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Phage-based Reduction of Salmonella Gallinarum in Poultry

Encapsulated bacteriophages significantly reduce Salmonella Gallinarum in poultry without antibiotics.

Researchers at Purdue have developed an antibiotic-free treatment for fowl typhoid with the use of encapsulated poly-bacteriophages that significantly reduce Salmonella Gallinarum concentrations in poultry ceca compared to untreated birds infected with Salmonella Gallinarum.

With the rise in antibiotic-resistant bacteria, the ability to control key bacterial infections has decreased, making antibiotic resistance one of the biggest challenges in both human and veterinary medicine. The use of bacteriophages as antibacterial has the potential to control bacterial infections without contributing to the global challenge of antibiotic resistance.

The researchers isolated 6 different bacteriophages that, when combined, effectively lysed all Salmonella Gallinarum strains isolated from diseased chickens. The phages were further characterized in terms of lytic capacity in different environments, their morphology, and DNA sequencing. In addition, the researchers also used a microencapsulation process that significantly increased the phage viability even phages when exposed to the harsh environments of the gastrointestinal tract (e.g., low pH, digestive enzymes, etc.). The researchers found that oral administration of the encapsulated poly-phage treatment to chickens infected with Salmonella Gallinarum significantly reduced the concentration of Salmonella Gallinarum in their ceca contents. This technology, which has been verified in a chicken model, could be expanded to include other species of livestock and their respective pathogens.

Technology Validation:

The poly-phage treatment was assessed in a chicken model by randomly separating 100 Jumbo Cornish Rock Cross chicks into four groups: 1) chicks infected with Salmonella Gallinarum and receiving no poly-phage treatment; 2) chicks not infected with Salmonella Gallinarum and receiving no poly-

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phage treatment; 3) chicks infected with Salmonella Gallinarum and receiving an oral mixture of encapsulated and unprotected bacteriophages; 4) chicks not infected with Salmonella Gallinarum and receiving an oral mixture of encapsulated and unprotected poly-phages. On days 1, 2, 4, and 7 post-treatment, random chickens were euthanized to measure concentrations of Salmonella Gallinarum in key tissues. The results showed that oral administration of encapsulated and unprotected poly-phages significantly decreased concentrations of Salmonella Gallinarum in the ceca of phage treated chicks as compared to control chicks.

Advantages:

- Significantly reduces Salmonella Gallinarum concentrations in cecal contents of infected poultry.

- Antibiotic-free treatment for Salmonella Gallinarum.

Applications:

- Poultry production

- Veterinary medicine

- Salmonella treatment

TRL: Veterinary

Intellectual Property:

NATL-Patent, N/A, Europe

Provisional-Patent, 2022-12-22, United States

PCT-Patent, 2023-12-20, WO

Foreign, Non-PCT, 2023-12-22, Pakistan

NATL-Patent, 2025-06-16, United States

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