

ChitoVelum® PRO for fish

NATURAL FOOD PROTECTION

- ✓ Considerably improves product yields and microbiological safety.
- ✓ No more listeria monocytogenes in fresh fish.
- ✓ No more weight loss during defrosting and storage.



ChitoVelum®
pro



A photograph of five large salmon hanging vertically by their heads from metal hooks on the deck of a fishing boat. The fish are fresh, with silvery scales and some pinkish-orange hues. The background shows a harbor with other boats and mountains under a cloudy sky. A green rounded rectangle is in the bottom right corner.

**DON'T LET
YOUR FISH LOSE
ITS VALUABLE
INGREDIENTS**

Do you know that

- ✓ ☐ Listeria monocytogenes is a serious threat to fish processors?
- ✓ ☐ Your fish loses valuable ingredients every day, and its weight decreases daily by an average of 3%.

Do you want

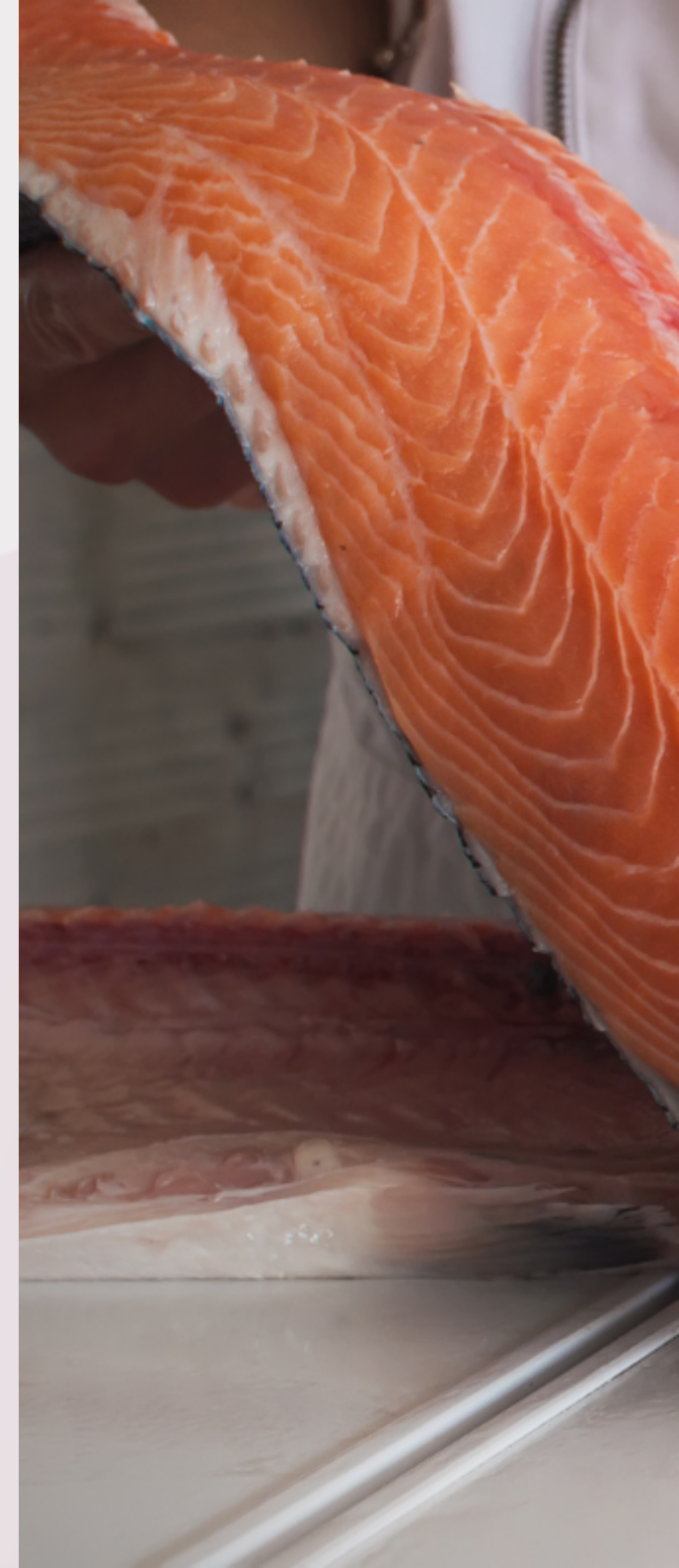
- ✓ ☐ Provide your customers with the best, healthiest and most natural fish?
- ✓ ☐ Minimise the losses of your facility?

USE  **ChitoVelum[®]
pro for fish**

ChitoVelum® PRO for fish

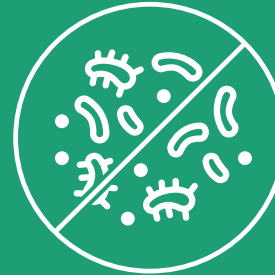
A natural product based on patented ChitoVelum® PRO technology for improving product yield, maintaining product quality and fighting early *Listeria monocytogenes* cross-infection during production, storage and distribution of fish and fish processed products.

