Celiac Disease, the Gluten-Free

diet, Synthetic Biology, and Synthetic Medicine change from before and after our discussions.



This pre/post survey format allowed us to determine the level of comfort and awareness along with the thoughts of our community members when presented with scenarios and descriptions of Synthetic Biology and our cell-based therapeutic. By sending an initial entry survey via email and conducting exit dialogues at Moonshot Night we were able to see how perception of our topic changed based on the conversations during the event. This means of increasing awareness enabled us to see what key words and discussion modes increased the acceptability of our solution while also increasing the attendees general knowledge on Synthetic Biology and Celiac Disease.



Also, we were able to engage in a community effort to increase awareness about STEM topics at the 6th Annual Tallahassee Science Festival. This enabled us to reach new demographics than either Moonshot Night or our involvement with children.



Due to the nature of our project, outreach and Public Engagement was essential. Lack of awareness, the demographics of affected populations, and the severity of Celiac Disease, require that we as a team work to increase the public's general knowledge on Celiac Disease. This obligation opens the opportunity to, likewise, create dialogues and learning opportunities for our project, BARTII, and Synthetic Biology as a whole. Through our efforts, our book "Cracking the Case on Celiac Disease" and our presentation to a Second Grade class allowed us to communicate complex topics to young children and increase their interest and understanding, our YouTube series "iGEM Florida" allowed us to reach a broader range of people than just our community members while opening dialogues that would not have been able to be gained before, and our pre/post survey at Moonshot Night allowed us to gain insight into how perceptions change after education on Synthetic Biology and BARTII. These efforts allowed us to increase public awareness, in addition to, allowing us the opportunity to gain input from those who would be impacted by BARTII, resulting in a more socially conscious project.