

# Bacteriophages

Most people have never heard of bacteriophages. But now that the U.S. government has given food companies permission to spray them on our food, consumers may want to learn all they can.

Bacteriophages (phages) are viruses that attack and kill a specific strain of bacteria. They do not attack plant and animal cells or other types of bacteria, and gravitate toward wherever bacteria live, including the human body, water and the environment.

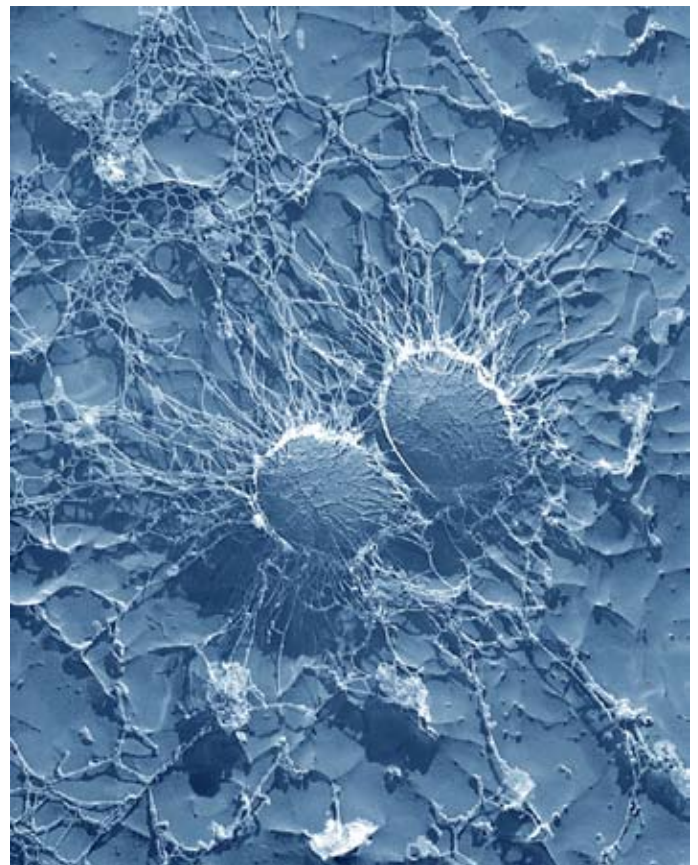
## History

In 1915, British bacteriologist Frederick Twort discovered these small agents that infect and kill bacteria. A few years later in 1917, Felix d’Herelle, a French Canadian microbiologist working at the Pasteur Institute in Paris, named the agents “bacteriophages.”<sup>1</sup> Scientists and doctors began using them to treat infectious diseases. But by the 1930’s, doctors in the United States were turning to penicillin instead. However, phage therapy has been used in Russia and other parts of Eastern Europe for decades, and has proven effective in treating some diagnosed bacterial infections.<sup>2</sup>

## Bacteriophages in Our Food?

In recent years, biotechnology companies began developing bacteriophage products to kill bacteria that cause foodborne illness in humans. Unlike traditional phage therapy, in which these viruses were employed to treat a diagnosed infection, the biotechnology companies plan to use their new phage products in the public food supply. So far, the federal government has allowed the use of two products.

First, in September 2006, the Food and Drug Administration, under the category of “food additives,” approved a bacteriophage mixture that would be sprayed on ready-to-eat meat and deli products to reduce the presence of *Listeria monocytogenes* bacteria. *Listeria* can cause serious illness and even death for people with weak immune systems. In meat processing plants, the bacteria often live in drains and other moist areas. The sealed plastic



Almost all strains of *Staphylococcal* infections in the United States are now resistant to penicillin, and to newer drugs as well.

pouches used for many ready-to-eat meats provide an ideal environment for *Listeria* to grow. Rather than improving sanitation measures in the processing plants and increasing testing for *Listeria*, the federal government has taken a short-cut in its oversight role by approving this new—and, in the realm of food safety, relatively untested—technology to address concerns about *Listeria*.

Intralytix, Inc. contends that its “cocktail” of six different *Listeria*-attacking phages will reduce the likelihood of the bacteria developing resistance to any specific phage.

