

Antiviral Natural Products Used As Surface Disinfectants

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WEST Center Lab

The WEST Center (Water and Energy Sustainable Technologies) succeeds in innovative research and technology in microbiology and water treatments. They are studying chemical and microbial contaminants in and around the community. They also investigate the efficacy of natural products as disinfectants to provide safer alternatives.

Essential Staff:

PI: Charles P. Gerba
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 PhD Research Scientist: Stephanie A. Boone
 Grad Students: Ray Sanchez, Skylar Tilden

Research Project Objective

Many disinfectants on the market contain active ingredients that can cause harm to humans and the environment. The objective of this study was to find natural microbicidal alternatives that can be used as disinfectants in the indoor home and work environment.

Experiment Process

The project focused on finding the virucidal efficacy of natural products against bacteriophages MS-2 and Phi-X 174. The natural product that we investigated salicylic acid because of its significant antimicrobial efficacy and antiviral effects.

1. Bacteriophages MS-2 and Phi-X 174 were grown in separate *E. coli* host. Then placed the flasks in an incubator for 4-5 hours (fig. 1.1 and 1.2).



Figure 1.1



Figure 1.2



Figure 1.3

2. After the incubation period each virus was centrifuged to remove bacterial debris which had been turned into a pellet (fig. 1.3).

3. The resulting product or supernatant consisted of pure virus, which we titer to verify viral concentration. We did this by first using dilution tubes to dilute the virus down (fig. 1.4)

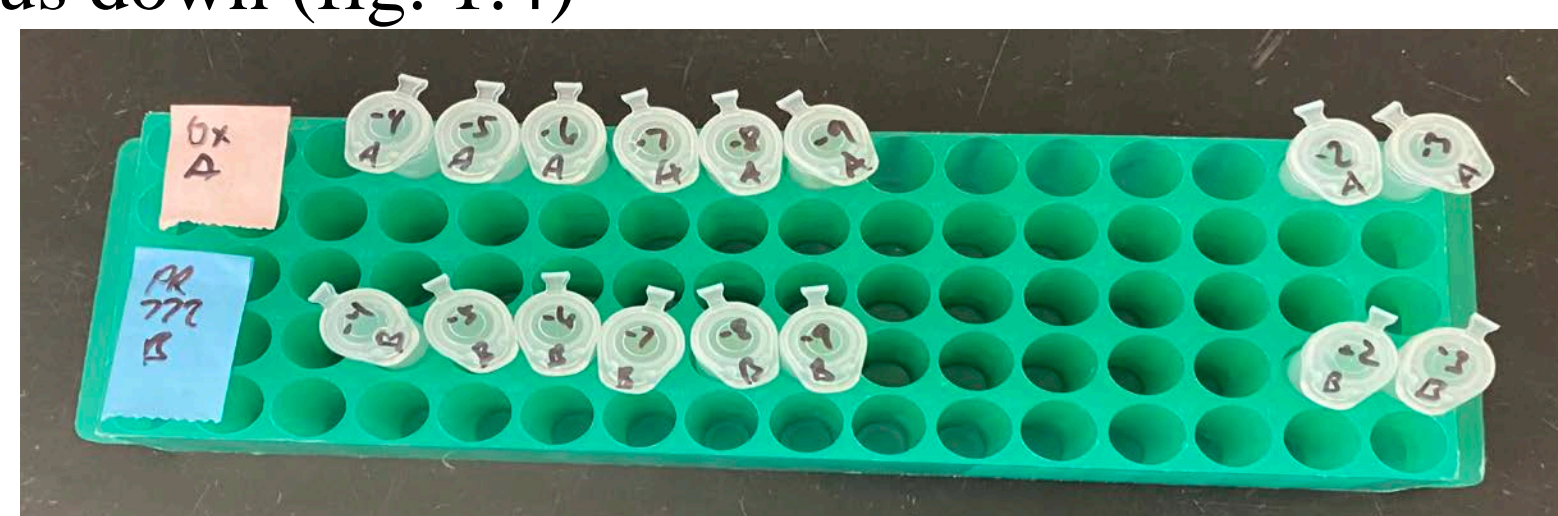


Figure 1.4

Experiment Process



Figure 1.5

Next, plates with TSA (tryptic soy agar) were made and labeled as found on the dilution tubes. We would use the plates to perform a plaque assay to count the number of plaques and determine the concentration of the virus (fig. 1.5).

- The actual plaque assay consisted of preparing top agar (fig. 1.6). Then adding 100 µl plaque forming bacteriophage and virus into a top agar overlay solution (fig. 1.7)



Figure 1.6



Figure 1.7

- After the solution was thoroughly mixed it was poured on top of a TSA plate and was solidified at room temperature and then placed in an incubator.

