CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

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Project Number

S1519

Project Title

Targeting Enterococcus faecalis with Phage Therapy

Abstract

Objectives

The objective is to introduce bacteriophages to Enterococcus faecalis cultures and to evaluate its efficacy against it in hindering growth compared to antibiotics used by many dentists. My hypothesis was that if I expose E. Faecalis to bacteriophages then it will be more effective than antibiotics in inhibiting bacterial growth.

Methods

My first step was to make my own Q69 phage. I did this by homogenizing unpasteurized goat cheese in 2% sodium citrate in a Lab-Blender. Melted BHI agar was added to this solution and supplemented with cycloheximide to inhibit yeast and mold growth. This solution was incubated for 24 hours. Next, I rehydrated the bacteria and it was incubated again. The next day, I soaked sterile disks with Penicillin, Augmentin, and Sulfamethoxazole-Trimethoprim and also with the Q69 phage. After, Brain Heart Infusion Agar plates were inoculated with the bacteria and the disks were placed into 4 separate plates and left to incubate for 24 hours at 37 degrees. On the final day, I measured the zones of inhibitions of each plate and compared the diameters to determine the most effective treatment method. This was repeated in 2 trials.

Results

After the procedure, it was found that E. Facelis was susceptible to the Q69 bacteriophage and Sulfamethoxazole-trimethoprim, resistant to Augmentin, and in the intermediate range for Penicillin. The first trial showed the zone of inhibition of the culture, when exposed to the Q69 phage, was 41mm making it susceptible to the phage. The zone of inhibition of the culture, when exposed to sulfamethoxazole-trimethoprim, was 39mm. Additionally, the zone of inhibition of the culture, when exposed to Penicillin, was 22mm placing it in the intermediate range. Finally, when exposed to Augmentin, the zone of inhibition was 0mm, meaning the culture was completely resistant to Augmentin. The above was true for the 2nd trial with slight discrepancies in inhibition values.

Conclusions

In conclusion, I believe that phages can have a huge impact in medicine, as they are able to exponentially grow in host cells which can significantly lower the cost for treatment compared to expensive antibiotics which are becoming increasingly inefficient today. The results I found indicate how bacteriophages are a much more viable and cost-effective option when fighting bacterial infections.

Summary Statement

I determined that bacteriophages are more effective in inhibiting bacterial growth (in E. Faecalis) compared to traditional antibiotics, and are a solution to antibiotic resistance.

Help Received

I received help from Mr. Stepan and Dr. Jordan who permitted me to use their clinical laboratory to conduct my project. Dr. Jordan did provide a suggestion when the mixture was not successfully combined in the centrifuge; otherwise, the main procedure was done by myself.