



Press Release

EBI Food Safety

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EBI Food Safety's bacteriophages are safe for control of *Listeria* in food and food processing equipment.

Today EBI Food Safety published its safety data regarding the use of its bacteriophage-product against *Listeria monocytogenes*, which can cause listeriosis, an often fatal infection. In recent years, *L. monocytogenes* has been implicated in several large food poisoning outbreaks. Though not as familiar to the public, *Listeria* poisoning results in the highest rate of hospitalization of any foodborne pathogen and the second highest mortality rate (i.e. 20% of *Listeria* victims die). Pregnant women who contract *Listeria* poisoning will almost always suffer miscarriage. *Listeria* bacteria are psychotropic, meaning they continue to grow at refrigeration temperatures, and are one of the major safety and liability concerns for the modern food processor.

Bacteriophages (litt. "bacteria eaters") are found in every natural environment and are harmless to humans, animals and plants. They can destroy harmful bacteria in a completely natural and safe process, which occurs in all natural environments, and is one of the most overlooked natural solutions in the fight against bacteria.

The publication of the safety data in the *Regulatory Journal of Toxicology and Pharmacology* is expected to accelerate the acceptance of bacteriophages in food safety applications. "To our knowledge this is the most comprehensive case presented to date", says EBI Food Safety's CEO, Mark Offerhaus. "All perceivable safety aspects have been demonstrated, including genomics, allergenicity and toxicity". The article is also available online (www.ebifoodsafety.com).

About EBI Food Safety

EBI Food Safety B.V. is an Applied BioSciences company focused on the development and commercialization of new anti-bacterial agents based on its phages technology. The company's success is built on a unique combination of an international scientific network and excellent capabilities for product development, manufacturing and marketing. The company applies its proprietary know how in the selection and



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development of products contributing to food safety, such as bacteriophage solutions against microbial food contaminants including *Listeria*, *Salmonella*, *Campylobacter* and *E-coli*.

Abstract from *Regulatory Journal of Toxicology and Pharmacology*

Title: Bacteriophage P100 for control of *Listeria monocytogenes* in foods: Genome sequence, bioinformatic analyses, oral toxicity study, and application

Abstract

Listeria monocytogenes is an opportunistic foodborne pathogen responsible for Listeriosis, a frequently fatal infection. This investigation represents a comprehensive approach to characterize and evaluate the broad host range, strictly virulent phage P100, which can infect and kill a majority of *Listeria monocytogenes* strains. First, the complete nucleotide sequence (131,384 basepairs) of the genome of P100 was determined, predicted to encode 174 gene products and 18 tRNAs. Bioinformatic analyses revealed that none of the putative phage proteins has any homologies to genes or proteins of *Listeria* or any other bacteria which are known or suspected to be toxins, pathogenicity factors, antibiotic resistance determinants, or any known allergens. Next, a repeated dose oral toxicity study in rats was conducted, which did not produce any abnormal histological changes, morbidity or mortality. Therefore, no indications for any potential risk associated with using P100 as a food additive were found. As proof of concept, and to determine the parameters for application of P100 to foods sensitive to *Listeria* contamination, surface-ripened red-smear soft cheese was produced. Cheeses were contaminated with low concentrations of *L. monocytogenes* at the beginning of the ripening period, and P100 was applied to the surface during the rind washings. Depending on the time points, frequency and dose of phage applications, we were able to obtain a significant reduction (at least 3.5 logs) or a complete eradication of *Listeria* viable counts, respectively. We found no evidence for phage resistance in the *Listeria* isolates recovered from samples. The results indicate that P100 can provide an effective and safe measure for the control of *Listeria* in foods and production equipment.

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