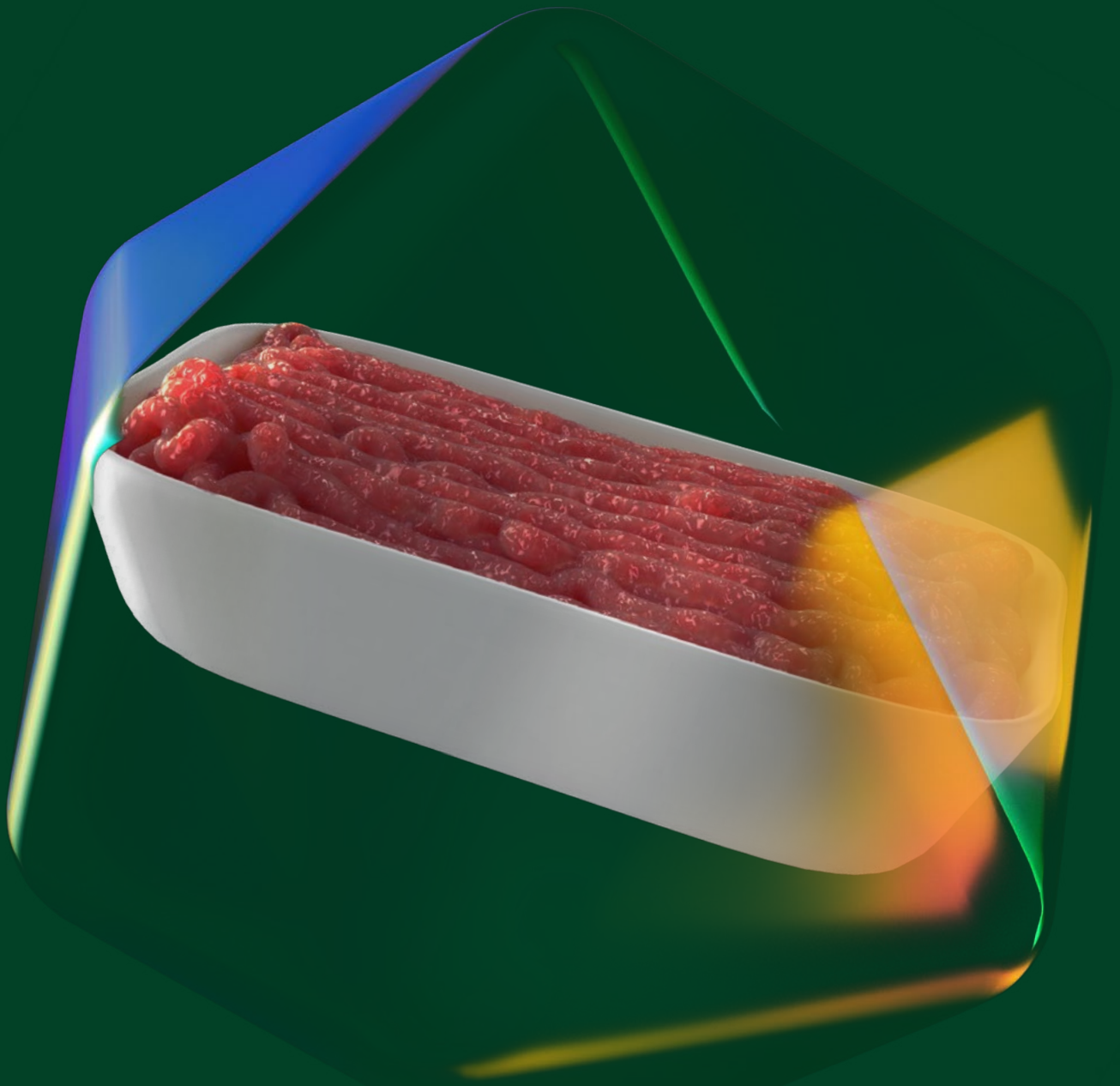
Technical data sheet
Salmonella solutions



How phages reduce *Salmonella* on ground beef

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 S

Is *Salmonella* posing a problem in 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 S (PGS) has been demonstrated in industry trials as well as studies conducted by multiple universities. Phageguard S (PGS) is effective against all prevalent *Salmonella* serovars, offering superior protection while maintaining your ground beef product's authentic color, taste, texture and odor. Therefore, our phages are a modern shield, keeping both your food safety and ground beef quality at the highest standard.

