

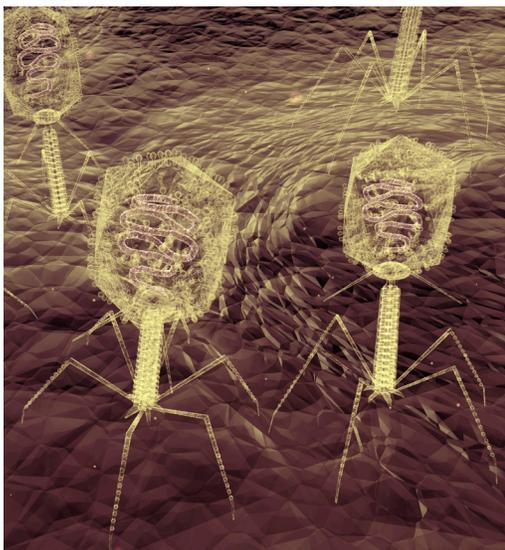
BACTERIOPHAGE HOST-RANGE EXPANSION

Patent Pending

Technology Readiness Level:4

Basic technological components are integrated to establish that the pieces will work together

TECHNOLOGY DESCRIPTION



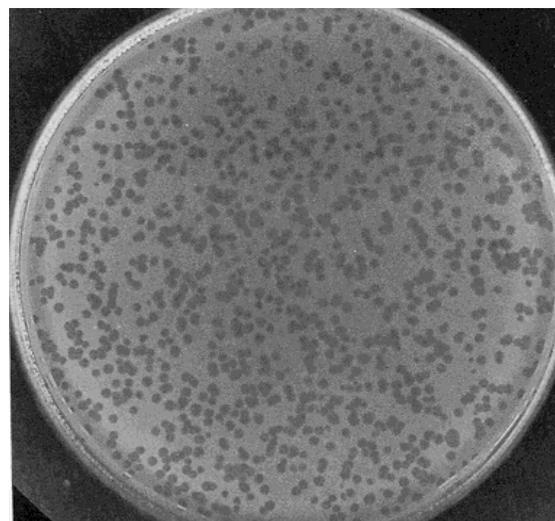
Decades of widespread antibiotic use has created antibiotic-resistant strains of bacteria that are becoming increasingly difficult to treat. In 2006, the Food and Drug Administration (FDA) approved the use of bacteriophages (phages) for food industry applications to eliminate the presence of bacteria, such as *Listeria*, *E.coli*, and *Salmonella*. Phages have also been approved for agricultural use as an alternative to chemical pesticides, and phage treatment is popular in other countries to treat bacterial infections in humans.

As phages are host-specific, searching for, isolating, and propagating phages to target specific “problem” bacterial strains can be challenging and time-consuming. Manufacturers of phage treatments have created phage “cocktails”, each containing dozens of phage strains to combat a single, specific bacterial strain. In order to receive FDA approval, each phage variant in these cocktails must be individually tested, which can take an extended amount of time.

Rather than searching the environment for bacteriophages specific to a particular bacterial strain, Sandia researchers developed a method to propagate known phage strains and mutate them in a way that expands their host-range. This method allows known phage strains to be modified to infect specific strains of bacteria. Mutant phage can become more effective against their natural hosts as well as against a wider range of hosts. By combining strains of mutant phages, problematic bacteria will be infected in multiple modes, overwhelming them and killing the entire bacterial population. By using mutant phages with broader host-ranges, the number of phage strains required for a cocktail would decrease, which, in turn, would speed up the FDA approval process. By broadening the use of currently known phage strains to fight more diverse bacterial variants, phages can be used as an alternative to, or in conjunction with, antibiotics.

