Luminescent infectivity assays on ground beef for detection of Escherichia coli O157:H7

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Abstract

Bacteriophages are viruses know for infecting bacteria, using the host cell to replicate, and eventually lyse it. With rising concerns related with antimicrobial resistance, bacteriophages represent an attractive alternative for traditional antimicrobial agents. Among their advantages are that are an economical technology, do not infect humans, possess specificity at the genus, species, and strain level, being completely safe when used for disinfection, leaving no corrosive or toxic residuals in food nor in food processing facilities. Lytic phages have shown in previous studies to be useful for reducing pathogens as *Escherichia coli* O157:H7, which is a contaminant related with recalls in fruits, vegetables, and ground beef. However, further studies are necessary to evaluate infectivity of phage with the target host on food surfaces. The objective of this study was to validate the infective event in a food matrix. In this work the bacteriophage PhiV10 was used, containing the nluc genes, which when expressed, causes the host pathogen *E. coli* O157:H7 to bioluminesce. Infection assays were performed on ground beef using drop inoculation and spray inoculation. Dilutions of bacteria were inoculated, then the phage PhiV10nluc was added, and samples were incubated overnight at 37∘C. Following, bioluminescence was detected by image analysis using a using a CCD (charge coupled device) low light camera in absence of light. Drop inoculation assays showed light production from the infection of bacteriophage FV10*nluc* on *E. coli* O157:H7 on the surface of ground beef. Spraying inoculation assay was able to detect light as low as 0.6 Colony Forming Units (CFU)/g of ground beef. PhiV10*nluc* shows promising use for detection of *E. coli* O157:H7 when sprayed on beef trims in meat processing facilities.

Keywords: bacteriophage, reporter phage, antimicrobial, beef trim

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