

How phages reduce *Listeria* on food contact surfaces

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Phages

Nature's force for balancing bacteria

Phages are biological organisms that serve to maintain the natural balance in a bacterial population. Phages outnumber bacteria by a factor of 10, making them the most common micro-organism on our planet. For reference: 1 ml seawater contains 1 billion phages.

The unique power of phages

Similar to bacteria, phages are extremely diverse, with each phage having the unique ability to target a specific bacterial species up to the level of bacterial strains. This also counts for targeting foodborne pathogens such as *Salmonella*, *Listeria* and *E. coli*.

Creating the future of food safety

Since 2005, Phageguard set out to develop and produce different phage products which specifically target *Salmonella*, *Listeria* or *E. coli* O157. This allows food processors to achieve maximum effectiveness against specific foodborne pathogens. Phages do not influence any of the characteristics of the treated product. This organic and non-chemical interference is transforming the future for food safety.









Phageguard L


Is *Listeria* posing a problem to your production process? We are here to help. Over the last couple of decades, the effectiveness of [Phageguard L \(PGL\)](#) has been demonstrated in industry trials as well as studies conducted by multiple universities. Phageguard L (PGL) is effective against all prevalent *Listeria* serovars, offering superior protection without affecting your production equipment or your product's authentic color, taste, texture and odor. Therefore, our phages are a modern shield, keeping both your food safety, production equipment and final product's quality at the highest standard.


The power of anti *Listeria* phages

PGL


-  PGL is effective against prevalent *Listeria* serovars
-  Harmless to humans, animals and plants
-  No wastewater issues
-  PGL specifically targets *Listeria* serovars and has no effect on color, taste, texture and odor of the final product
-  Non-corrosive to production equipment
-  PGL can be applied on both Food Contact Surfaces (FCS) and directly on the food product itself, as an addition to the control management plan

Different application possibilities are available for applying Phageguard L (PGL) on Food Contact Surfaces, without requiring any significant changes to the control management plan. Over the years, Phageguard L (PGL) has proven to be easily applicable on different Food Contact Surfaces found in the production environment. Some examples for application of Phageguard L (PGL) in the production environment can be seen below:

