Scientists bolster 'phage' weapons in food safety battle

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In the war to keep food safe from bacteria, Cornell food scientists examine a class of weaponry called bacteriophages – an all-natural biological enemy for the nasty Listeria monocytogenes, which threatens meat, produce, cold-smoked seafood and dairy products.

While new research reveals a few genetic gaps in which Listeria can evade bacteriophages ("phages" for short), the Cornell scientists believe the chromosomal fissures can be plugged with a phage cocktail.

"We need to find good ways to keep our food supply safe," said Thomas Denes, Cornell doctoral candidate in comparative biomedical sciences and lead author of the new research. He explains how scientists are determining how to improve the chances of phages succeeding. "We want to guard against phage-resistance so we can keep phage-based biological control on the table."

For the new study, "Selection and Characterization of Phage-Resistant Mutant Strains of Listeria monocytogenes Reveal Host Genes Linked to Phage Adsorption," Denes' co-authors include Henk C. den Bakker of Texas Tech; Jeffrey I. Tokman '15; post-doctoral researcher Claudia Guldimann; and senior author Martin Wiedmann, Cornell's Gellert Family Professor in Food Safety.

In food safety, phages have been around for most of the last decade, as they were approved by the U.S. Food and Drug Administration in 2007. Phages infect the bacterial host and transform it into a "phage-factory,"

essentially destroying the bacteria in the process, Denes said.

Today, phages protect a wide variety of foods, including meat and dairy products. A phage solution may be misted on products or wiped throughout food facilities. Previously, producers favored food-grade chemical products to ward off Listeria.

The researchers showed that some strains of Listeria from this study resisted phage infection through a mechanism called "adsorption inhibition" – which is when molecules or particles fail to bind to a cell surface. Denes said specially tailored combinations of phages – working in concert with each other to overcome resistance – may provide better long-term protection against Listeria than current phage products.

"After doing the basic science to learn how Listeria and phages interact at a genetic level, we can leverage this new knowledge to make an even more effective biocontrol – making our food supply safer," Denes said.

Provided by Cornell University