



The Future of Food Safety is Natural: Controlling Listeria with Inneo

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Laurent Dallaire, CEO – Cofounder
Innodal

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THE FUTURE OF FOOD SAFETY IS 100% NATURAL

Laurent Dallaire, P. Eng, M.Sc.



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Industry Snapshot



Food safety investigation into Listeria in frozen waffles and pancakes leads to expanded recall

By News Desk on October 23, 2024



3rd person dies in Listeria outbreak in plant-based milks

Canadian Food Inspection Agency has confirmed contamination originated at Pickering, Ont., factory

Nicole Ireland - The Canadian Press - Posted: Aug 12, 2024 2:22 PM PDT | Last Updated: August 13, 2024



Fresh Express recalls certain Chicken Caesar Salad Bowls because of Listeria concerns

By News Desk on October 28, 2024



Boars Head deli meat implicated in outbreak of Listeria infections; recall initiated

For images of all recalled products go to <https://www.cdc.gov/listeria/outbreaks/delimeats-7-24/index.html>



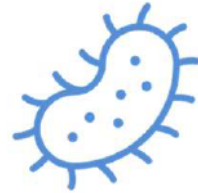
Kirkland Signature Smoked Salmon recalled because of potential Listeria contamination

By News Desk on October 25, 2024

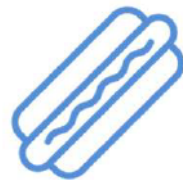
Industry Snapshot

Recalls between 2002-2023

An Analysis of Food Recalls in the United States,
2002-2023, Journal of Food Protection



22% of F&B recalls were caused by
Listeria monocytogenes



> 60% of *Listeria* recalls were for processed
foods, almost 70% were chilled or frozen
products



88% of *Listeria* recalls were class I

Highest Risk Food Categories for Listeria Contamination

10-30 M\$



Deli Meats & RTE Meat Products



Processed vegetables
(Salad kits, cut vegetables)



Cheese & Dairy Products



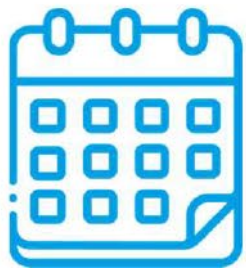
Sandwiches & Prepared meals



Ice Cream & Frozen Desserts

Tools currently available to control *Listeria*

Type	Name	Dosage
Physico-chemical parameters	pH	<4,4
	aw	<0,92
Thermo-mechanical treatment	Cooking	83°C – 3sec
	Pasteurization	72°C – 16sec
	HPP	3min – 87 000psi
Additive	Sodium lactate	3%
	Sodium diacetate	0,25%
Processing aid	Ozone	2,5 – 20 ppm
	Hydrogen peroxide	88 – 2750 ppm



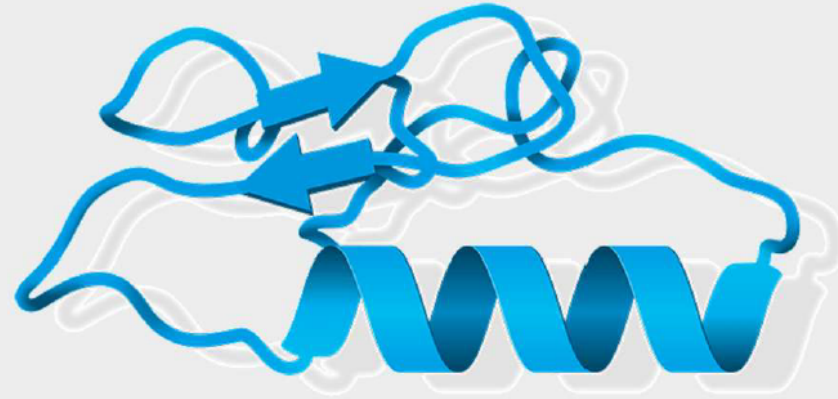
Fresh

Healthy

Natural
preservation

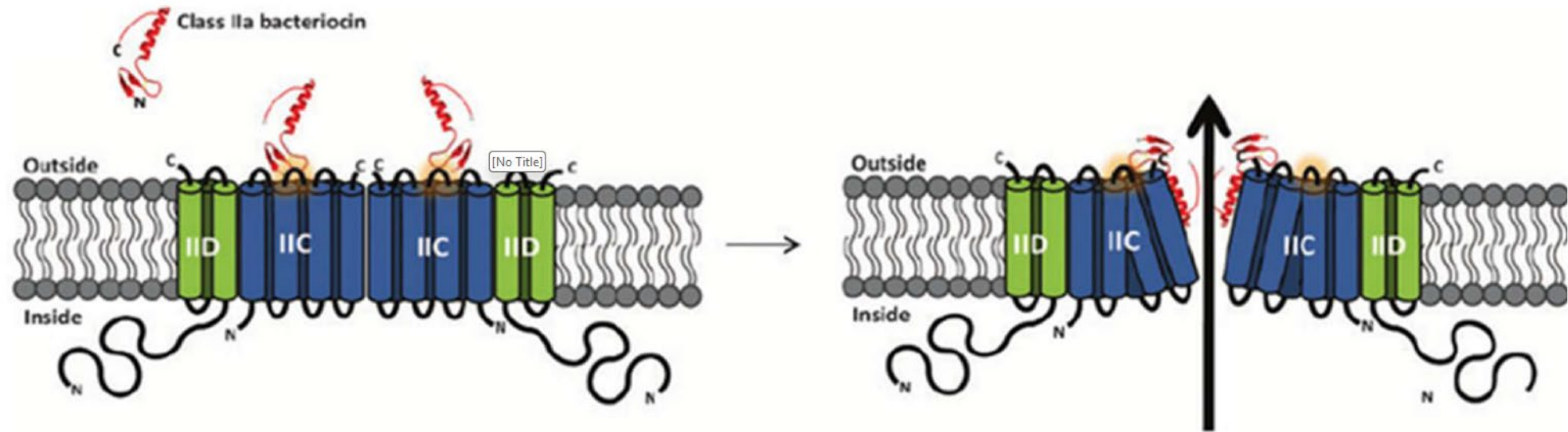


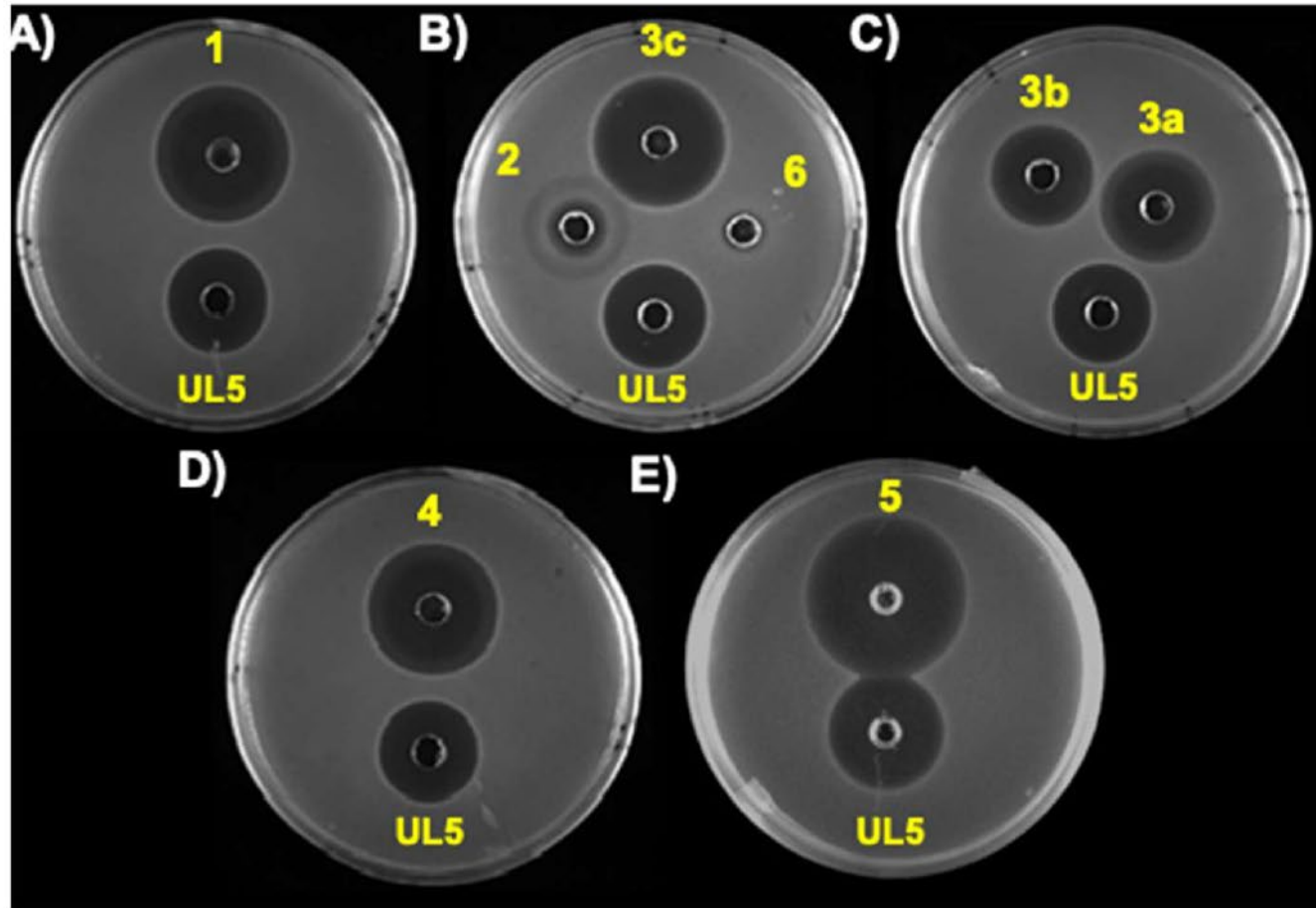
PEDIOGIN : A PEPTIDE BASED ON 44 NATURAL AMINO ACIDS



