

ABSTRACT

THESIS: Bacteriophage as a Biocontrol Agent Against *Salmonella* in Dairy Milk

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Bacteriophages have been employed as antibacterial agents to treat bacterial illnesses in humans, animals, and plants. Bacteriophages are bacteria-specific viruses that encode proteins that participate in various stages of the infection cycle, from host identification to bacterial cell death. Antibiotic-resistant bacteria could be combated by phage-encoded proteins such as receptor-binding proteins and endolysins, which could inhibit bacterial growth, fight infections, and minimize food spoiling. The use of bacteriophages and their lytic proteins to treat resistant bacterial illnesses is gaining popularity in recent years. Antibiotic resistance has emerged as a major problem, putting human health at risk globally. This crisis has arisen over many years from poor antibiotic stewardship, resulting in the rise of multidrug-resistant bacteria. Multidrug resistance (MDR) bacterial infections are negatively impacting the health and welfare of humans and other animals globally, with pending catastrophic potential. Misuse of antibiotics results in MDR or pan-resistance in exposed bacterial populations. Bacterial resistance to a wide spectrum of antibiotics has emerged as a serious therapeutic problem worldwide. The purpose of this research is to use a commercially available *Salmonella*-specific bacteriophage as a biological control for raw dairy milk artificially contaminated with *Salmonella enterica subsp. enterica serovar Typhimurium str., S1*, an unknown *Salmonella spp.* identified in raw milk. InvA-specific PCR was used, as well as 16S rDNA and ITS primers, to amplify and sequence extracted DNA from *Salmonella* cultures and furthermore confirm the identity of our experimental strains.

Sequence analysis of our ATCC positive control strain validated the *Salmonella* identity, and both this strain and the *SI* isolate amplified consistently using the *invA* primers, which targets a *Salmonella*-specific virulence gene, and studies how the phage affects each strain's survival and growth in a dairy milk environment (medium) in connection to MDR resistance. From the phage infection bioassay, the hypothesis was upheld with the 2h -and 4h (phage infection exposure) subsequently plated onto SSA and 4h plated onto TSA, but was not upheld from 2h TSA, 4h TSA or 3h SSA colony counts. Our findings open the door for phage to be employed for biological control (phage treatment) of MDR *Salmonella*. Our results from our sequence matches, which identify *Salmonella* as our sample, indicate that our phage inhibits the growth of the positive control strains of *Salmonella* as well as *SI*.