Then, in January 2007, the U.S. Department of Agriculture also approved a bacteriophage product that OmniLytics Company designed to be sprayed, misted or washed onto cattle hides to reduce the presence of *E. coli* bacteria. But this does not address the source of the problem, for the bacteria start out living in cattle intestines. They then pass through the digestive tract and out, into the manure. Inside today's industrial factory farms, the animals are packed together amidst the mucky mixture of manure and water, so it is no surprise that *E. coli* are splashed onto their hides. From there, the bacteria can contaminate the meat supply if the hide touches muscles and organs during slaughter. Rather than spraying an inadequately tested product, a better solution to *E. coli* and other bacterial contamination would be to eliminate factory farms and instead raise cattle on pasture.

In addition to the two products described above, Intralytix, Inc. and OmniLytics are developing other phage products to be used in food, water and agriculture. Based on the recent decisions, the government likely will approve them.

## Concerns with Bacteriophages in the Food Supply

### Limited Safety Testing

The FDA and USDA did not conduct thorough safety testing on the widespread introduction of bacteriophage products into the food supply. While medical practitioners have long employed them to fight bacterial infections, they have done so for a diagnosed condition to be treated within a finite period. Now, however, the pharmaceutical industry would expose consumers to these products via the food supply on a daily basis.

In the petition for government approval of bacteriophage preparation as a food additive, Intralytix, Inc. submitted only one unpublished study, conducted by their researchers, showing that the product reduced the presence of *Listeria* in meat. No independent, peer-reviewed feeding studies were conducted. These products should have undergone more thorough safety testing before receiving approval.

### Resistance

Bacteria can and do, after repeated exposure to low levels of antibiotics routinely fed to livestock on large factory farms, develop resistance. When these bacteria reproduce, they spread the resistance trait. The American Medical Association, American Public Health Association, and the National Institutes of Health all describe antibiotic resistance as a growing public health concern.<sup>3</sup>

Almost all strains of *Staphylococcal* (Staph) infections in the United States are now resistant to penicillin, and to newer drugs as well.<sup>4</sup>

Based on conversations with microbiologists, Food & Water Watch is concerned that the widespread use of bacteriophages in the human food supply could result in bacteria becoming resistant to bacteriophage treatments. Intralytix, Inc. tried to address this concern by including six different phages specific to *Listeria* in their product. In its approval of the product, the FDA described the company's "rationale for incorporating multiple phages in one formulation is to minimize the possibility of *L. monocytogenes* developing a resistance to the additive."<sup>5</sup> However, this raises the question of whether bacteria eventually will develop resistance in spite of the multiple phages. And how will we know?

### Labeling

Consumers have the right to know which meat products have been treated with bacteriophages and which have not. As it stands now, unfortunately, the only way of knowing whether foods contain them would be to look for the words "bacteriophage preparation" buried in the ingredient list. The government does not require the companies to clearly and prominently label these products – the more effective way to inform consumers.

The Food and Drug Administration and U.S. Department of Agriculture should require clear labeling—not the fine print—so that consumers can make informed choices about food.

### Endnotes

<sup>1</sup> Pennazio S. "The origin of phage virology." *Rivista di Biologia*, 99(1):103-29, Jan-Apr 2006.

<sup>2</sup> Khardori N. "Antibiotics—past, present, and future." *Medical Clinics of North America*, 90(6):1049-76, Nov. 2006.

<sup>3</sup> "Antibiotics and Antimicrobials." American Medical Association. <http://www.ama-assn.org/ama/pub/category/1863.html>.

"The Problem of Antimicrobial Resistance." National Institute of Allergy and Infectious Disease. <http://www.niaid.nih.gov/factsheets/antimicro.htm>. April 2006

"Antibiotic Resistance Fact Sheet." American Public Health Association. <http://www.apha.org/advocacy/reports/facts/advocacyfactantibiotic.htm>.

<sup>4</sup> Keep Antibiotics Working. "The Health Threat." [www.keepantibioticsworking.com](http://www.keepantibioticsworking.com).

<sup>5</sup> 71 Fed. Reg. 47,729, 47,730 (Friday, August 18, 2006).

### For more information:

web: [www.foodandwaterwatch.org](http://www.foodandwaterwatch.org)  
email: [foodandwater@fwwatch.org](mailto:foodandwater@fwwatch.org)  
phone: (202) 797-6550

Copyright © March 2007 Food & Water Watch