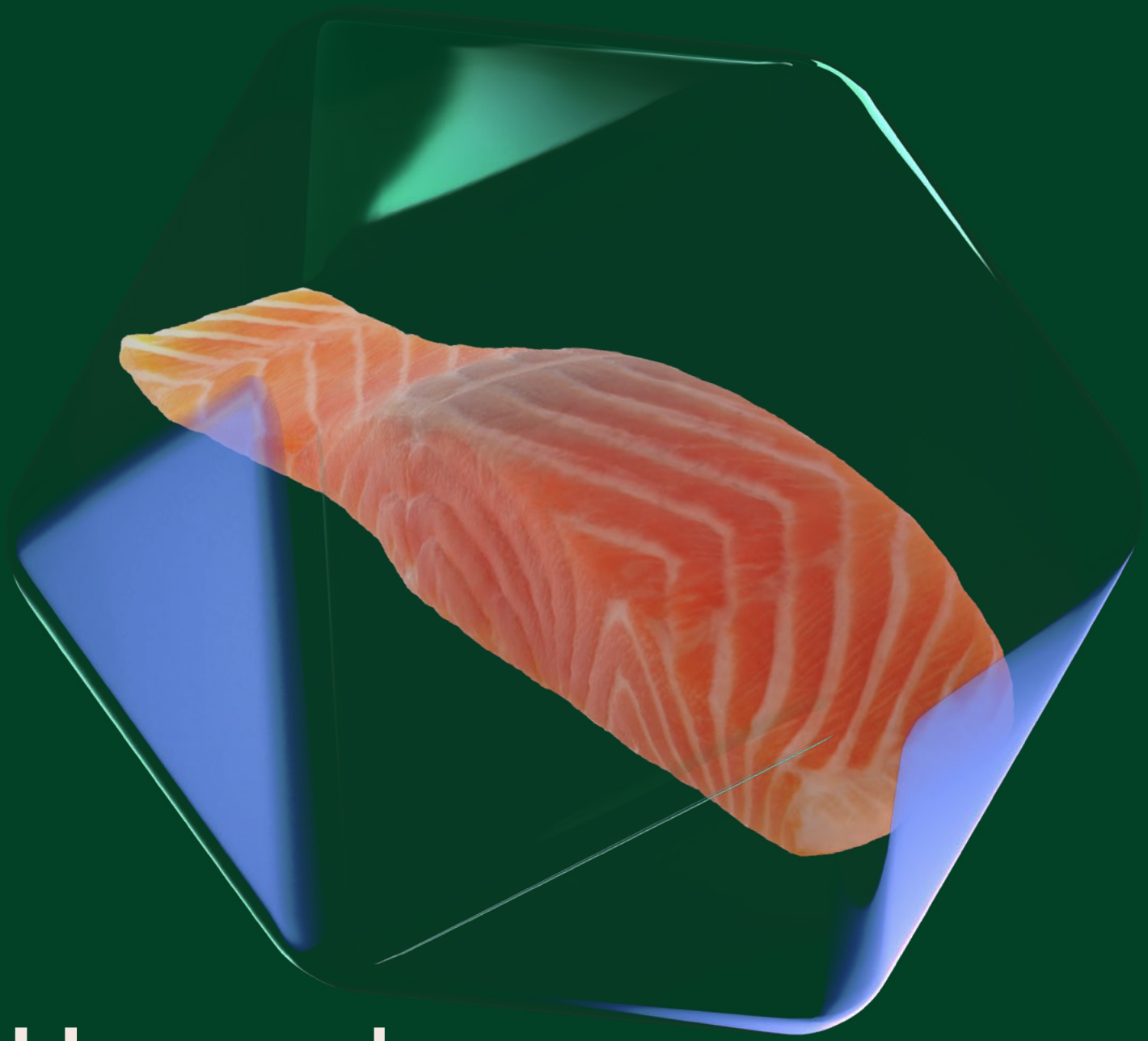
Technical data sheet
Listeria solutions



How phages reduce *Listeria* on fresh salmon

phageguard

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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 or do you want to move ahead of modern regulations? 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 and salmon 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 salmon fillets and Food Contact Surfaces (FCS), as an addition to the control management plan

Different application possibilities are available for applying Phageguard L (PGL) on salmon, often without requiring any significant changes to the production line. Depending on your production size, processing, and final salmon product, multiple techniques for application can be used. Some examples for applying Phageguard L (PGL) can be seen below:

- In-line spray systems
- Handheld spraying system
- Treatment of brine or batter
- Dip tanks