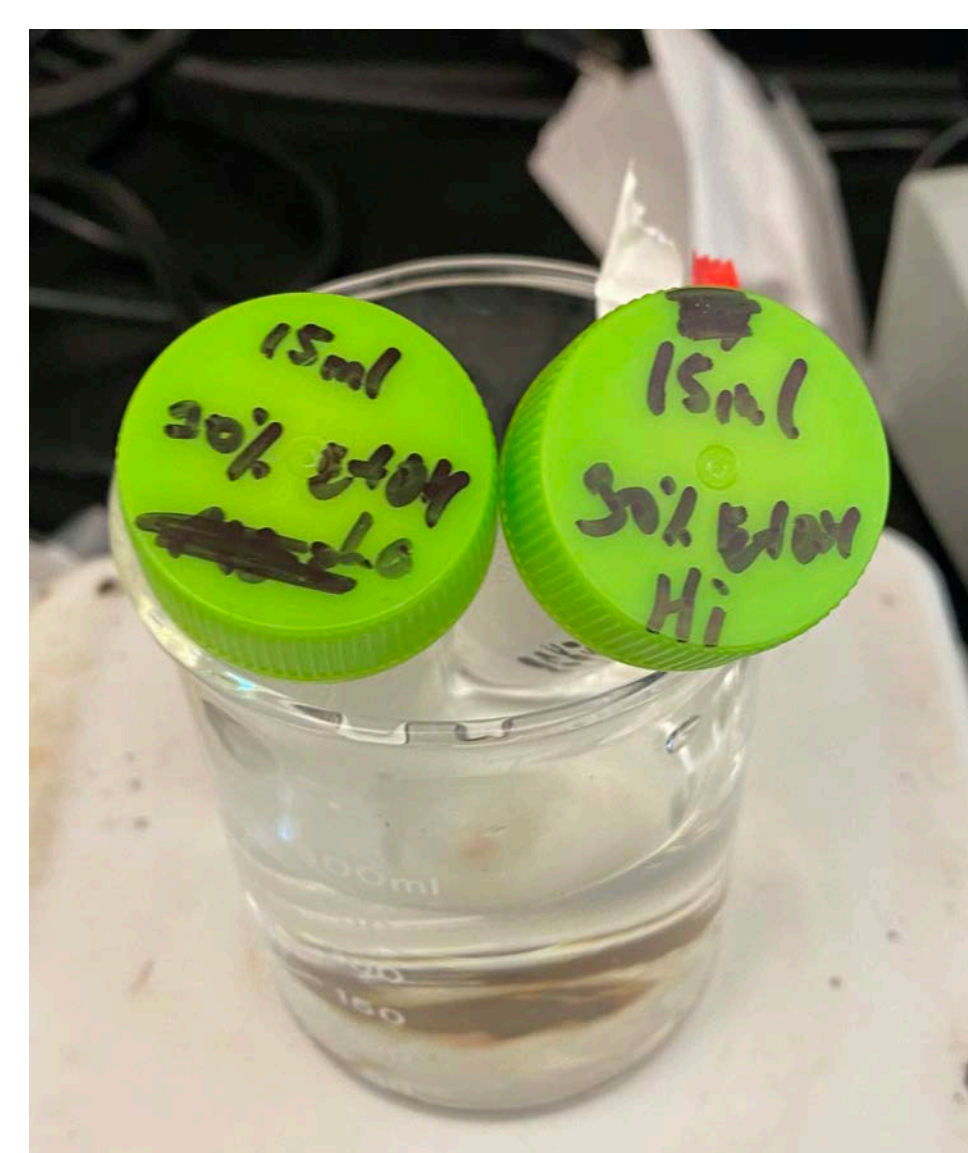


Figure 1.8

- After finding out the concentration of our viruses it was time to perform the actual experiment. Our goal was to create 2 different solutions of salicylic acid and 30% ethanol and test it against 250 ml of virus. We then timed how well it deactivated the virus in a .1% high concentration of salicylic acid and a .01% low concentration (fig. 1.8).

- We created a control panel of dilution tubes, a low concentration panel, and a high concentration panel all with a buffer (fig. 1.7)