Pediocin acts to **destroy bacteria** cells by permeabilizing their cell membrane.

Its action on *Listeria* spp. is immediate, classifying it an antimicrobial **processing aid** under Health Canada and FDA regulations, which allows it to be used without having to be added to the list of ingredients.





Listeria monocytogenes ATCC19111 – TSBYE medium
Peptide quantity per well: 15 nmoles (75 μ g)

- 1: Linear
- 2: Peptide
oxydized
- 3c: Cyclic pediocin
- 4: Leucine + linear
- 5: Leucine + cyclic
- 6: Trully linear

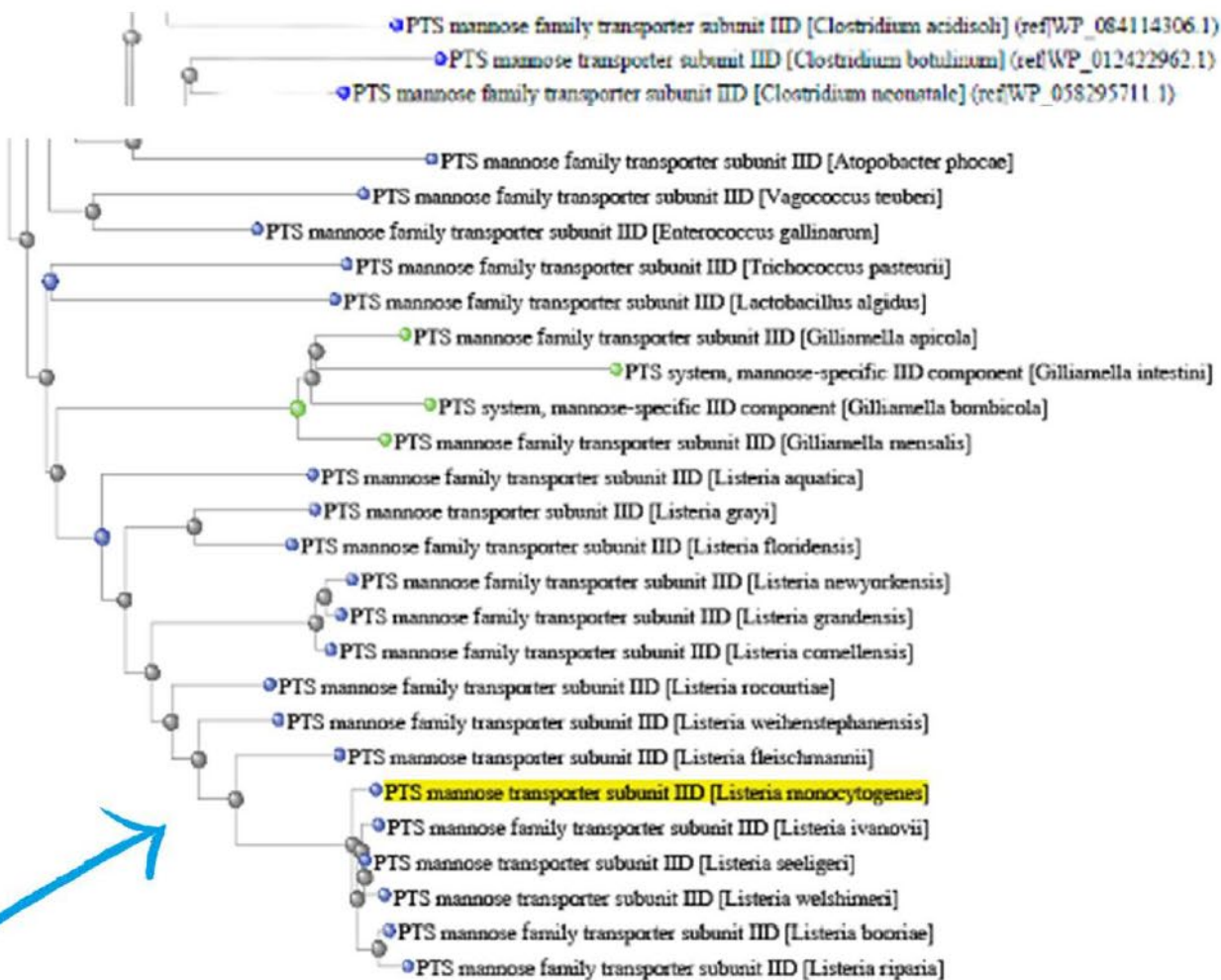


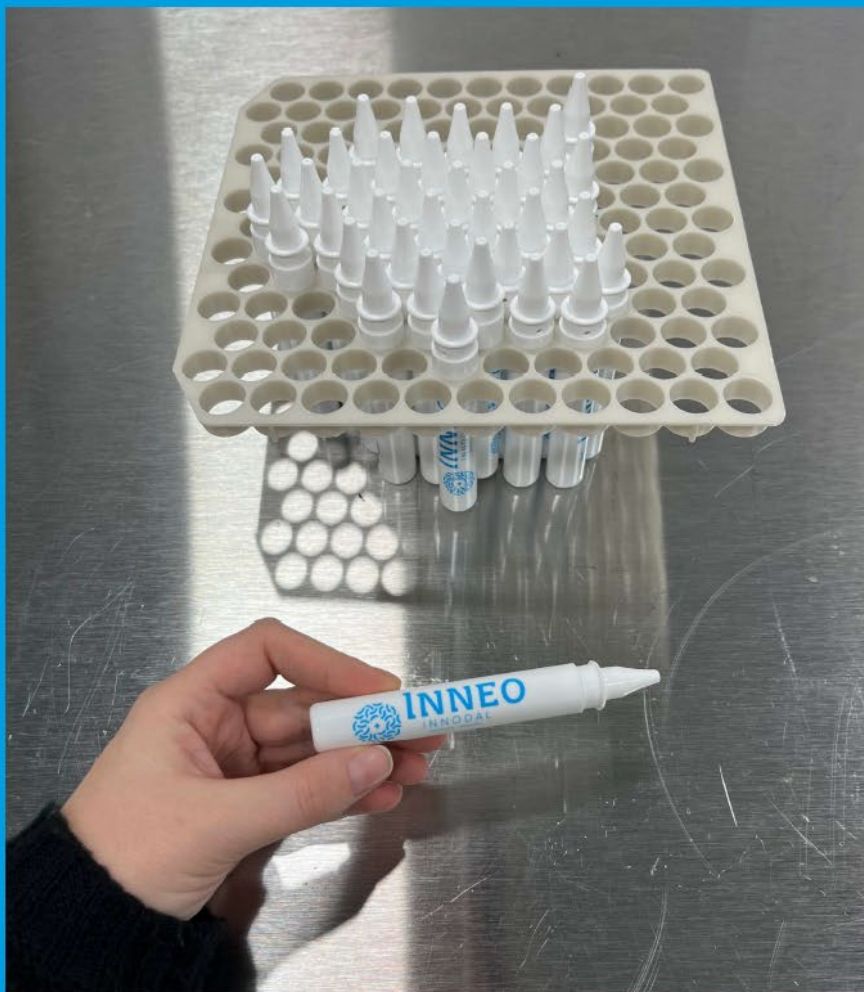
KYYGNGVT**CG**KHSC**SV**DW**GK**ATT**CI**IN**NGA**L**A**WATGGHQGNHK**C**