Efficacy

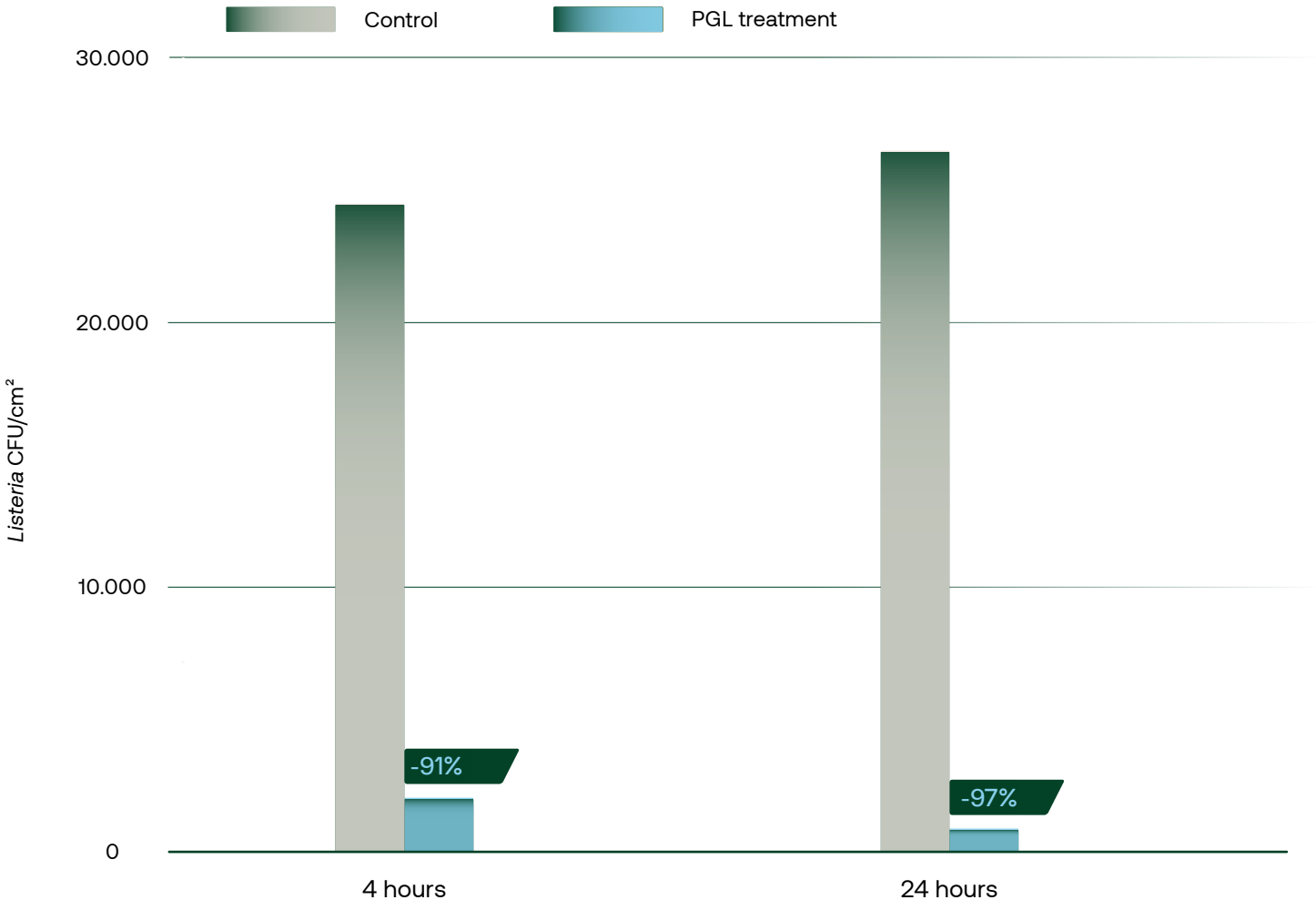
Reducing *Listeria* on fresh, raw salmon

Lab trial data results

The lab trial was conducted by artificially contaminating the salmon fillets. Phageguard L (PGL) was added at a low treatment and applied on the fresh, raw salmon. The efficacy of Phageguard L (PGL) in the lab trial showed a reduction of 91% to up to 97% depending on the dwell time. The reductions achieved were measured over 24 hours after application.

97%
Reduction

Phageguard L (PGL) reduces the *Listeria* found on the salmon up to 97%. The reductions achieved by applying PGL were measured at 4 hours and 24 hours after application.



Application

To ensure the maximum effectiveness of the application, our specialists work closely with you to determine the optimal dilution and application method tailored to your salmon processing needs. Based on trial results, we collaboratively set up a plan to maintain *Listeria* control.

- Phageguard L (PGL) can be applied pre- or post smoking of the salmon fillets
- 0.5% to 1% pickup of spraying Phageguard L (PGL) onto the salmon results in good coverage of the surface
- Shelf life trials performed by K. Soni, PhD, and R. Nannapaneni, PhD, showed that decreasing the initial *Listeria* load with Phageguard L (PGL), lowered the *Listeria* load at the end shelf life

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 Food Contact Surfaces, in containers used for the PGL dilution, or in areas where the salmon is stored for treatment
- 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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