



The Effectiveness of Listex P100 in Reducing *Listeria Monocytogenes* in RTE Food Products

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Introduction

The control of *Listeria monocytogenes* (*Lm*) on ready-to-eat (RTE) meat and cheese products is a high priority for the food industry. Both USDA's Food Safety and Inspection Service and FDA have established a zero tolerance for *Lm* in RTE processed foods. The food industry has placed great focus on reducing the risk of *Listeria* contamination in the post processing environment through the application of sanitation, good manufacturing programs and microbiological testing. However, although the presence of environmental *Lm* has been reduced, it has not been completely eliminated. There is still a potential for post-process contamination of RTE products.

One of the critical risk factors for *Lm* is that unlike other pathogens, it can multiply even under refrigerated storage. Therefore, even if very low levels of *Lm* are present in a RTE product, the numbers can reach high and dangerous levels during storage and distribution. In order to properly address the risk of *Lm* in RTE products additional barriers are required.

This report will evaluate a Bacteriophage, marketed under the trade name, Listex P100. This product has received GRAS status from the US Food and Drug Administration and is approved by UDDA's Food Safety and Inspection Service as an antimicrobial in RTE meat and poultry products. Listex P100 is also considered as a processing aid and therefore, does not require labeling.

Evaluation of Research

Bacteriophages are natural enemies of bacteria and provide a natural means of inactivating pathogens that may be present in food products. They can also be designed to be pathogen specific. Listex P100 is specifically designed to address *Listeria monocytogenes*.

The effectiveness of Listex P100 has been determined in numerous scientific studies. These studies have included cooked, RTE processed meat and poultry products and catfish. Guenther et. al. (2009) published a study in the Journal of Food Science that demonstrated a 5 log reduction of *Lm* associated with the Listex P100 treatment. Since this is a post-process treatment applied to RTE products after thermal processing, a 5 log reduction provides an adequate margin of safety to assure that *Lm* is properly controlled.

A 2008 challenge study conducted by DANISCO evaluated the anti-listerial properties of Listex P100 in hot dogs. This study showed a 2 log reduction in *Lm* in RTE products after 24 hours of storage. Interestingly, this study also showed that Listex P100 controls the growth of *Lm* under refrigerated storage.

A 2009 study conducted by Holck and Berg published in the Journal of Applied and Environmental Microbiology evaluated Listex P100 for control of *Lm* in sliced cooked ham. They reported a 2 log reduction after 14-28 days of storage. This study is significant because it demonstrates that when Listex P100 is present, the outgrowth of *Lm* controlled, and even reduced by a magnitude of 100 fold.

The Danish Technological Institute also evaluated Listex P100 in ham and fermented sausages and found that *Lm* levels are reduced by the Bacteriophage treatment. The reductions were dependent on the initial level of *Lm*, the number of phages in the Bacteriophage treatment.

A challenge study performed by EBI Food Safety in the Netherlands determined the lowest Listex P100 dose necessary to achieve > 1-2 log reductions in *Lm* respectively on the surface of hot dogs. The reductions were dependent on the number of phages in the Bacteriophage treatment.

A 2010 study on the effect of Listex P100 on fresh catfish inoculated with *Lm* was published in the Journal of Foodborne Pathogens and Disease. This study showed that Listex P100 reduced the levels of *Lm* by > 1 log when the contact time was greater than 30 seconds. The reductions in *Lm* populations on the surface of fresh catfish were maintained over the 10 day shelf life of the product.

Conclusions

The control of *Listeria monocytogenes* in RTE food products requires a multiple hurdle approach. These products must be processed using treatments that effectively eliminate *Lm* that may be present in raw materials. This step usually involves thermal processing using a validated cooking process.

The next point of control for *Lm* is in the post-processing environment. *Listeria* often survives and even colonizes in the plant environment and this can result in the recontamination of cooked RTE products

before they are packaged. Since *Lm* can grow under refrigeration, even very low levels of contamination at this point in the process represent a significant public health risk.

In order to address low levels of post-process *Lm* contamination, an additional control measure is required. A Listeria-specific bacteriophage effectively reduces post-process contamination with *Lm* and controls the outgrowth of the pathogen during refrigerated storage. Listex P100 has been shown to reduce *Lm* and its outgrowth in various RTE products. Listex P100 has received GRAS status from FDA and is approved by USDA's Food Safety and Inspection Service as an antimicrobial in RTE meat and poultry products. Since it is considered a processing aid, Listex P100 does not require labeling.

Listex P100 has applications in an integrated Listeria control program for manufacturers of RTE meat and poultry products. It would certainly reduce the risk of *Lm* that may be present on the surface of RTE products and would also control outgrowth during refrigerated storage. The use of the Listeria-specific bacteriophage in RTE food products would greatly reduce the risk of cases and outbreaks of listeriosis and help assure compliance with USDA regulatory requirements.