The power of anti *Salmonella* phages **PGS**

- PGS is effective against all prevalent *Salmonella* serovars
- Harmless to humans, animals and plants
- No wastewater issues
- PGS specifically targets *Salmonella* serovars and has no effect on color, taste, texture and odor of the final product
- Non-corrosive to production equipment
- PGS can be applied after applying chemicals (e.g., PAA, Chlorine) to contribute to a multi-hurdle, multi-technology approach

Different application possibilities are available for applying Phageguard S (PGS) on ground beef, often without requiring any significant changes to the production line. Depending on your production size, processing, and ground beef type, multiple techniques for application can be used. Some examples for applying Phageguard S (PGS) can be seen below:

- Tumbling machines
- Blenders/mixers
- Dip tanks
- In-line spray setups

Efficacy

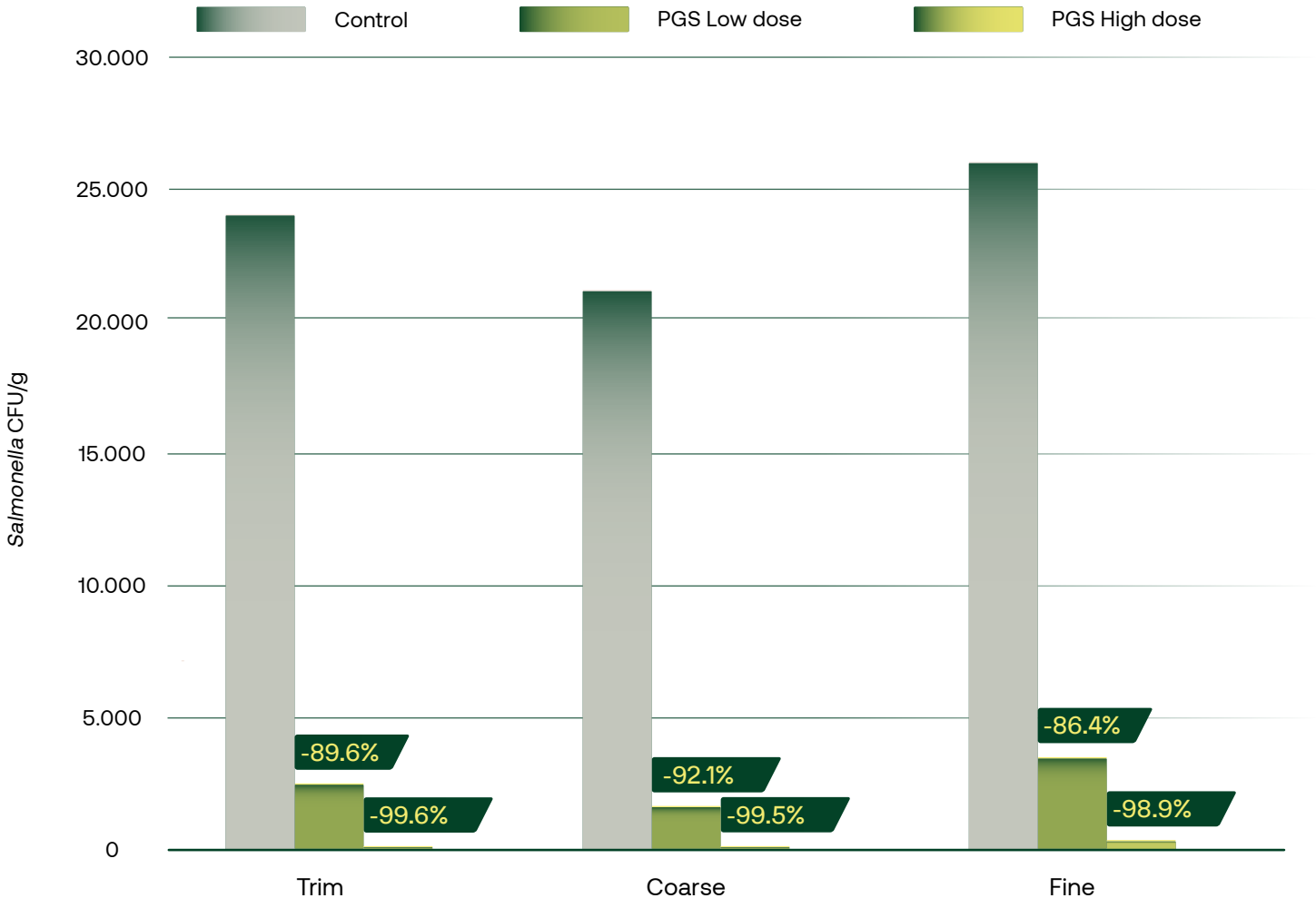
Reducing *Salmonella* on ground beef

Lab trial data on different grinding stages

Depending on grinding stage and Phageguard S (PGS) dosage, the efficacy of Phageguard S (PGS) in lab trials achieved a *Salmonella* reduction ranging from 86.4% to up to 99.6% after 24 hours. Phageguard S (PGS) was applied at both a low and higher doses at a 1% pickup. The study was conducted by following similar processing procedures to those observed in the ground beef processing industry.

99.6%
Reduction

A higher dose of Phageguard S (PGS) reduces the *Salmonella* found on the samples up to 99.6%. The achieved reductions by applying PGS were measured 24 hours after application.



Efficacy

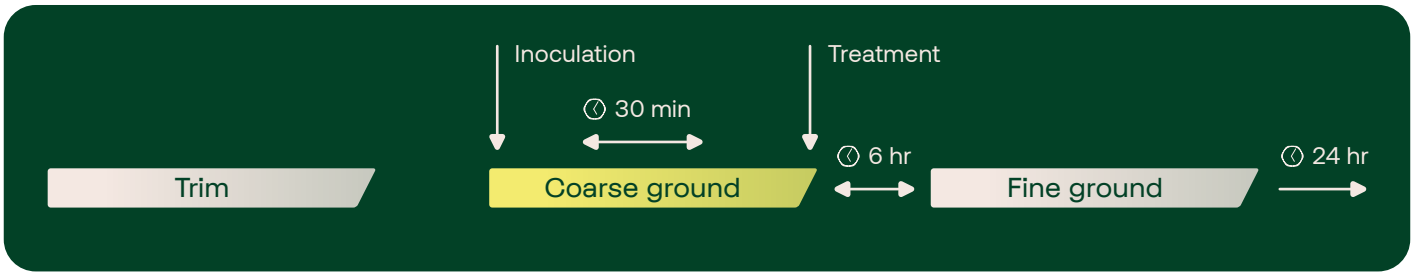
Reducing *Salmonella* on ground beef

Lab trial procedure of the different grinding stages

The Phageguard S (PGS) lab trials followed procedures similar to those observed in the industry. The artificially *Salmonella* contaminated samples were treated 30 minutes after inoculation. A 6-hour interval was provided between the treatment and the following grinding stage. After the final grinding stage, the samples were stored for 24 hours.

