A Novel Approach to Improve Bacteriophage Phi X174 Lysis of E. coli K-12 Through Addition of Methylcellulose

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Bacteriophages are gaining traction in medical treatments targeting bacteria, food additives, surface cleaners, and water disinfectants in lieu of antibacterials due to their efficiency, relative harmlessness, and host specificity. The objective was to determine if methylcellulose would improve bacteriophage ability to lyse bacterial cells. Escherichia Coli strain K-12 was grown for eight hours in nutrient broth and infected with Phi X174 phages in differing concentrations of methylcellulose; the optical density was measured by spectrophotometry before and after infection and was converted to cell density, corresponding to bacterial cell death. The group without methylcellulose experienced the highest rate of cell death averaging a -67.7% difference; cell death decreased to -31.1% at 2% methylcellulose then increased at 3% to -39.0%. The results suggest a negative parabolic trend with an initial decrease in cell death followed by a general increase. Although not supporting the hypothesis, the study showed a significant pattern in the relationship between an increase in methylcellulose concentration and the rate of cell death. These results can be explained by collision theory: the proportional ability for methylcellulose to inhibit flagella and bacteriophages at increasing concentrations vary the probability a bacteriophage can attach to a suitable host. The impact of methylcellulose on bacteriophage action against bacteria has a multitude of both laboratory and practical uses, especially because methylcellulose is nontoxic and disintegrates over time. Any situation where bacteria need to be killed on surfaces or in a liquid can benefit from this research.