Investigating Novel Bacteriophage Solutions as a Preventative Measure for Biofilm Formation in Medically Relevant Settings

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Bacteriophages have been known to be capable of eliminating deadly bacterial infections, but their use on biofilms in medical settings has been very limited. In this proof-of-principle investigation, bacteriophages were identified that are specific to Vibrio cholerae, Escherichia coli, Staphylococcus epidermidis, and Helicobacter pylori, and were combined in a nutrient solution. The targeted bacteria in the investigation are those commonly found in biofilms in medical settings around the world. In the preliminary stage of the experiment, the prepared sanitation solutions were tested on established biofilms of the four chosen clinically relevant bacteria. Four different phages, KHP 30, T4, DP-1, and CTX-F were identified and growth curves were plotted to determine their lytic efficiency and life cycles. These phage solutions were then added to established biofilms. The efficacy of the phages was measured through counting the colony-forming-units in the biofilm assays and using a logarithmic scale to monitor biofilm viability and growth over time. The results displayed that the combination of the bacteriophage mixture and UV radiation allowed for the greatest viral phage proliferation, and in turn, most bacteria in the biofilm destroyed. This significant effect on curbing biofilm growth indicates the success of the phage mixture as a sanitation solution, as opposed to increasingly problematic antibiotics and antibacterials. The next stages of experimentation call for the introduction of laser-generated shockwaves, sonication, and temperature control to the sanitation treatment, in addition to building and programming a comprehensive, micro-environment sanitation chamber for affordable, efficient, and effective sanitation in medical environments around the world.

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