Biocontrol of Foodborne Pathogens Using Bacteriophages

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Abstract

Salmonella and *Shigella* are two important groups of foodborne bacterial pathogens. *Salmonella* cause an illness called salmonellosis while *Shigella* cause shigellosis (bacillary dysentery). The most common symptoms of these illnesses are abdominal cramps, diarrhea, and fever. *Shigella* can also cause bloody diarrhea. It was estimated that each year *Salmonella* cause 93.8 million cases of gastroenteritis and 155,000 deaths globally. *Shigella* causes 164.7 million cases and 1.1 million deaths throughout the world yearly. People get these illnesses mainly by eating food or drinking water contaminated *Salmonella* and *Shigella*. Thus, to protect the public's health, it is crucial to effectively control of these pathogens in food systems. Bacteriophages (or phages) are viruses that kill bacteria. Phages have emerged as promising biocontrol agents against bacterial pathogens because 1) phages can cause rapid bacterial death, 2) phages do not replicate in foods unless their bacterial hosts are present, 3) phages do not infect humans and other animals, and 4) phages do not alter food color, odor, taste, and nutritional value. This project isolated two phages infecting *Salmonella* and *Shigella*. Both phages are tailed phages and belong to *Siphoviridae* or *Myoviridae* family. They have broad host range infecting several species. The kinetic study showed that the burst sizes of the two phages are about 100 phage particles per infected cell. *Salmonella* phage infection in cucumber juice (as a model food system) caused rapid cell lysis within 4 hours, resulting in 5- log unit reduction (or 99.999% decrease) in host cell concentration compared with the control.