TECHNOLOGICAL BENEFITS

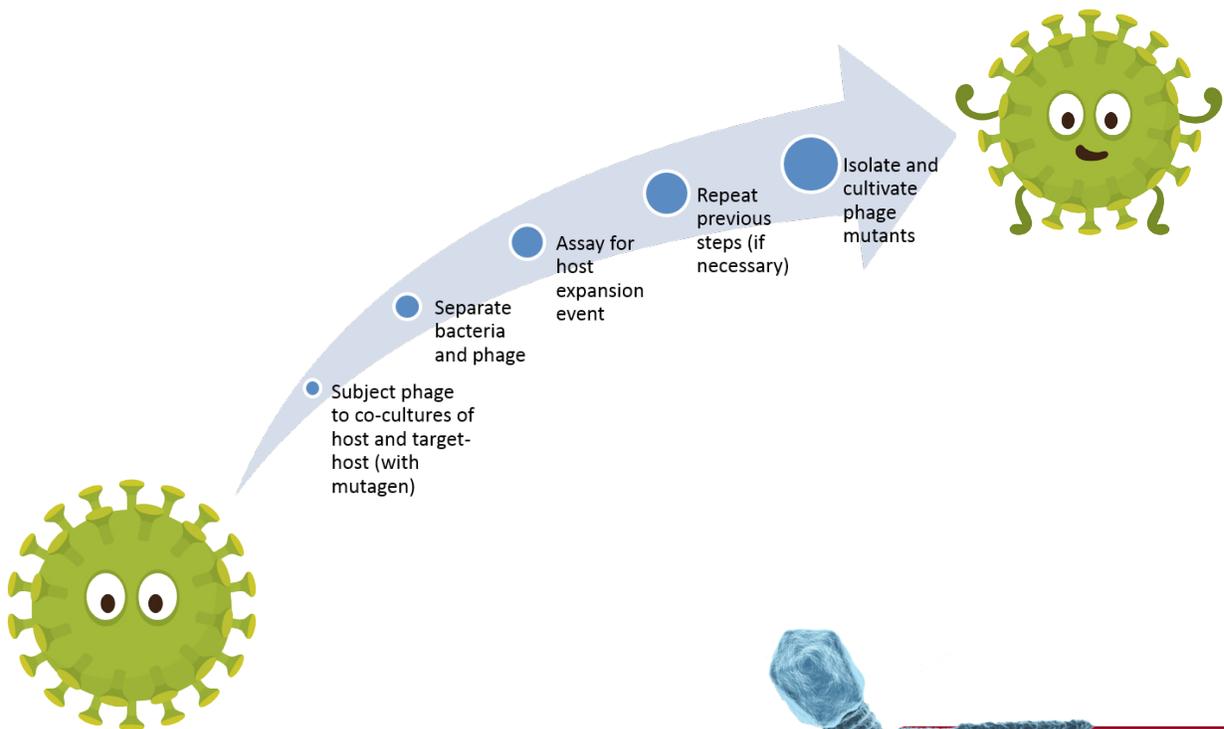
- Creates bacteriophage strains with increased host-range
- Creates bacteriophage for specific bacteria of interest
- Reduces the number of phage strains needed in bacteriophage cocktails (speeding up the FDA approval process)
- Eliminates the need to search the environment for phages that target a specific bacterial strain
- Straightforward to implement with existing lab infrastructure and supplies
- Utilizes a directed evolution, non-GMO (genetically modified organism) approach



Plaque Assay

DIRECTED EVOLUTION APPROACH

1. Ensure that the selected phage infects one host but not the target-host
2. Subject phage to bacterial co-cultures consisting of the bacterial host and the target-host
3. Add predetermined mutagen (optional)
4. Separate bacteria and phage (phage purification)
5. Assay purified phage against target-host to determine if a host-expansion event has occurred (aka. occurrence of plaques on target-host lawn)
6. If necessary, repeat passaging, phage purification, and assay until there is evident infecting activity against target-host bacterial strain.
7. Isolate mutant phage and cultivate in naïve target-host culture to produce a larger population of the phage mutant.



POTENTIAL APPLICATIONS

- Healthcare
- Agriculture
- Food safety & processing
- Hospital sterilization
- Veterinary

CONTACT US

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