4

- ❑ Highly potent against *L. monocytogenes* MIC: 13.5 nM = 0.06 µg/mL
- ❑ manPTS IID is highly conserved among a wide variety of bacteria.
- ❑ With a BLAST, we were able to sort 175 species from the generated phylogenetic tree.

Strain	Reference	MIC (nM)	Diffusion (mm)
<i>Carnobacterium divergens</i>	ATCC 35677	1.9	35
<i>Leuconostoc mesenteroides</i>	ATCC 23386	1.9	33
<i>Listeria seeligeri</i>	ATCC 35967	4.7	32
<i>Clostridium perfringens</i>	AAC 1-222	37.8	25
<i>Clostridium perfringens</i>	AAC 1-223	75.7	22
<i>Listeria murrayi</i>	ATCC 25401	151.4	28
<i>Lactobacillus plantarum</i>	ATCC 8014	605.5	23





Inneo

A single recipient for different levels of concentrations

- Easy to use
- Precise dosing
- Clean Label
- Turn-key





MANUAL





AUTOMATED SPRAY



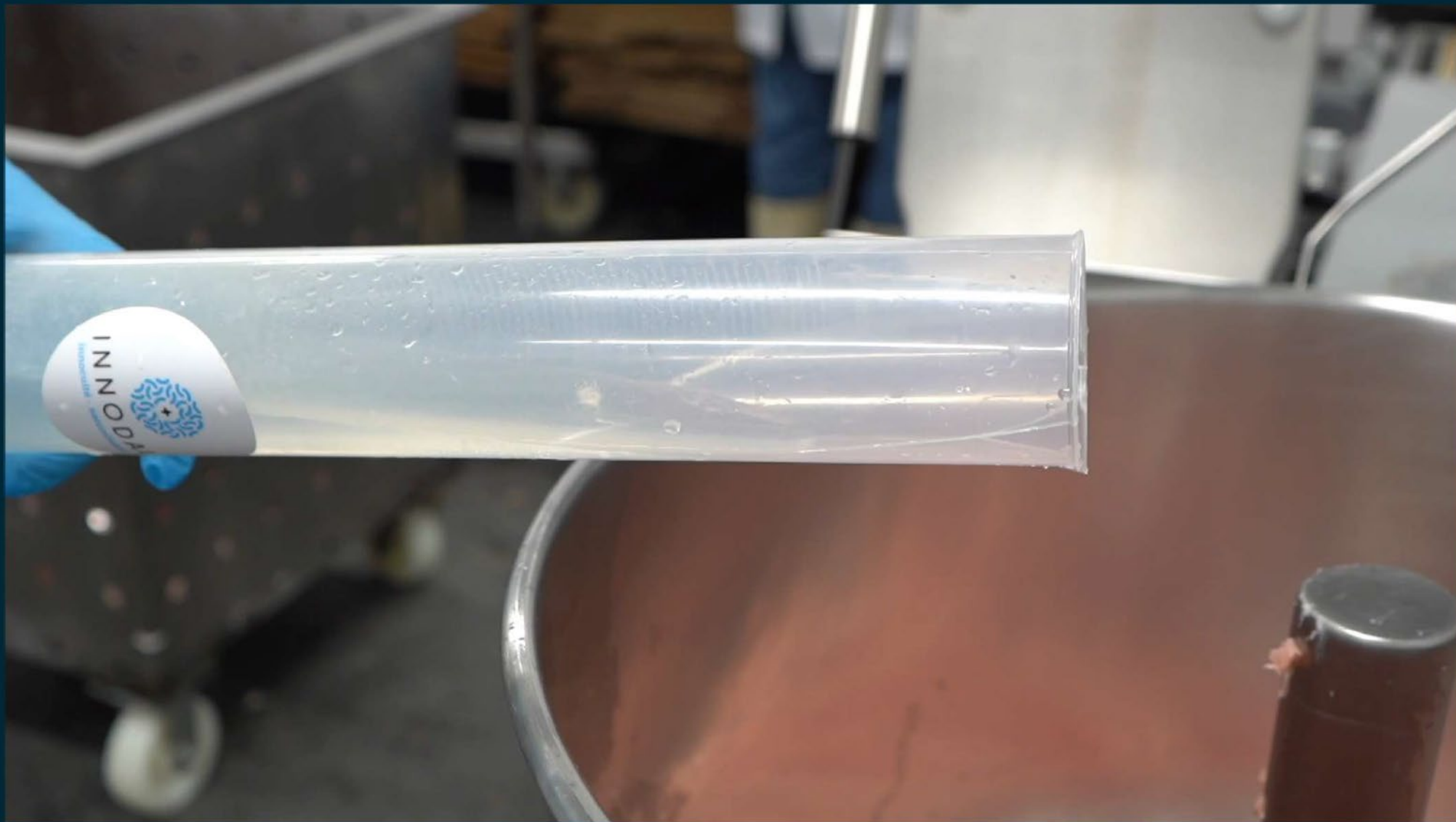


MANUAL SPRAY





MIXED IN PRODUCT





SOAKING BATH