 Stainless steel

 Cutting/portioning equipment

 Conveyor belts

 Biofilms

Efficacy

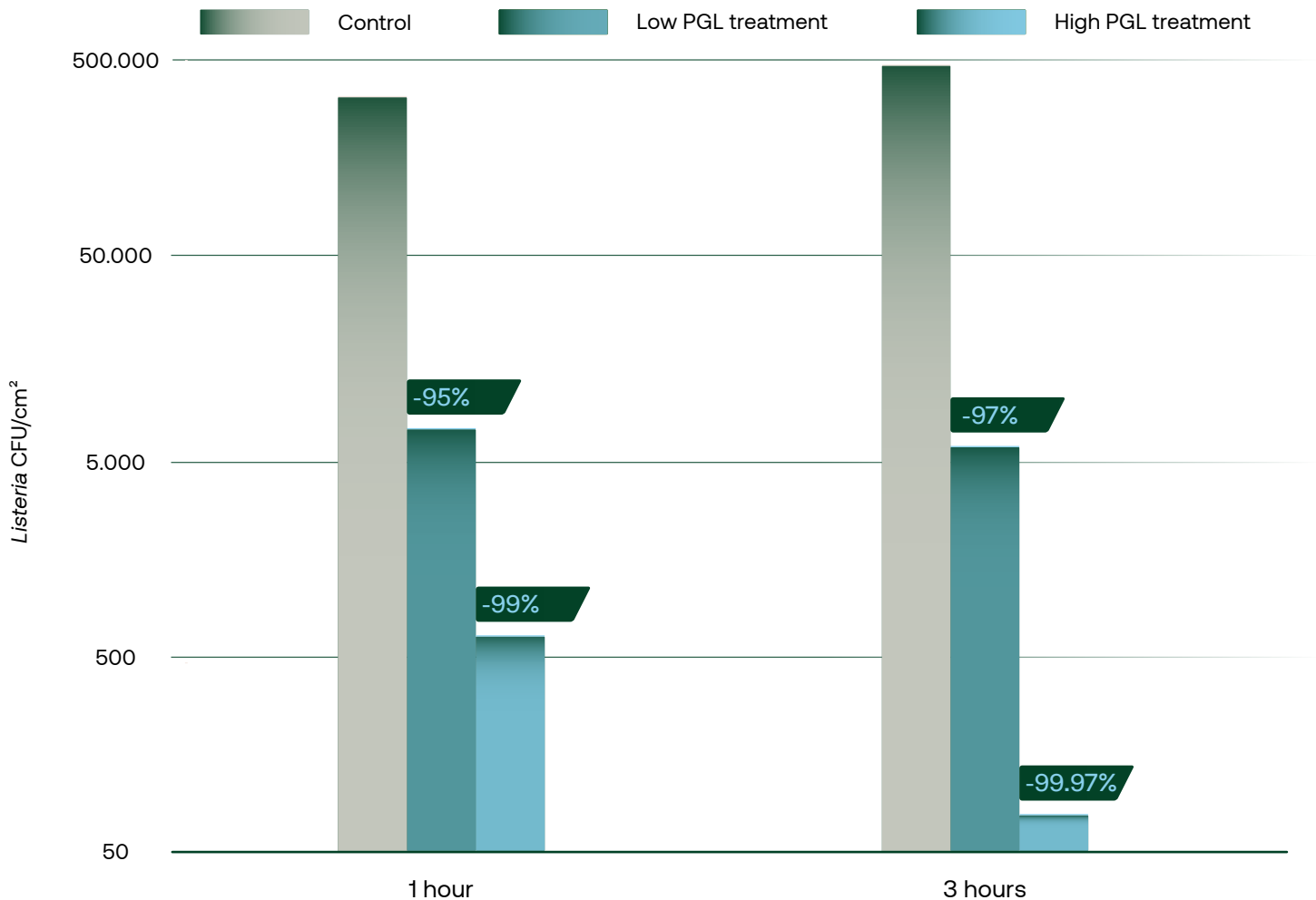
Reducing *Listeria* on stainless steel

Trial results demonstrated by R. G. Reinhard et al.

To conduct the trial, Phageguard L (PGL) was added at both a low and higher doses and applied to the surface using a handheld spraying system. Depending on the dosage and application time, the efficacy of Phageguard L (PGL) in the trial showed a *Listeria* reduction ranging from 95% to up to 99.97%. The reductions achieved by applying PGL were measured at 1 hour and 3 hours after application.

99.9%
Reduction

A higher treatment of Phageguard L (PGL) reduces *Listeria* presence on the stainless steel up to 99.97% 3 hours after application. Control is tap water measured over the same time span as the PGL application.



Efficacy

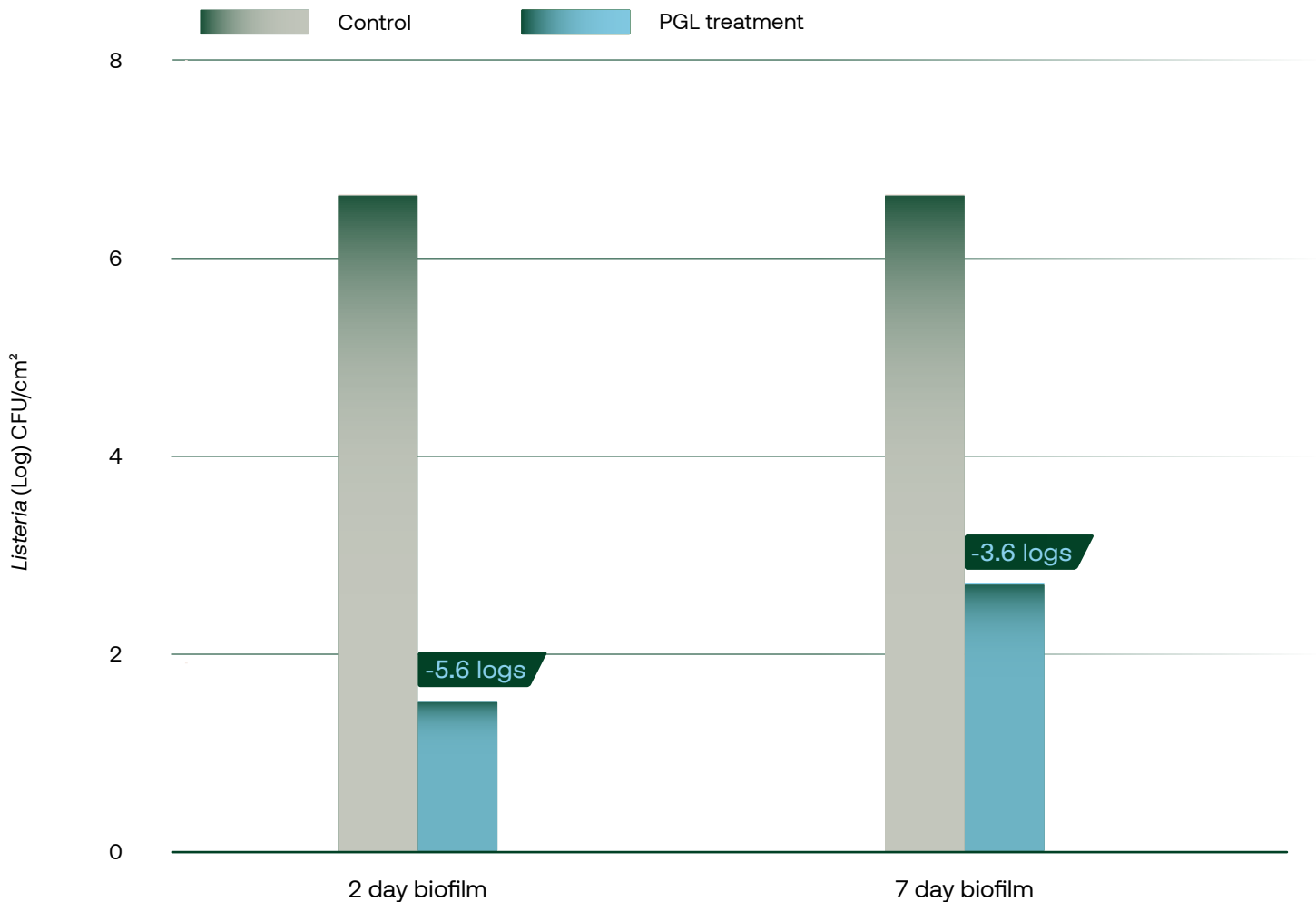
Reducing *Listeria* biofilms on stainless steel