- ✓ Supports water retention in the product and provides long term and sustainable microbiological protection throughout the supply chain from the time of application.
- ✓ Is effective against existing early infections of *Listeria monocytogenes*, *Staphylococcus aureus* (SA 6538 / SA 29213) and *Escherichia coli* (E. Coli PCM 2560).
- ✓ Does not affect product characteristics, including chemical composition. It is edible, harmless to workers, consumers and the environment.





Increases yield.
Prevents water loss.
Improves quality.



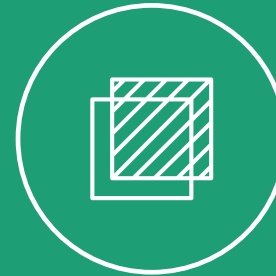
Bacteriostatic
properties.
Bactericidal
properties.



Easy application.
Easy preparation
Easy storage.
Easy implementation.



100% edible.
100% natural.
100% biodegradable.
100% marine origin.



Tasteless.
Odourless.
Colourless.
pH 4.0-6.0

ChitoVelum® PRO for fish approvals

ChitoVelum® PRO main component (chitosan) is considered a product of animal origin intended for human consumption (food constituent). It is also a natural component food of many fish species.

ChitoVelum® PRO is produced from EU origin chitosan (North Atlantic Coldwater Shrimp *Pandalus borealis*) processed according to the HACCP system, ISO 22000:2005, Tún Standards for Certified Nature Products and Inputs and The Halal Food Council of Europe (HFCE).

How does ChitoVelum® PRO for fish work?

Good
stays
inside



Applied on a product surface, **ChitoVelum® PRO** forms a bacteriostatic and bactericidal coating preventing dehydration and oxidation.

ChitoVelum® PRO:

- prevents *Listeria monocytogenes* infections
- reduces the total number of bacteria
- and decreases the pace of growth of TVB-N

Applied inside a product, **ChitoVelum® PRO** maintains the desired texture of the muscle tissue.



How to apply ChitoVelum® PRO for fish?

Easy implementation and adaptation to the existing production lines.



- spray application



- brush application



- injection application



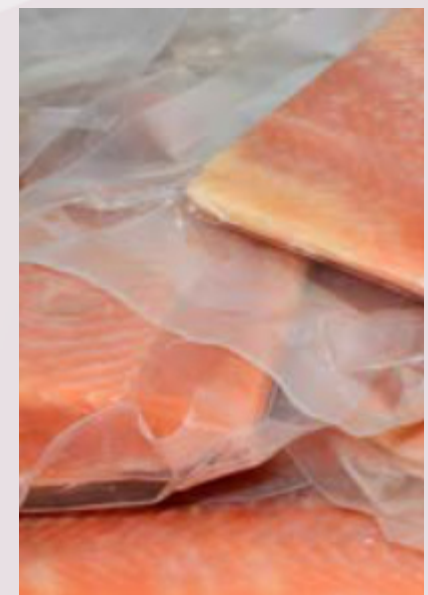
**After catching
/gutting**



After filleting



Before smoking



Before freezing



ChitoVelum® PRO for fish implementation process

1

INITIAL CONTACT

- ✓ Presentation of the offer
- ✓ Calculation of benefits

2

VISIT AT THE FACILITY

- ✓ Needs analysis
- ✓ Solution proposal

3

FIRST IMPLEMENTATION TEST

- ✓ Work at the facility
- ✓ Selection of parameters
- ✓ Implementation rationale



4 TESTING, OPTIMISATION



- ✓ Raw material analysis
- ✓ Process optimisation
- ✓ Industrial test plan

5 SECOND IMPLEMENTATION TEST

- ✓ Work at the facility
- ✓ Confirmation of results
- ✓ Production plan

6 PROTECTED PRODUCTION

- ✓ Employee training
- ✓ Start of production

ChitoVelum® PRO fights *Listeria monocytogenes*

(laboratory conservation test)

✓ It restrains the growth of *L. monocytogenes* on the surface of the protected product (bacteriostatic properties).

✓ It neutralizes early cross-infection foci (bactericidal properties).