<https://www.youtube.com/watch?v=17OR3opsbw4>

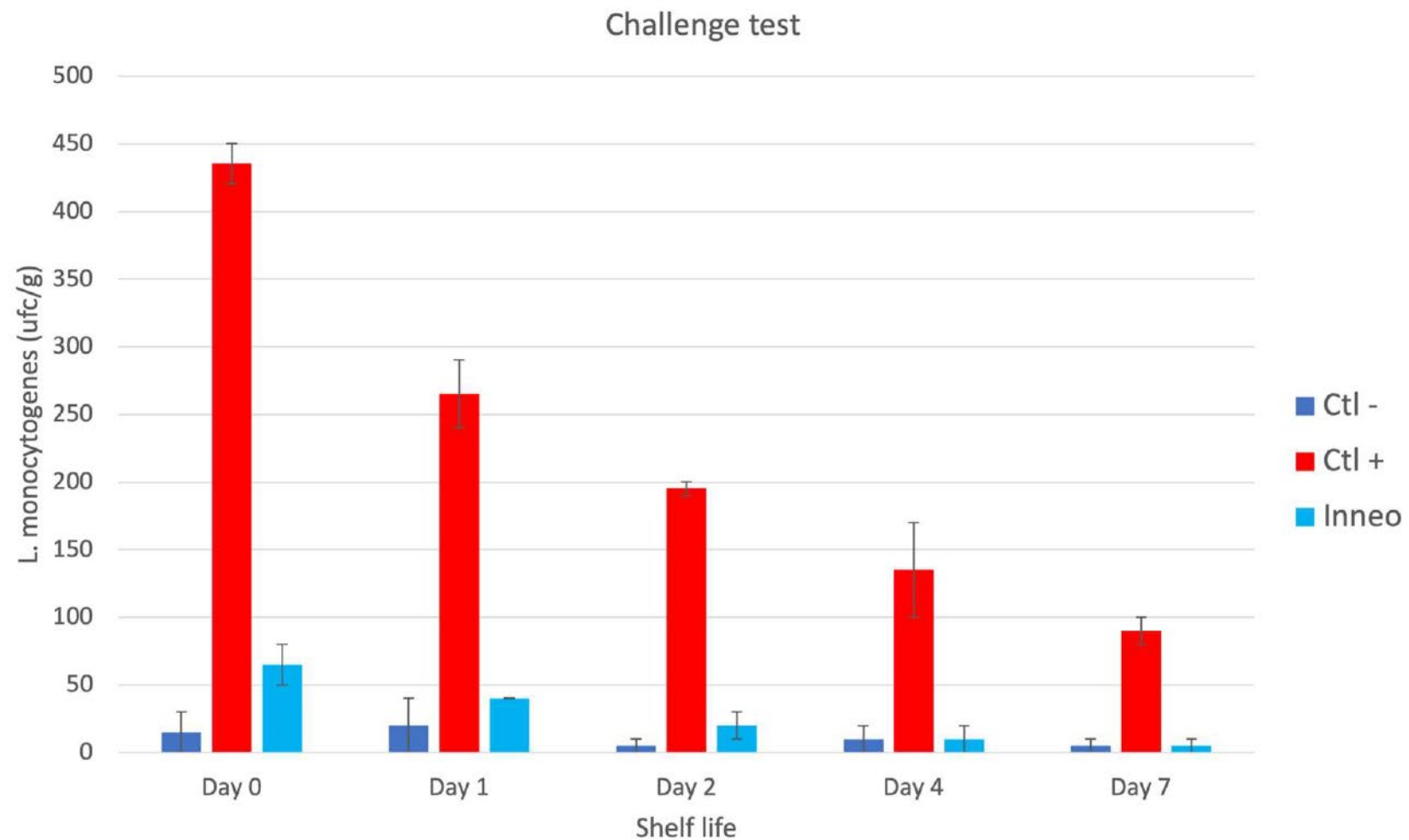




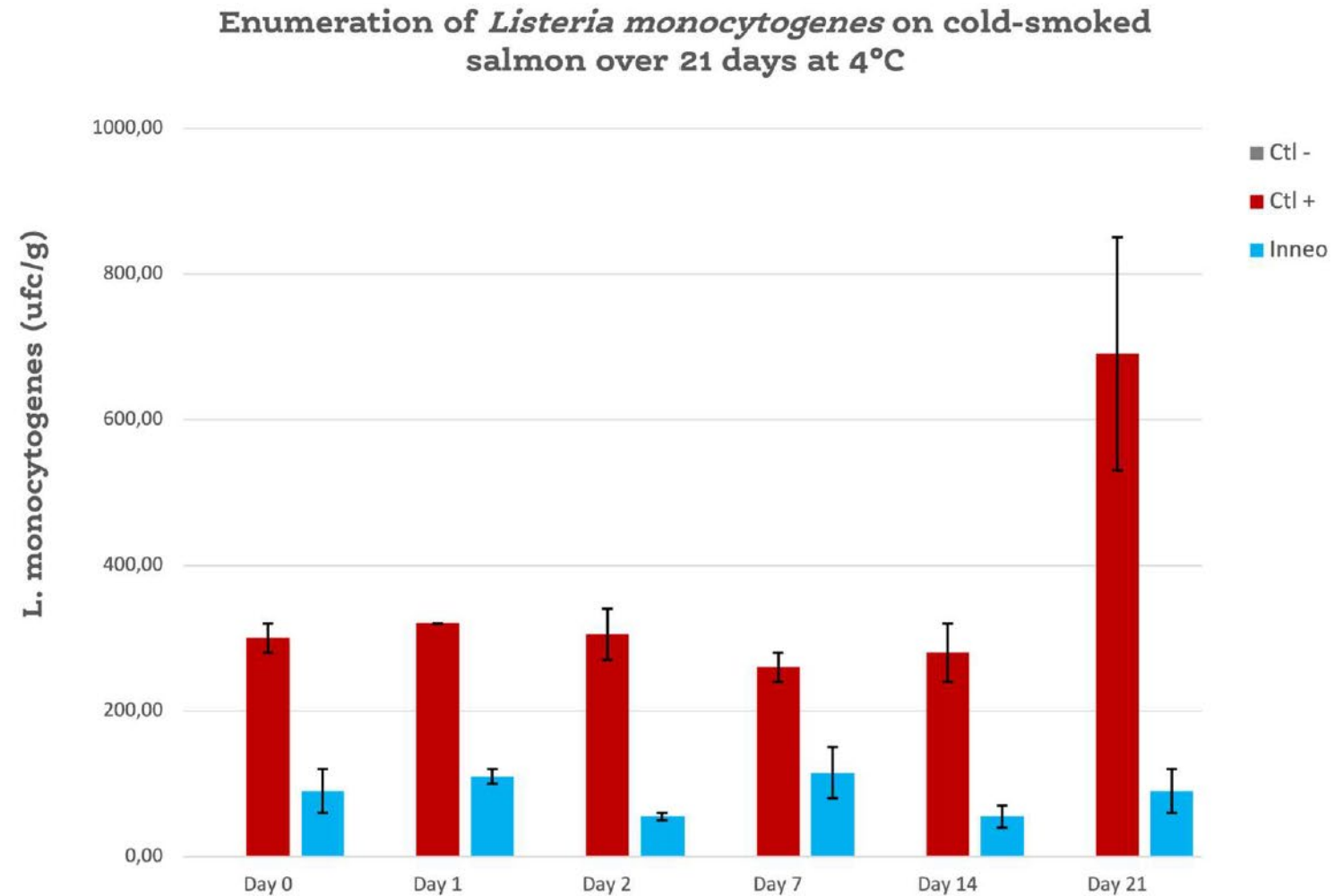
SOAKING BATH



Efficacy on salmon



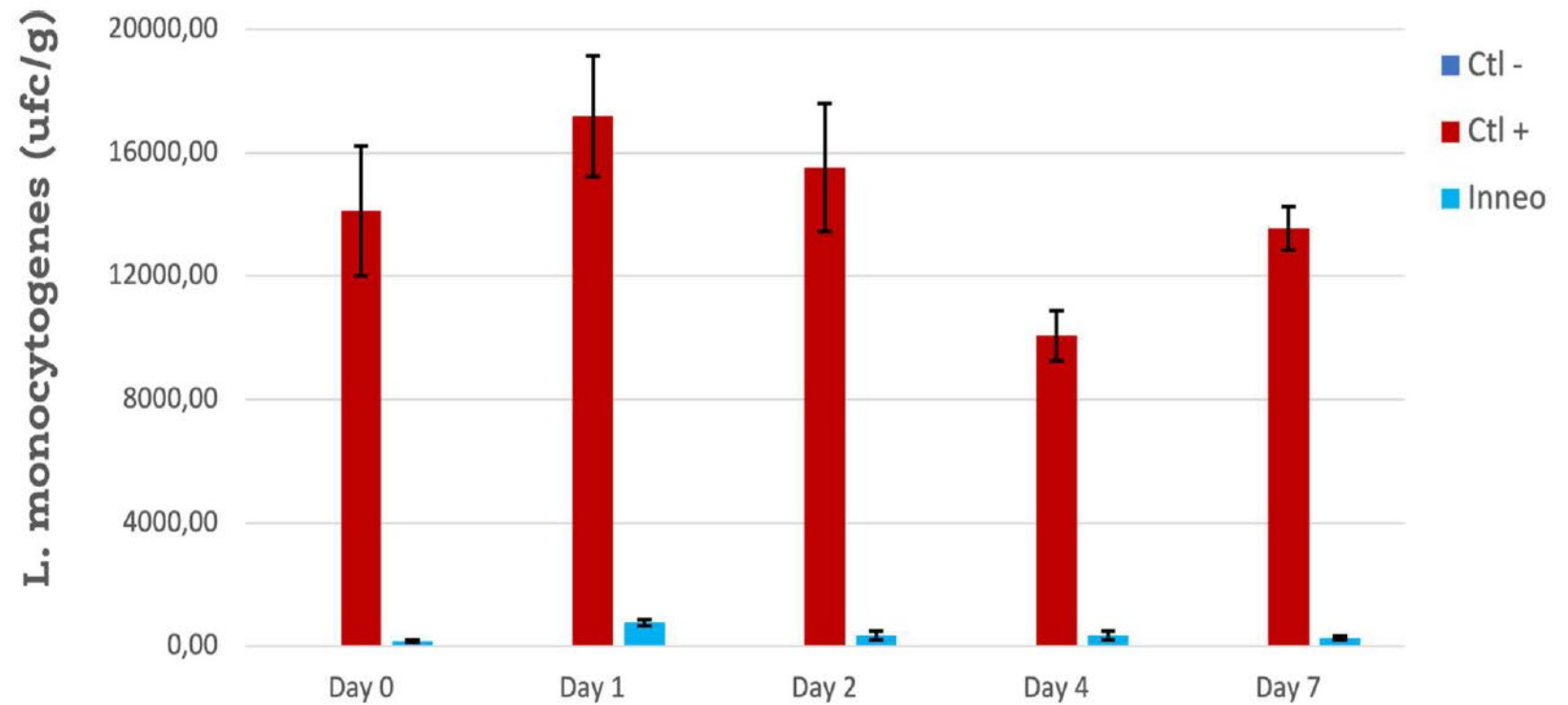
Efficacy on cold- smoked salmon



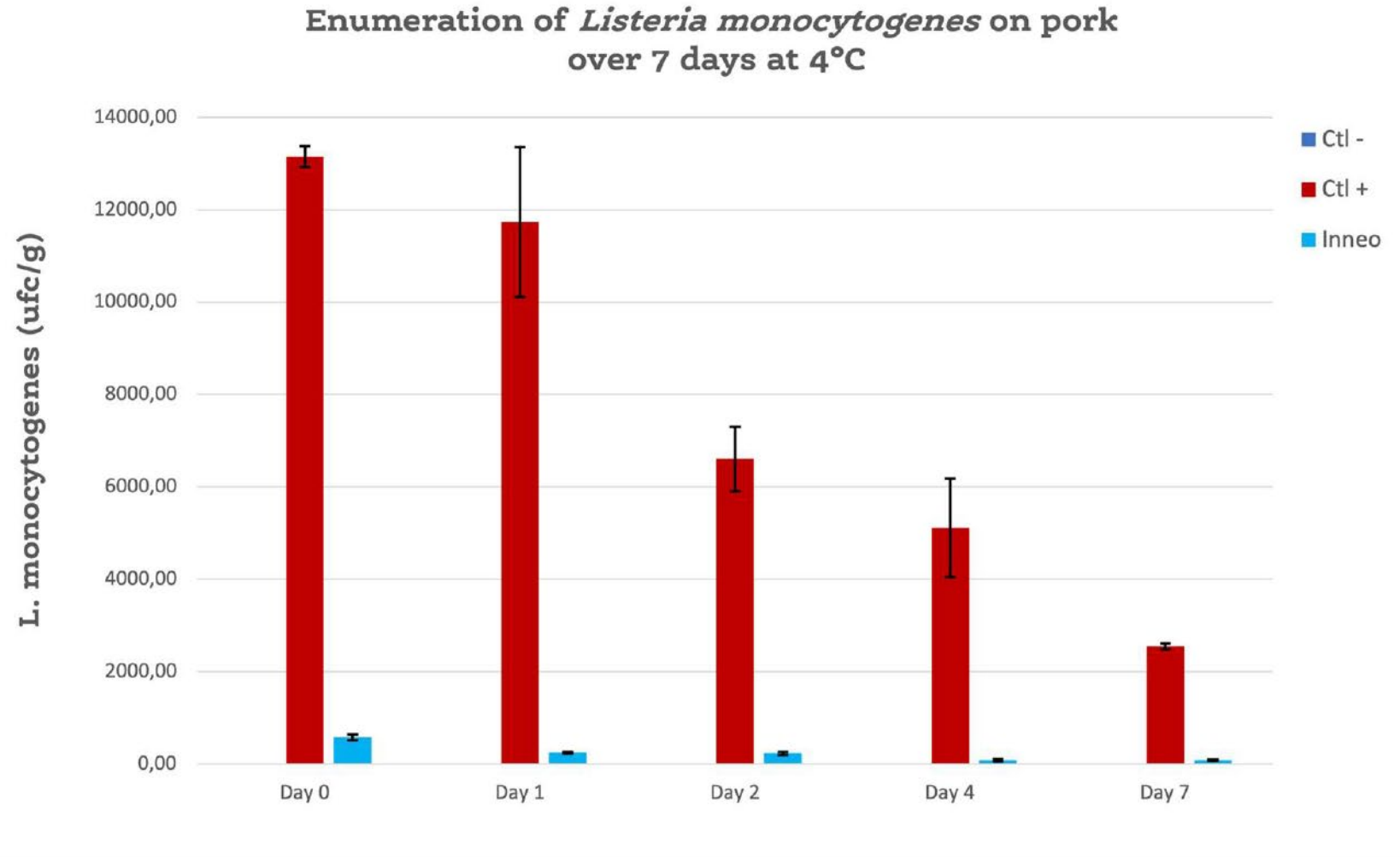
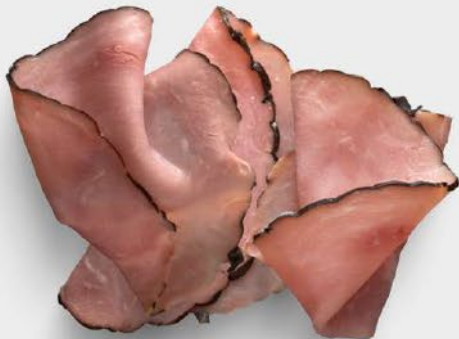
Efficacy on beef



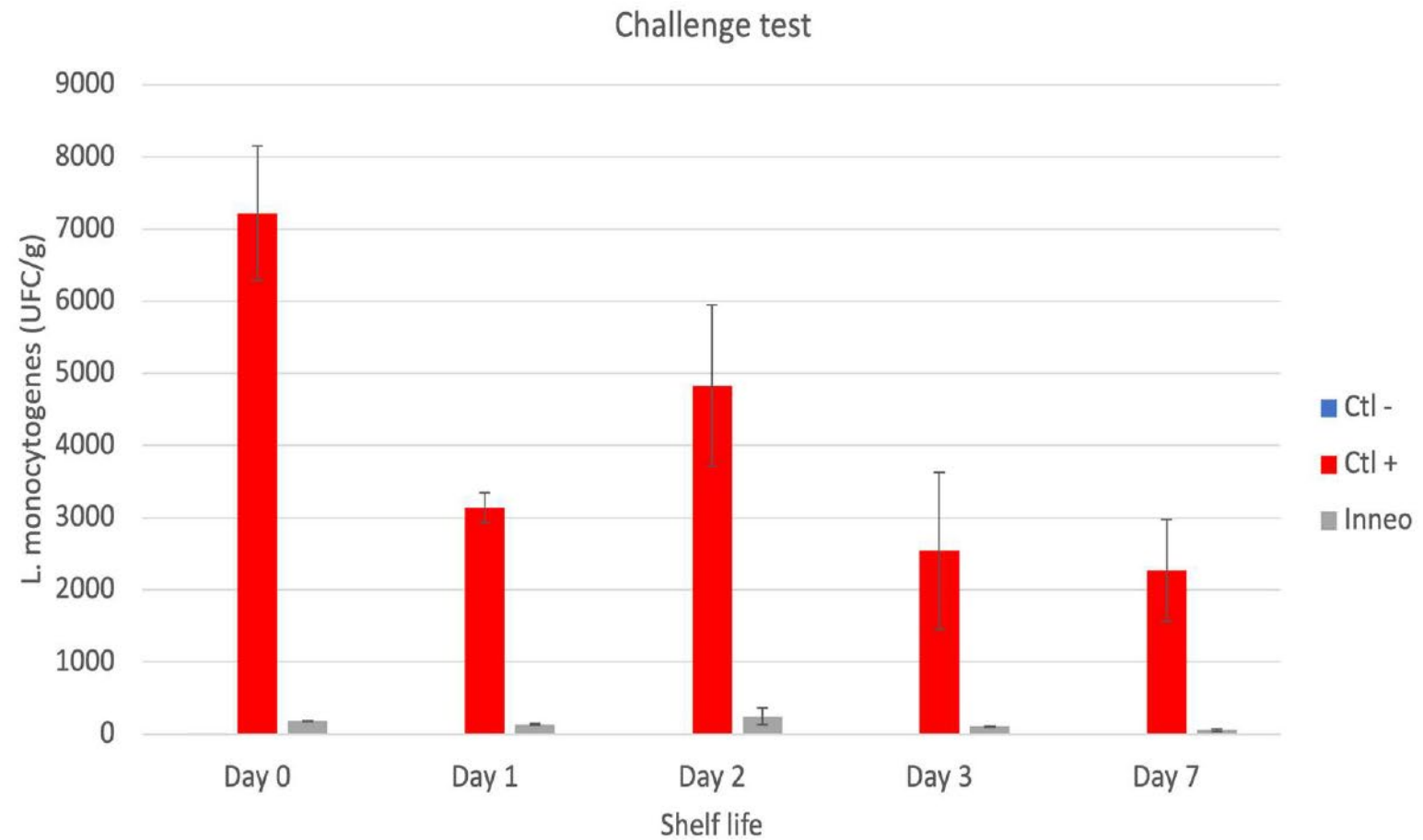
Enumeration of *Listeria monocytogenes* on beef
over 7 days at 4°C