Scientific research by K. Soni et al,

The trial was conducted on newly formed biofilms and aged biofilms. Phageguard L (PGL) was added at a low dose and applied to the biofilm surface using a handheld spraying system. Depending on the biofilm age, the efficacy of Phageguard L (PGL) in the trial achieved a *Listeria* reduction ranging from 3.6 logs to up to 5.6 logs.

5.6 logs
Reduction

A 2 day biofilm sprayed by a low Phageguard L (PGL) dosage reduces the *Listeria* biofilm up to 5.6 logs. Control is measured over the same time span as the PGL application.



Efficacy

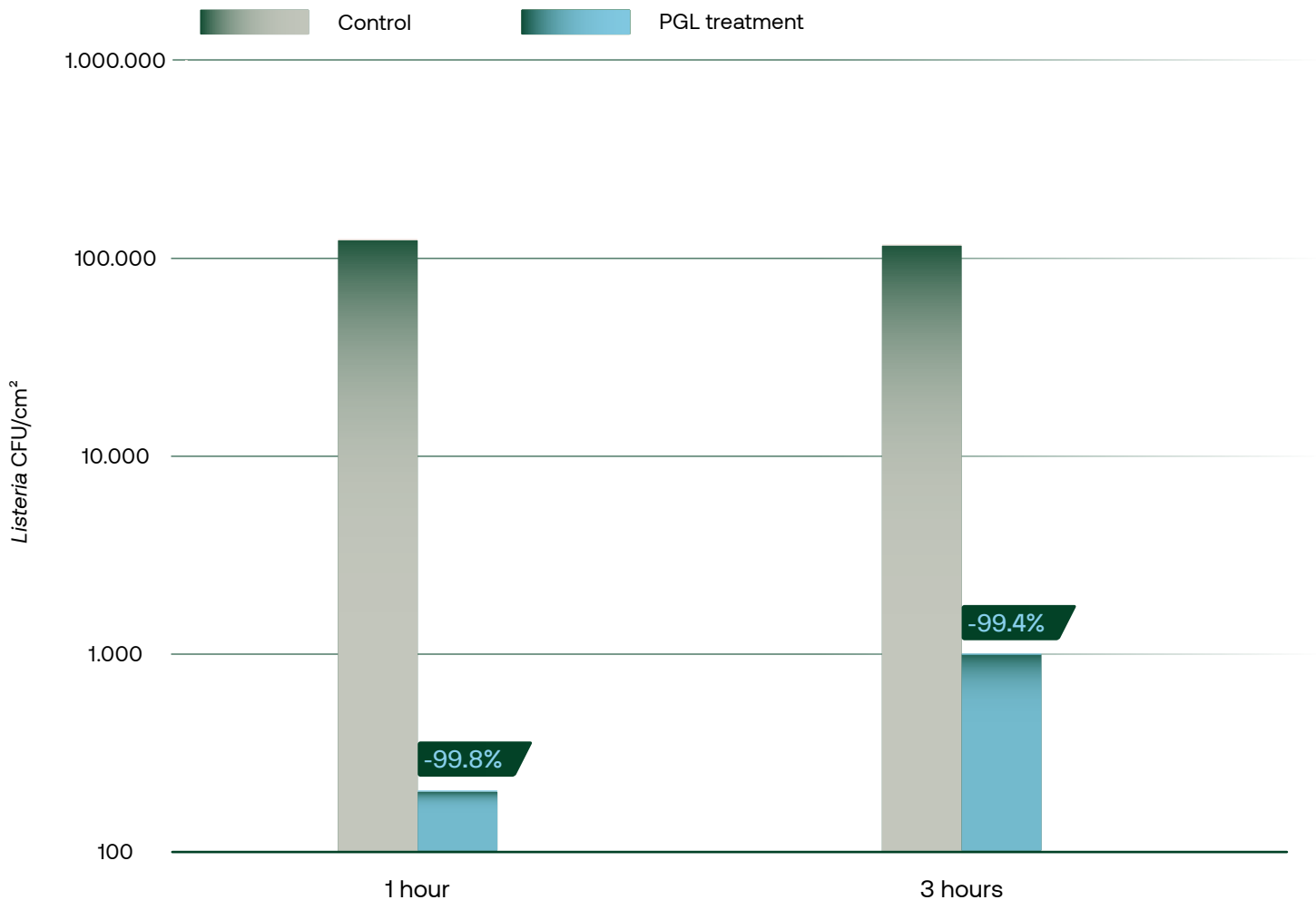
Reducing *Listeria* on conveyor belts

Trial results demonstrated by R. G. Reinhard et al.

The trial was conducted on a blue belt conveyor model. Phageguard L (PGL) was applied to the surface using a spraying system. Depending on the application time, the efficacy of Phageguard L (PGL) in the trial achieved a *Listeria* reduction ranging from 76% to up to 99.8%. The reductions achieved were measured at 1 hour and 3 hours after application.





99.8%
Reduction

Phageguard L (PGL) reduces the *Listeria* presence on the blue belt conveyor model up to 99.8% 1 hour after application. Control is tap water measured over the same time span as the PGL application.









Application

To ensure effectiveness, recommended treatment of Food Contact Surfaces is on a daily basis. For biofilms, spray 1 to 3 times after area has dried. If swabs test positive, repeat PGL application until *Listeria* tests negative for 3 consecutive days. Biofilms should be eradicated in 2 to 7 treatments of PGL.

-  Rinse off other chemical cleaning agents from the surface if used before. Avoid contact of chemical residues with the prepared PGL solution
-  Improve effectiveness by applying PGL as the final step in your sanitizing procedure, and at the end of the (daily) shift to achieve further reductions overnight or over the weekend
-  Spray on surface until visibly wet.
-  9.5 liter of diluted PGL (at either 1% or 5%) can treat approximately up to 93 square meter

Get the most out of Phageguard L

PGL

-  Recommended storage temperature of PGL is 4°C to 7°C (39.2°F to 44.6°F) handled in a sterile manner
-  Gently shake the concentrated Phageguard solution before opening/diluting, and the diluted solution again before application
-  Use chlorine free water (< 1 ppm free Cl level) at a temperature below 20°C (68°F) to dilute the PGL solution
-  Dilute the needed PGL volume before application
-  Ensure that no chemical residues are present on the treated surfaces, or in containers used for the PGL dilution
-  Use the working solution the same day that you make the dilution. Make sure not to re-use or store the diluted PGL for more than 48 hours under recommended storage temperatures

Trusted solutions

Phageguard L (PGL) received approvals and opinions from government institutes worldwide and is GRAS (generally recognized as safe) certified by the FDA since 2006. Over the last couple of decades, the efficacy of phageguard L (PGL) has been consistently demonstrated through trials conducted with some of the most reputable universities. This ensures our customers with scientifically proven solutions for care-free processing.

- ✓ USA, FDA GRAS for all products (GRN 218) – 2006
- ✓ USA, USDA approved processing aid (Directive 7120.1) – 2007
- ✓ The Netherlands, Ministry of Health: Processing aid (letter) – 2010
- ✓ Canada, Health Canada: Processing aid – 2011
- ✓ Australia/ New Zealand. FSANZ processing aid (Phageguard Listex™) – 2012
- ✓ Brasil, Ministerio da Saude (CIP) – 2012
- ✓ Israel, Food Control Services Ministry of Health: approved processing aid – 2014
- ✓ EU: Phageguard Listex™ is safe for use (EFSA opinion) – 2016
- ✓ Chile, Subsecretaria de Salud Pública. (ORD. B34/N794) - 2022

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The future of food safety



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