Progress Report I

Each of the students in the group brought with them a project about which they were clearly passionate. Since there are six students in the group, one of our primary goals was to narrow the six projects down to the three that would have the greatest impact, be the most feasible, and be the most interesting. To do this, the students continued researching the projects they brought with them, and also worked to learn about and contribute to their teammates projects. As a result, the first few sessions consisted of trying to work out the details of these individual projects and assessing the merits and possible pitfalls of each.

"M" was interested in designing a bacterial system that would circulate in the blood and regulate diabetes. To treat type I diabetes, she proposed a system that would sense the amount of glucose in the blood stream and secrete insulin if glucose levels became too high. She had also put some thought into a system that would alleviate type II diabetes, which would be rather more complex than the type I system. This raised the question of whether the type II system should be pursued because it is an interesting and difficult problem to solve, or whether the problem what simply too difficult, and our efforts would be better spent trying to make the type I system work.

Similar to "M"'s insulin-producing system, "D" was interested in creating a blood-based system that would treat hemophilia by sensing the presence of clotting factors in the blood stream and producing clotting factor when these protein levels are low. Instead of using a bacterial delivery mechanism, his system would avoid immune system complications by using memory B cells donated by the patient; for each patient, a blood sample would be taken, and the B cells would be modified to contain the clotting factor sensing/producing system.

"A" was working on a vitamin K secreting bacterial system that would live in the intestine. His inspiration for this is the vitamin B secreting bacteria that have already been engineered. Since these bacteria serve as a "proof of concept" he wanted to go on to design a system that produces vitamin K, which would hopefully serve as a stepping-stone for bacteria that can supplement other fat-soluble vitamins.

"P"'s main project idea was inspired by the iGEM bacto-blood project. He was interested in developing a system that could deliver drugs to the blood stream. He also put a lot of effort into researching his teammates' projects and contributing to their ideas.

"L" researched curing viral infections by looking at a part of the viral pathway that is generally not targeted: lysis. She was interested in preventing the infected cell from lysing and releasing more virus into the body.

"F" brought a couple different ideas with him. He was interested in designing some type of bacterial system that works as a disease alarm, which would be valuable in immuno-suppressed patients. He was also interested in designing a sort of "bacterial breath mint"

which would be a bacteria that fills the niche of the bacteria that produce unpleasant odor in the mouth.

From these projects, we decided that we wanted to choose three that were diverse, would have a profound impact, and could reasonably be implemented. Since "M"'s Type I diabetes treatment was similar in nature to "D"'s hemophilia treatment (both were systems that detected low levels of a substance in the blood and produced a protein as a result), the group decided to choose only one of these two projects. It decided pursue the hemophilia treatment, since it seemed like the current method of treating hemophilia needed to be improved more than the current diabetes treatment.

"A"'s vitamin K (recently changed to vitamin A) producing system was chosen because of its feasibility and the profound impact it could have. The development of bacteria that could stably survive in the gut and produce vitamin K could improve the lives of many people, particularly in third-world countries where diets are poor and daily supplements are not available. Moreover, since a similar system for vitamin B already exists, it seems likely that we could get this project to work.

Finally, the group also decided to expand "F"'s mouth-dwelling bacteria idea to create a bacteria that helps prevent tooth decay, since it is a widespread problem that effects many people. They decided to alter the bacteria to regulate pH in the mouth, since acidic conditions can lead to decay.

Overall, the group has dedicated a significant amount of effort and time into designing their own projects and researching and discussing their teammates projects. They have come up with several very interesting ideas that could have incredible societal impact. I am excited to see how these projects progress from this point over the next few weeks.

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