Define problem and significance

Cancer is a disease that has plagued people for quite some time. It is terrible in the fact that, it can be so deadly and life changing to the people who are diagnosed with it and the people who are close to them. With this said, it has spurred researchers and engineers to develop new ways of fighting cancer. One research group has looked to bacteria to aid in the fight against cancer. They have found that bacteria is very dynamic and versatile, where they have evolved to grow very well in environments that harbor diseases. They use this to their advantage by making these bacteria act as drug delivers, which would deliver doses of medication in a cyclical manner. This is very important because this could more affectively treat or aid cancer patients compared to what they have to go through currently.

Methods/ result

In order for them to be able to control the population and drug delivery they are created a synchronized lysis circuit (SLC). SLC use positive and negative feedback loops that create oscillatory dynamics. **ADD simplification of what that means.** In order to make this happen they need to create the best SLC they could.

They started by constructing and characterizing the SCL to have it perform the function they wanted it to, and also see when it was active through florescence. **Learn more on quorum firing and stuff.**

Next they looked to see the robustness of the SCL. They incubated at varying temperatures, 36 to 40 degrees celcius, and fusion rates. The experiment was a success and found that the SLC had the capacity to make robust cycles of bacterial lysis, over many different environments showing it had the capability to perform in the human body.

Once they had tested their ability to sustain itself in vivo, they moved to its effectiveness haulting the growth or decreasing the cancerous tumor, but before they can go straight to live trials they wanted to find a way to test its ability most effectively. They did this through a computational model. This model would find the optimal strategy to test it a low- throughput animal model setting. The results of this examinations showed protein to have a wider domain, and that the SLC is more dynamic and better for tunability. This is because they could adjust the cycle period of how fast the bacteria delivered the drug and the amount of drug that got delivered.

After checking the SCL’s dexterity and changeability, they look to test its effectiveness in killing cancerous cells produced by the tumor. They did this by constructing a microfluidic device that would allow for the cancerous cells to grow in a controlled manner, and allow the bacteria growth to flank the cell growth. From there they observed the bacteria lysis and cell death. In this case they tested it with the cervical cancer, HeLa cells, and the results were impressive. The SLC we able to HlyE at a high enough level to kill these cell. This is important because this is the primary function of SCL, this is one source of vindication that shows that it is a has real potential to work in the real world.

Proving all these components are effect and work, allowed the team to start moving into animal trials. In this research they chose to use mice as comparable human analog. The reason why testing on live animals is so key, is because it give them a chance to see how there bacteria will interact with the host’s body. They started by injecting mice, with colorectal cancer. And then they inject the mice with the SLC bacteria intramurally, or through the tumor. For comparision, they used two other strains of the SLC to see which one is most affective when injected. Suprisingly enough though it was the combination of the three strains that was the most effective in killing the tumor cells. With this in mind they proceed testing, as to conserve the amount of mice, they use in the experiment. With these trials on the mice, they found it to only benefit their health and saw no other draw backs to injecting the SCL.

Reaching the final stages of their research, they felt good enough with what they had to pursue more human like trial, which was to use a liver. They simulated as if they ingested the bacteria orally and like the mice seemed to do very well in dealing with the cancer.

Finally, they wanted to test the bacteria with other methods of dealing with cancer like chemotherapy. This proved super effective, improving the performance of both solutions. **Elaborate more**

In conclusion, after constant trial and error they were able to make a SCL that was super effective. While trials still need to be ran it looks very promising that we might see this in treatments soon. This could be the next big breakthrough in cancer treatment.

**Still need future direction**