

Metaphylactic Use of Bacteriophages in Food Animals

R. C. Bicalho
 College of Veterinary Medicine
 Department of Population Medicine and Diagnostic Sciences
 Cornell University, Ithaca, NY, 14853

Cornell Technology
 Venture Forum

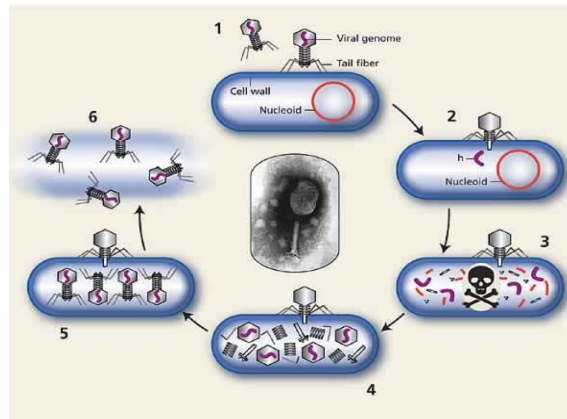
Opportunity & Need

- ❑ **Economic Losses:** The food animal industry is plagued by the high incidence of several bacterial diseases.
 - Bacterial diseases are prevalent in poultry, swine & dairy & beef cattle
 - Economic losses result from increased mortality and decreased value of the carcass and milk.
 - Economic losses in the dairy industry due to bacterial mastitis alone in the US are >US\$2 billion annually.
- ❑ **Antibiotic use in food animal and antibiotic resistance:** Since penicillin was discovered ~80 years ago, use of anti-microbial agents in food animals creates a selective pressure for the emergence and dissemination of bacteria resistant to antibiotics.
- ❑ **Environmental pollution:** Annual antibiotic drug market world-wide is >US\$25 billion, representing 100,000 to 200,000 tons of which half is used for veterinary and food production related purposes.
- ❑ **FDA has approved bacteriophage use in food safety:** animals and crops.

Background

- ❑ **Bacteriophage therapy:** Bacteriophages are viruses that infect bacteria; they are obligate intracellular parasites and lack their own metabolism.
 - ✓ Bacteriophages are the most abundant biological entities on the planet
 - 10^6 phages/mL of ocean and lake water;
 - 10^9 phages/gm of sediment and topsoil.
 - ✓ Bacteriophages are ideal antimicrobial agents
 - highly specific to few bacterial species or strains;
 - non-toxic to mammals;
 - grow exponentially.
 - ✓ The problem of antibiotic resistance has rekindled the interest in phage therapy, the promise of which had been identified 90 years ago upon their discovery.

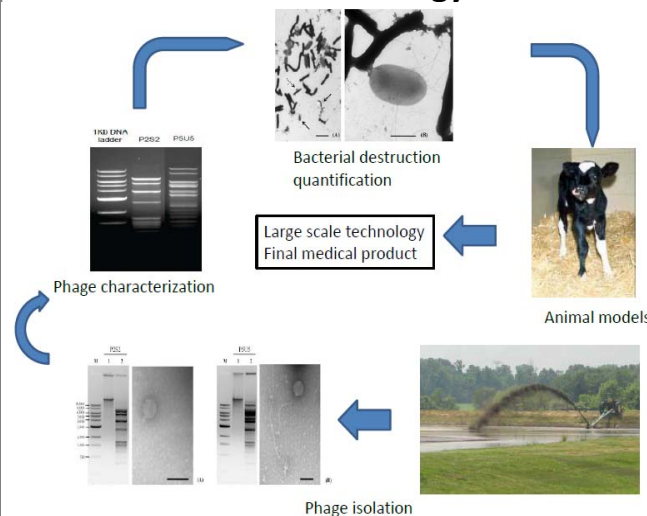
Mechanism



Conclusions

- ❑ Food animal diseases are commonly caused by environmental bacteria.
- ❑ Bacteriophages lethal to environmental pathogens are ubiquitous and easily isolated from the farm environment.
- ❑ Isolated phages were fully characterized and presented excellent *in-vitro* antimicrobial activity.
- ❑ Field trials are being planned to prove safety and efficacy in various animal models of disease, including metritis and mastitis in cattle.

The Technology



Results

- ❑ Our laboratory have isolated over 100 phages active against *E. coli*, *P. aeruginosa*, *A. pyogenes*, *A. baumannii*, among others.
- ❑ 80 *E. coli* were isolated from the uterus of postpartum dairy cows.
 - 35% of isolates were multidrug resistant (florfenicol-cloramphenicol-ampicillin)
- ❑ Phage cocktail had excellent *in-vitro* antimicrobial activity.

