

## PhageGuard Listex Application Data Sheet Cheese

### PhageGuard Listex

PhageGuard Listex is a highly concentrated solution containing Phage P100. Phages are the most abundant microorganisms in the world and can be used for targeted bacterial control.

The phage used in PhageGuard Listex is selected for its killing ability against *Listeria monocytogenes* targeting all *Listeria* strains.

Products that reduce *Listeria* risks are useful in the food industry as *Listeriosis* has a 20-25% mortality rate. PhageGuard Listex can effectively be applied as surface intervention against *Listeria* risks on cheese. PhageGuard Listex has no effect on the colour, texture or taste.

### Product supply

PhageGuard Listex is supplied in 100ml and 1-liter bottles at a concentration of  $2 \times 10^{11}$  phages per ml.

### Approvals

PhageGuard Listex is USDA/FDA GRAS approved. It is further accepted as a processing aid in Australia, New Zealand, Israel, Switzerland, The Netherlands (EU) Canada and others. It is organic certified (OMRI USA and SKAL EU). As a processing aid, no labelling is required.

### Application

*Listeria* can typically be found on the outside of cheese products. Surface ripened washed rinds and white mould cheeses are especially at risk since growing conditions for *Listeria* are ideal and there is a significant chance of proliferation.

A sufficient amount of phage needs to be present to ensure the statistical probability that the phage encounter the bacteria. Preventive use ensures *Listeria* is accessible and not vested within the cheese matrix.

Cheese variety	Application	Dilution
Soft/Semi-hard	On rind at pH 4,5 - 5,5	1%
White Mold	Prior to mold growth	1%
Queso Fresco	In pasteurized milk during cheese making	0,05%
Washed Rind	In wash liquid	0,05%

Application of PhageGuard Listex is either by spraying (1ml per 100 cm<sup>2</sup>) or by immersion and is effective in solution between +0°C and 35°C. Dilute with clean water prior to application (<1 ppm chlorine)

Concentration	PFU/(plaque forming units) per ml
100% Listex	$2 \times 10^{11}$
1%	$2 \times 10^9$
0,05%	$1 \times 10^8$

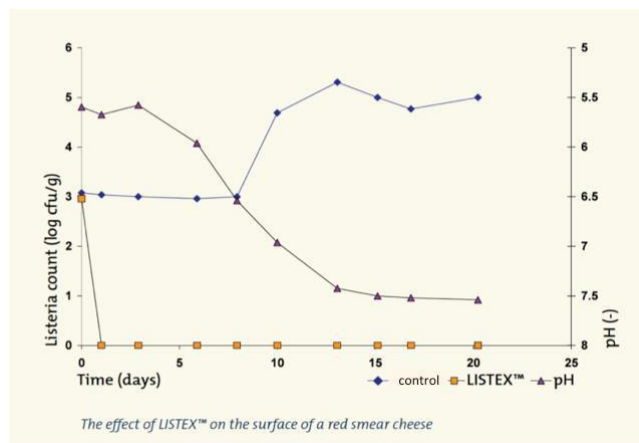
A typical application; PhageGuard Listex is added to the ripening culture to protect the smearing robot against spreading *Listeria* during brushing and washing, see photo below.



*PhageGuard Listex is applied at the point of smearing/washing which potentially is a vulnerable point in the process.*

### Benefits

Below graph shows the result of PhageGuard Listex against *Listeria monocytogenes* on the surface of a red smeared cheese with an inoculation of 1.000 cfu/g.



There are no sensory effects when using PhageGuard Listex and it does not affect starter cultures.

### Detection

The concentration of phages in PhageGuard Listex can be measured via titration using the double agar overlay (DLA) method or using an optical density measuring device.

### Literature

- 2011:** Bacteriophage biocontrol of *Listeria monocytogenes* on soft ripened white mold and red-smear cheeses; Susanne Guenther and Martin J. Loessner, Bacteriophage 1:2, 94-100; March/April 2011
- 2012** Reduction of *Listeria monocytogenes* in queso fresco cheese by a combination of listericidal and listeristatic GRAS antimicrobials. Kamlesh A. Soni, Monil Desai, Ademola Oladunjoye, Frederick Skrobot, Ramakrishna Nannapaneni; International Journal of Food Microbiology 155 (2012) 82–88
- 2006** Challenge study on mozzarella cheese. Microcos Food Safety, Phage Technology Center.