Efficacy on pork



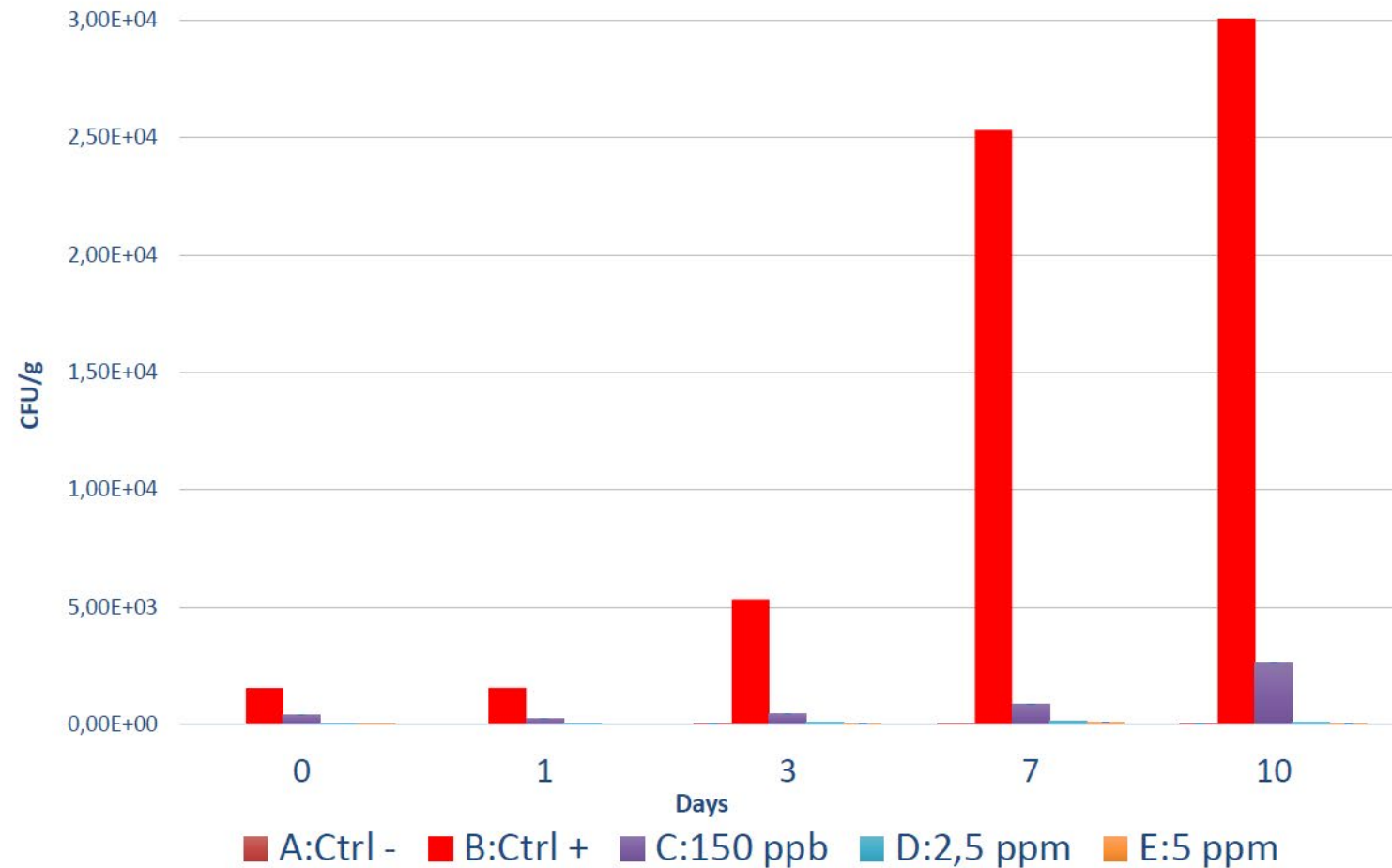
Efficacy on thawed mixed vegetables



Efficacy on raw chicken



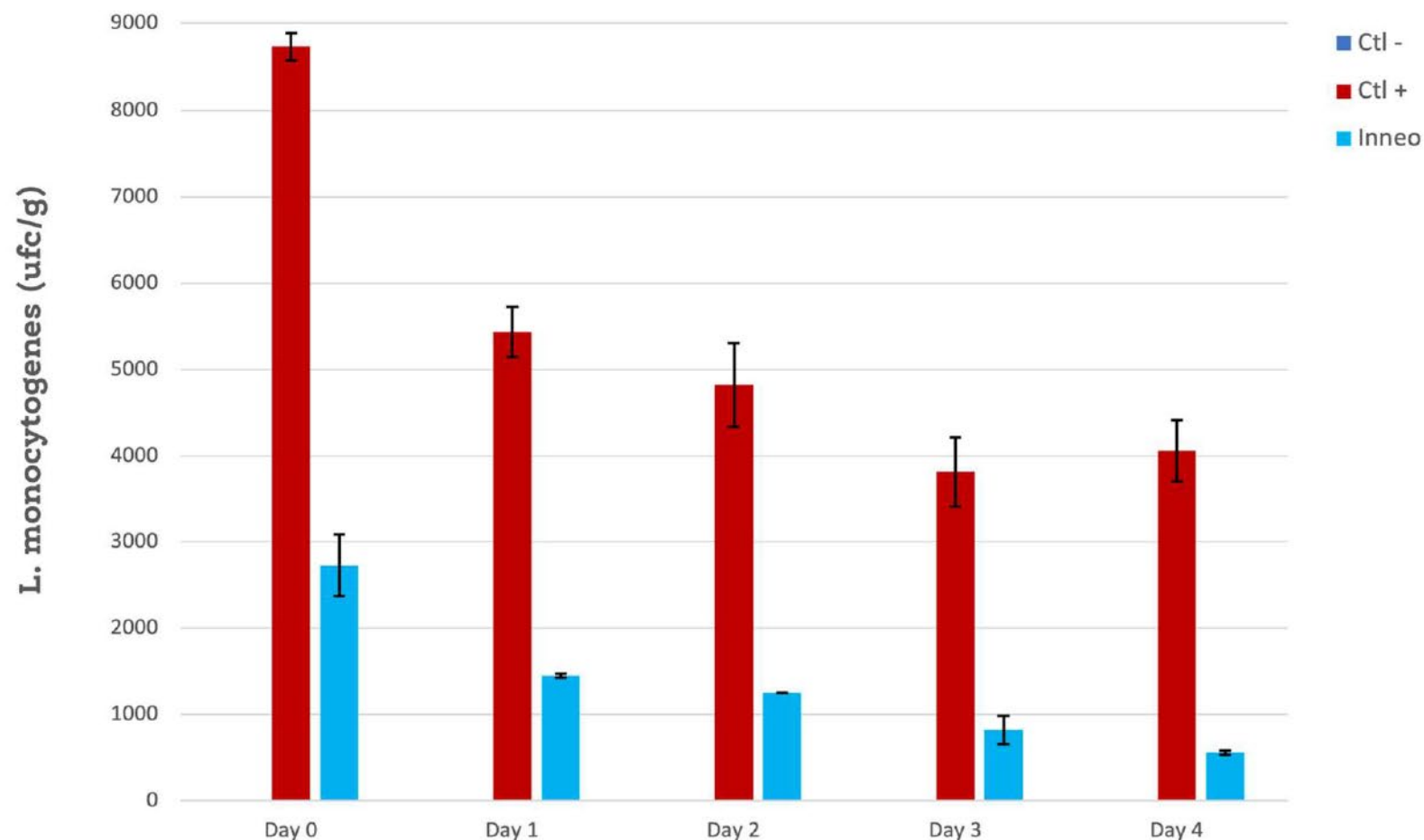
Enumeration of *Listeria monocytogenes* on poultry treated by spray