Table 1. Restraining the growth of *Listeria monocytogenes* as a result of application of ChitoVelum®PRO - day 0 (marking applied immediately following infection).

dilution/test	ChitoVelum®PRO + LM	Control
10 ⁻¹	u.n.	u.n.
10 ⁻²	u.n.	u.n.
10 ⁻³	u.n.	u.n.
10 ⁻⁴	139	294

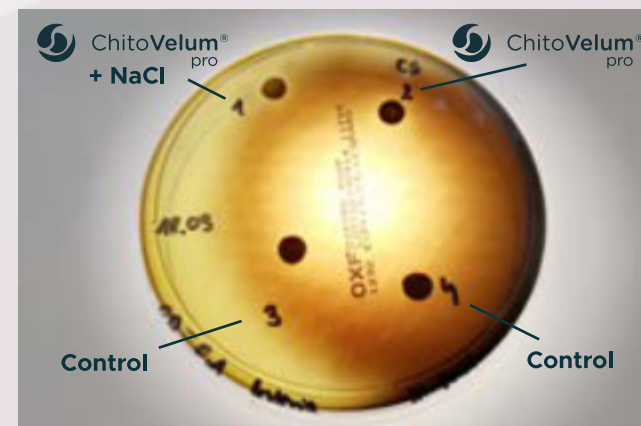
Table 2. Restraining the growth of *Listeria monocytogenes* as a result of application of ChitoVelum®PRO - (marking applied 24 h following infection).

dilution/test	ChitoVelum®PRO + LM	Control
10 ⁻¹	0	u.n.
10 ⁻²	0	u.n.
10 ⁻³	0	69

Legend:

u.n. – uncountable number of bacteria

LM – *L. monocytogenes*



(see picture above)

ChitoVelum®PRO - bacteriostatic properties. *Listeria monocytogenes* does not multiply in contact with ChitoVelum®PRO. Visible growth restraint area around the rings soaked with ChitoVelum®PRO.

(see tables on the left)

ChitoVelum®PRO - bactericidal properties. Following contact with ChitoVelum®PRO *Listeria monocytogenes* is fully neutralized within 24 hours from infection. (The growth of the *L. monocytogenes* bacteria following infection has been estimated at the level of 3 x 10⁶ cfu/ml (control: phosphate buffer 0.2 M).

ChitoVelum® PRO fights *Listeria monocytogenes*

(cross-infection simulation test)

- ✓ It permanently protects against future infections with *Listeria monocytogenes* once applied on the product (bactericidal properties).
- ✓ It fully neutralizes *Listeria monocytogenes* infections in less than 24 hours (bactericidal properties).

Table 1. Restraining the growth of *Listeria monocytogenes* as a result of application of ChitoVelum®PRO (marking according to ISO 11290-1:2017)

After	ChitoVelum®PRO + LM	Control
2h	3	u.n.
24h	0	u.n.
1 week	0	u.n.
2 weeks	0	u.n.

Legend:

u.n. – uncountable number of bacteria

LM – *L. monocytogenes*



ChitoVelum®PRO was applied on fresh fish (2.5 mg of ChitoVelum®PRO on 25 g of fish). After 2 h, *Listeria monocytogenes* infection was simulated (100 bacterial cells per 25 g of fish). The infected fish was then stored in cooling conditions.

ChitoVelum® PRO fights *Staphylococcus aureus* & *Escherichia coli*

(laboratory conservation test)



It restrains the growth of *S. aureus* & *E. coli* on the surface of the protected product (bacteriostatic properties).



It neutralizes early cross-infection foci (bactericidal properties).

Table 1. Restraining the growth of *S. aureus* & *E. coli* as a result of application of ChitoVelum® PRO - day 0 (marking applied immediately following infection).

dilution/test	ChitoVelum® PRO + <i>S. aureus</i>	Control	ChitoVelum® PRO + <i>E. coli</i>	Control
10 ⁰	u.n.	u.n.	u.n.	u.n.
10 ⁻¹	u.n.	u.n.	u.n.	u.n.
10 ⁻²	u.n.	u.n.	u.n.	u.n.
10 ⁻³	u.n.	u.n.	u.n.	u.n.
10 ⁻⁴	217	u.n.	198	u.n.
10 ⁻⁵	28	78	32	92

Table 2. Restraining the growth of *S. aureus* & *E. coli* as a result of application of ChitoVelum® PRO (marking applied 24 h following infection).

dilution/test	ChitoVelum® PRO + <i>S. aureus</i>	Control	ChitoVelum® PRO + <i>E. coli</i>	Control
10 ⁰	0	u.n.	0	u.n.
10 ⁻¹	0	u.n.	0	u.n.
10 ⁻²	0	u.n.	0	u.n.
10 ⁻³	0	u.n.	0	u.n.
10 ⁻⁴	0	62	0	94
10 ⁻⁵	0	11	0	13

Legend:

u.n. – uncountable number of bacteria

ChitoVelum® PRO - bactericidal properties.
Following contact with ChitoVelum® PRO *Staphylococcus aureus* (SA 6538 / SA 29213) & *Escherichia coli* (E. Coli PCM 2560) is fully neutralized within 24 hours from infection.
Control: phosphate buffer 0.2M.

Cooperation

ChitoVelum® PRO is the result of combining science with nature.
We help our partners meet the needs of conscious consumers by
offering them proven and safe products.

Our team helps design and implement simple yet effective, unique
and beneficial solutions based on technology close to nature.

Thank you!
Chitone Team



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