Sampling for PGS on trim study

Sampling for PGS on coarse ground study



Sampling for PGS on fine ground study

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 ground beef processing needs. Based on trial results, we collaboratively set up a plan to maintain *Salmonella* control.

- PGS can be applied at any grinding stage (on trim, coarse ground and fine ground)
- Applying PGS on trim before grinding improves the effectiveness
- PGS shows an adequate reduction of *Salmonella* presence within 20 minutes after application. Further reductions can be achieved within 24 hours

Get the most out of Phageguard S PGS

- Recommended storage temperature of PGS 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 PGS solution
- Dilute the needed PGS volume before application
- Ensure that no chemical residues are present on Food Contact Surfaces, in containers used for the PGS dilution, or in areas where the (ground) beef 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 PGS for more than 18 hours under recommended storage temperatures

Trusted solutions

Phageguard S (PGS) received approvals from government institutes worldwide and is GRAS (generally recognized as safe) certified by the FDA since 2013. Over decades, the efficacy of phageguard S (PGS) 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.

- ✓ Australia / New Zealand, FSANZ processing aid (Phageguard S™) - 2012
- ✓ USA, FDA GRAS (GRN 468) - 2013
- ✓ Israel, Food Control Services Ministry of Health: approved processing aid – 2014
- ✓ USA, USDA approved processing aid (Directive 7120.1) – 2016
- ✓ Canada, Health Canada: Processing aid – 2016
- ✓ India, FSSI: Food contact surfaces and processing aid - 2021
- ✓ Chile, Subsecretaria de Salud Pública. (ORD. B34/N794) - 2022

The future of food safety

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