Figure 1.9

Experiment Process Continued



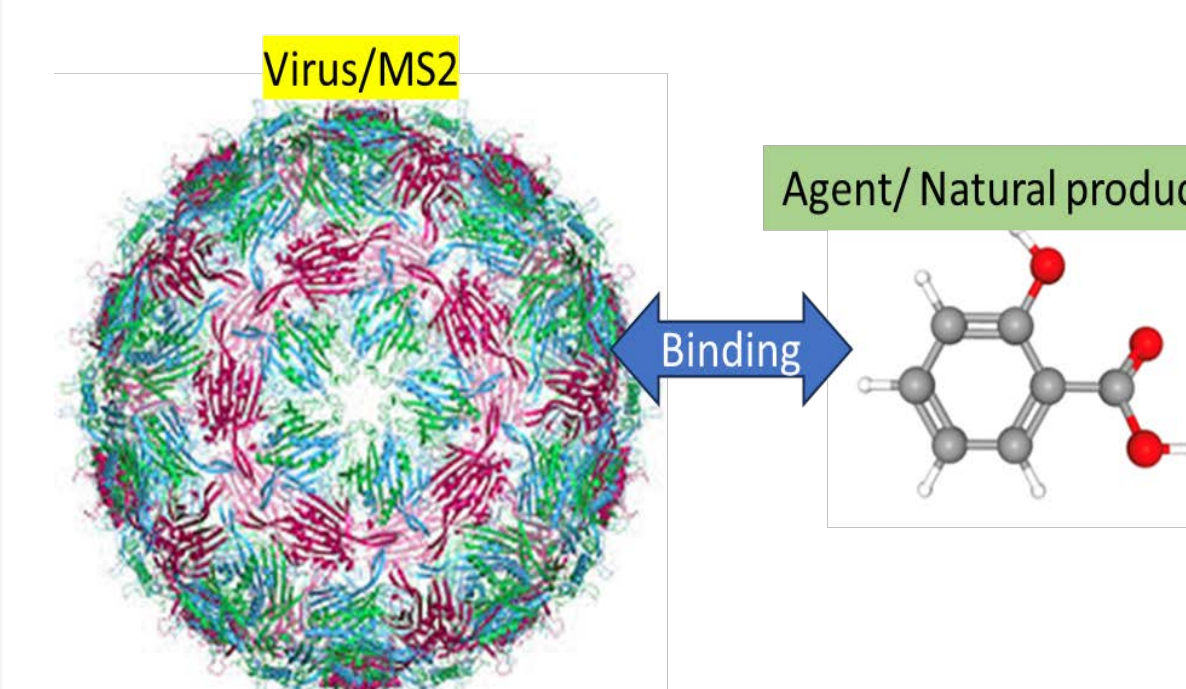
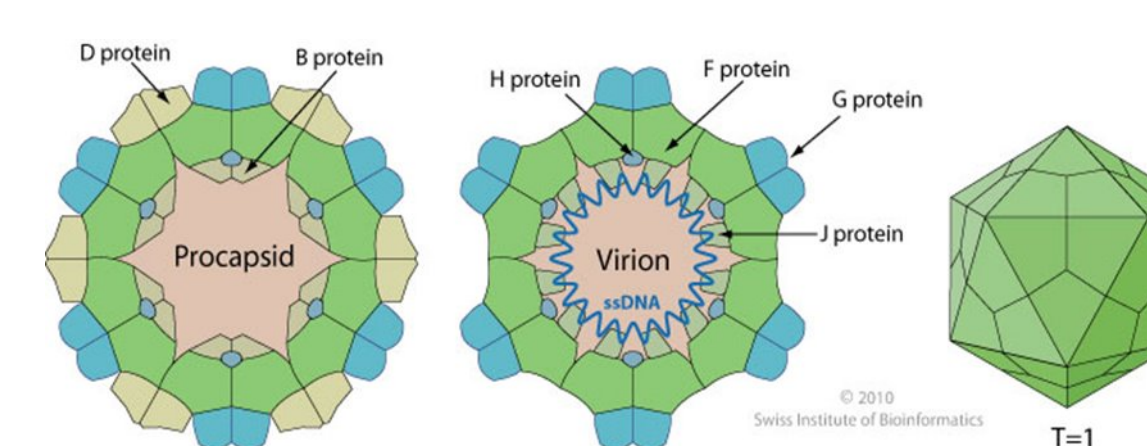
Figure 1.8

- Next, each neutralized solution was diluted in a 10-fold dilution series and then assayed using the top agar overlay procedure. Two plates were used per dilution in order to ensure an accurate estimate of the concentration of a virus after the salicylic acid solution (fig. 1.8).

Discussion

- This summer experience has been extremely eye-opening in many aspects. At first I was nervous working in a microbiology lab because I had no prior experience working in microbiology. It was also difficult to comprehend the jargon that many of the scientists used but after some hours of studying and looking up terms I slowly started to understand more and more. It was truly amazing to see how these small organisms develop and grow. While it may seem that there might not be much going on in a flask there is a whole world of organisms in it. I learned so much in these few weeks and I hope to carry on this knowledge into college. As a result of this experience I have decided I want to double major in Physiology and Microbiology with an emphasis on pre-medical studies to fulfill my dreams of becoming a Naval flight physician.

Conclusion



Acknowledgements