Efficacy on cheese curds

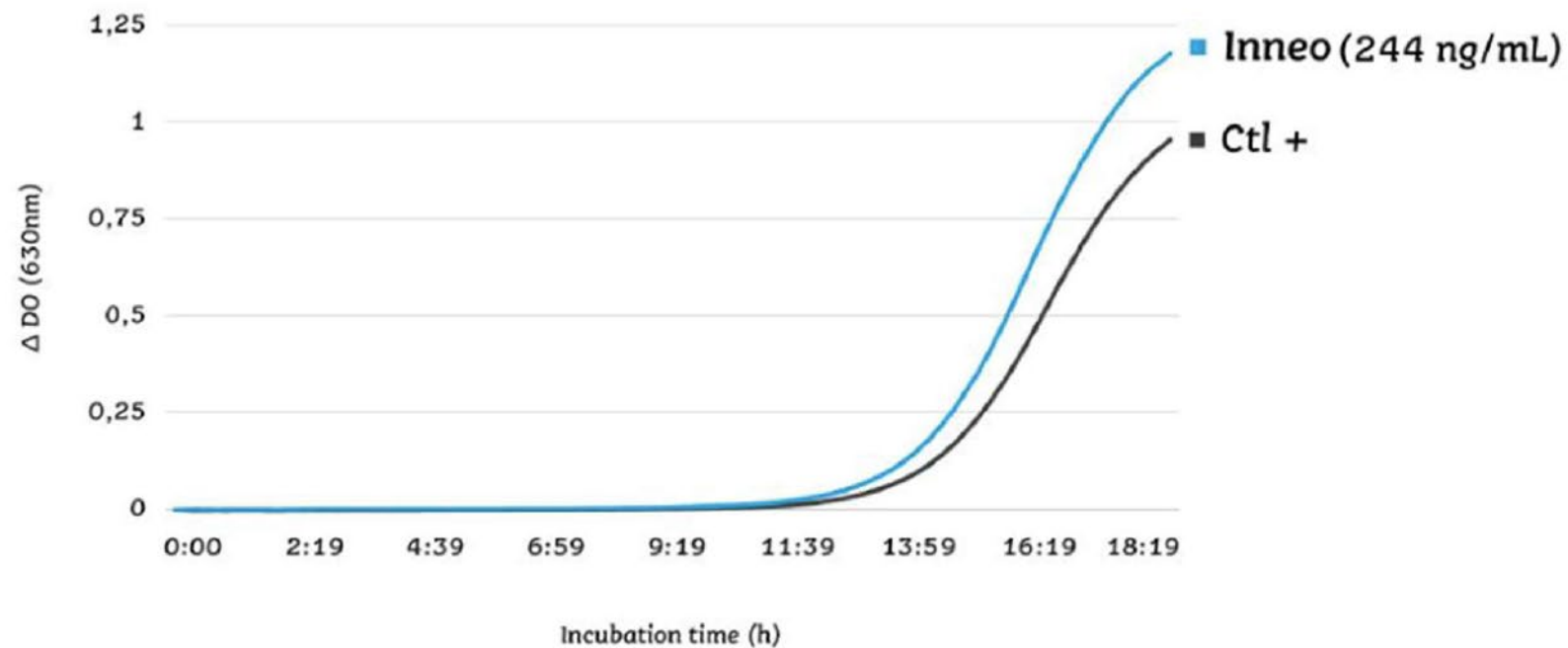


Enumeration of *Listeria monocytogenes* on cheese curds
over 4 days at 4°C





Growth curve of lactic ferments used in commercial production with and without the addition of Inneo



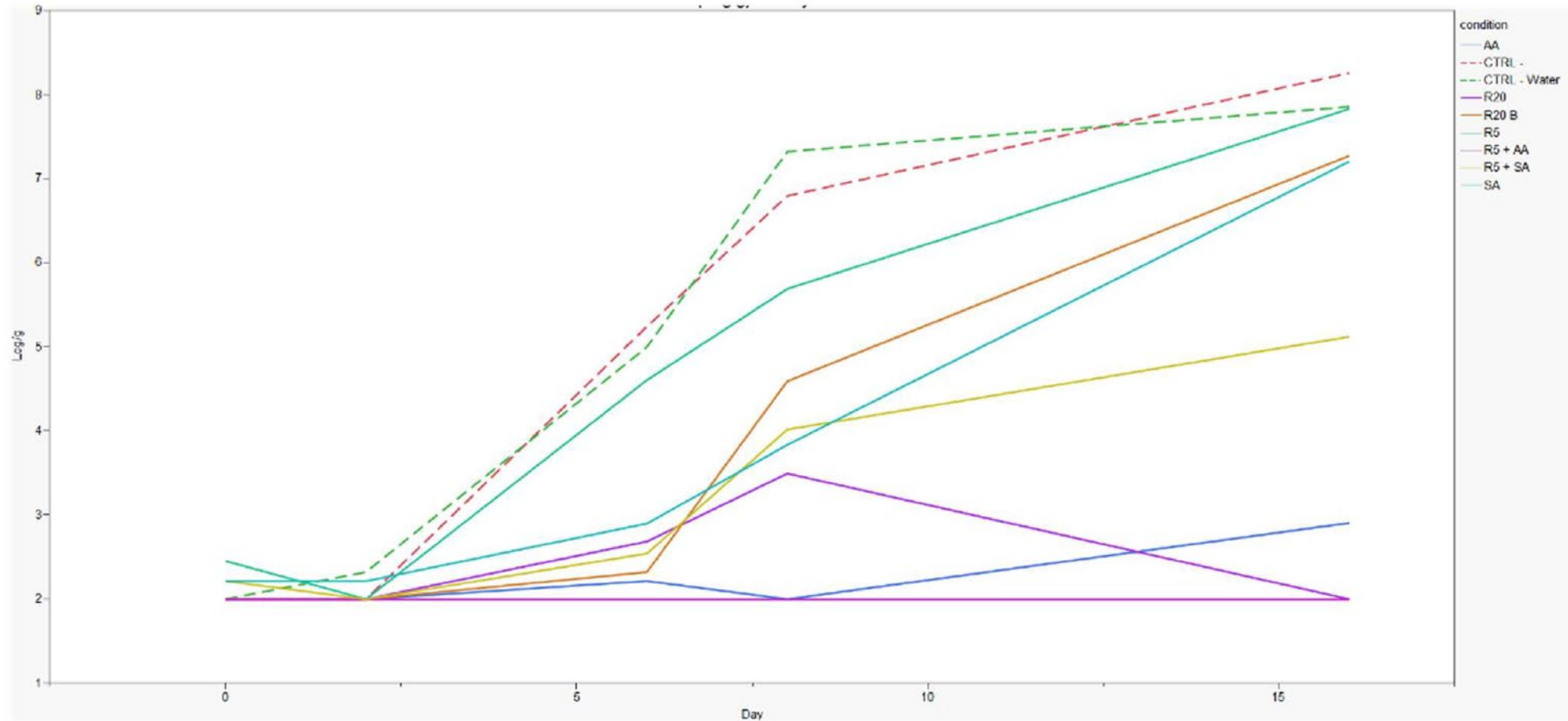
New project due in 2026

Increased shelf-life of food using natural clean label antimicrobials



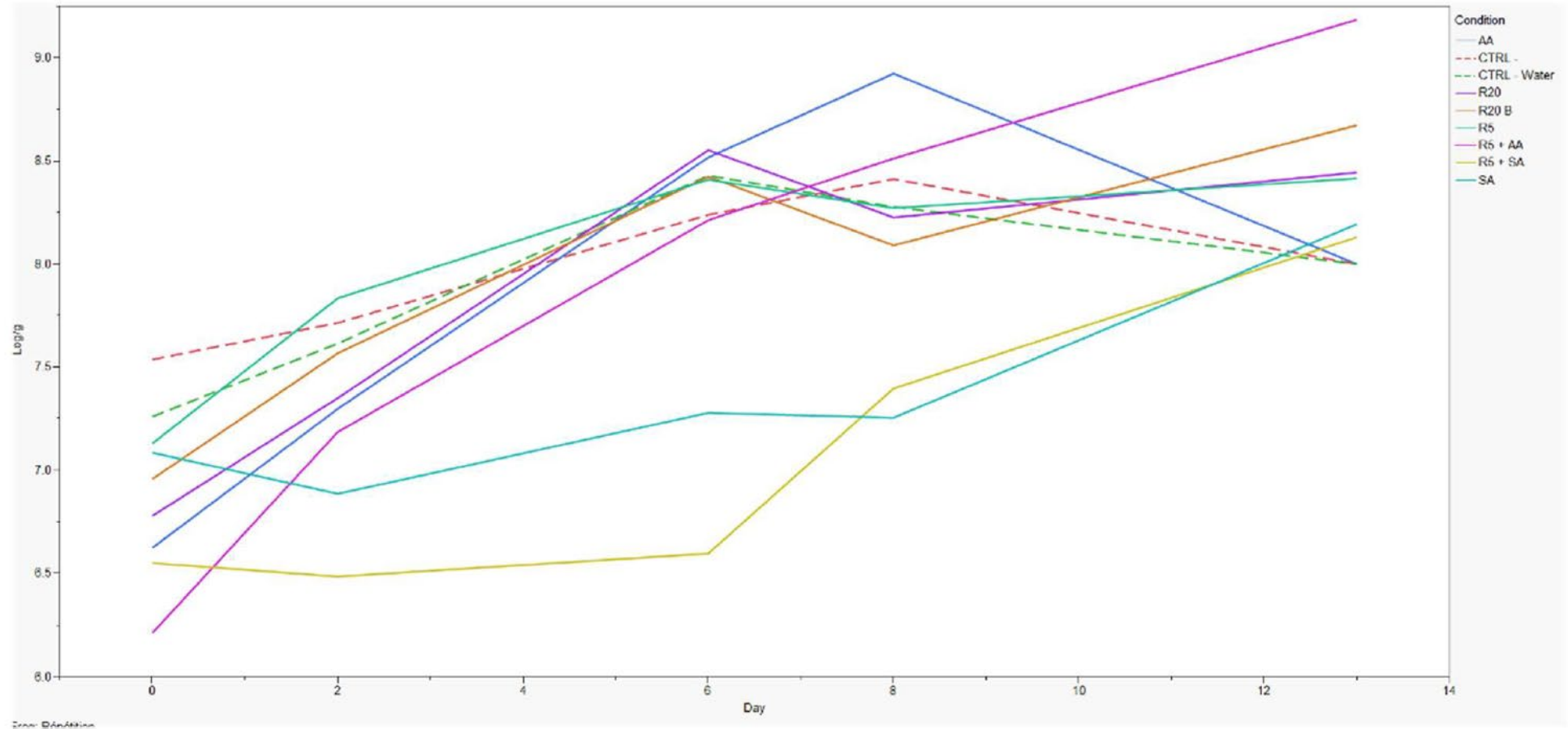
- Address a top priority of the food industry
- Help reduce food waste
- Use broad-spectrum ANCLs to act as microbiological barriers directly on food

PRELIMINARY RESULTS - DICED VEGETABLES



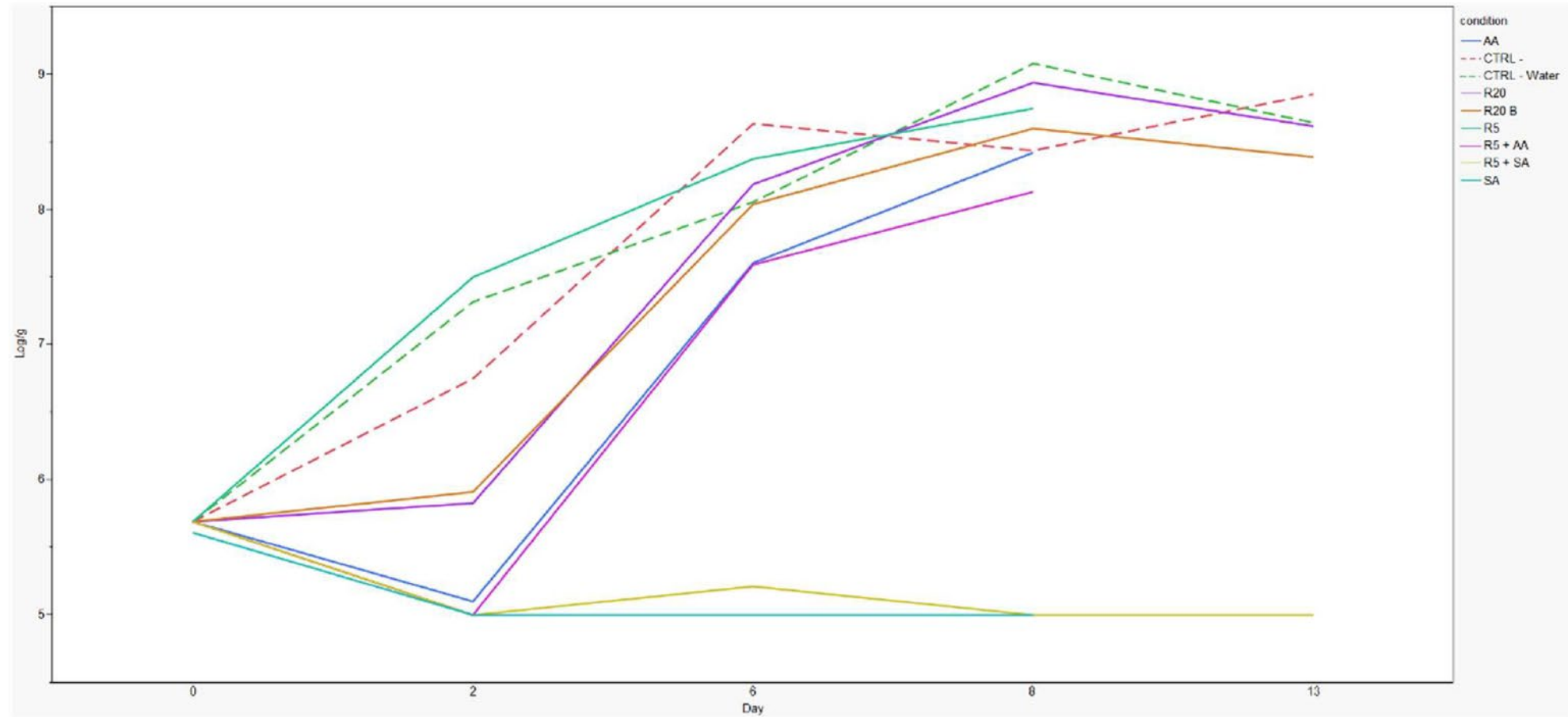
These results demonstrate a possibility of increasing the shelf life of vegetables using bacteriocins **between 4 and more than 8 days.**

PRELIMINARY RESULTS - SALMON



This demonstrates a possibility of increasing the shelf life of the salmon by **8 days**.

PRELIMINARY RESULTS - CHICKEN



These results demonstrate a possibility of increasing the shelf life of the chicken using bacteriocins **between 1 and 12 days**.



Meet the team !

Thank you !



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CALL

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Questions?
Ask away !