

TunaShield™ FSI Acqua by IntaBiotech



TunaShield™ FSI Acqua / ZOELTAR™ Tuna Protect

Multilayer antioxidant system for tuna flakes intended for canning. A comprehensive technical solution combining redox protection, metal chelation and natural antioxidants to stabilise tuna flakes for export and canning manufacture.

TECHNICAL DOCUMENT

INTABIOTECH

FOOD TECHNOLOGY



1. Technical Challenge

Tuna crumb presents a significantly more complex oxidative problem than whole loin. Its fragmented nature multiplies the vectors of degradation, making a specific and robust technological intervention necessary.



Greater exposed surface area

Fragmentation exposes a much larger surface to oxygen, accelerating lipid and protein oxidation dramatically.



Cell rupture and haem iron

Cell rupture releases haem iron, the main catalyst of lipid oxidation in tuna muscle.



Water/brine contact

Greater exudate and contact with water/brine increase the rate of deterioration and favour pro-oxidant reactions.



Multiple oxidation pathways

It does not only involve rancidity: it also causes colour loss, metmyoglobin formation, metallic odours, omega-3 degradation, and lower technological yield.

Scientific literature confirms that in tuna muscle, lipid oxidation is closely related to metmyoglobin formation and darkening. Sodium ascorbate has been shown to inhibit both the formation of lipid hydroperoxides and myoglobin oxidation. Polyphenols such as EGCG, at moderate doses, significantly reduce PV/TBARS values and help maintain tuna colour.

INTABIOTECH has a strong platform on which to build a competitive solution: Food Safety Innovations includes lines of natural antioxidants such as GreenShieldTM, RosmarShieldTM, CarnoShieldTM, OliveShieldTM and GreenPShieldTM, positioning oxidation as the primary cause of discolouration, off-flavours, nutrient loss and reduced shelf life.

2. Recommended Product: **TunaShield™ FSI Aqua**

Powder product that is soluble and dispersible in cold water, designed for application by bath, spraying or incorporation by vacuum/gentle tumbler. Its multi-barrier formulation acts synergistically across all the oxidation fronts identified in tuna mince.



Antioxidant Reducer

Ascorbic acid / sodium ascorbate (INTABIOX™ platform). Reduces metmyoglobin, quells free radicals, protects colour and the fat fraction.



Metal Sequestrant **Citric acid / citrates.**

Chelation of iron and copper, pH control, reduction of oxidative catalysis mediated by trace metals.



Water-Soluble Polyphenols

GreenShield™ or soluble green tea extract. Protection against lipid and protein oxidation, with additional colour support.



Olive Polyphenols

OliveShield™. Natural antioxidation with a strong Mediterranean and clean label narrative, highly accepted by canning manufacturers.



Lipophilic Fraction

CarnoShield™ / RosmarShield™ in micro-dispersible version. Specific control of rancidity in the fat phase, key in mince with high lipid content.



Carrier System

Dextrose, maltodextrin, salt or neutral food carrier. Ensures homogeneity, accurate industrial dosing and stability of the final product.



3. Smart formulation:


TunaShield™ FSI Aqua

The following composition represents the optimised starting point for this development. The percentages have been designed to achieve a bath pH between 5.8 and 6.2, guaranteeing effective redox protection without aggressively acidifying the crumb or compromising its sensory profile.

Component
Food-grade sodium ascorbate
Ascorbic acid
Sodium citrate
Anhydrous citric acid
GreenShield™ – soluble green tea extract
OliveShield™ – olive extract
RosmarShield™ / microdispersible CarnoShield™
Food-grade dextrose / maltodextrin
Food-grade anti-caking agent

pH target

The bath should be maintained between **5.8 and 6.2** for optimum redox protection.

 It is not advisable to lower the pH below 5.8: it may cause a cooked/acidic texture, loss of juiciness, and sensory notes that are undesirable for the canning industry.

Product format

Soluble/dispersible powder in cold water. Suitable for bath treatment, spraying, or incorporation via vacuum/tumbler.

4. Recommended Application Method

Two application methods are considered, adapted to different industrial configurations and crumb types. Both aim to maximise absorption of the antioxidant system whilst respecting the product's structural integrity.

Option A — Cold Antioxidant Bath

Bath preparation:

- 1.0–1.5 % TunaShield™ FSI Aqua
- 0.8–1.2 % salt
- Potable water + ice, 0–2 °C
- Final bath pH: 5.8–6.2

Process:

1. Introduce crumb at a ratio of 1 kg : 1.5–2 L bath
2. Contact: 3–6 minutes
3. Draining: 2–5 minutes
4. Immediate vacuum packing or packing in high-barrier bag
5. Rapid freezing to ≤ -18 °C ($-25/-30$ °C for long-haul export)

Option B — Incorporation by Vacuum/Gentle Tumbler

Recommended for drier or irregular crumb. Allows the final actual absorbed dose to be calculated more accurately.

Preparation: 2.0–3.0 % solution of TunaShield™ FSI Aqua; add 3–5 % solution by weight of crumb.

Process:

1. Gentle tumbler or slow paddle mixer
2. Partial vacuum
3. Time: 5–8 minutes
4. Avoid overmixing to prevent the formation of a paste
5. Pack and freeze immediately

i This route is more controllable than the bath because it allows the final actual absorbed dose by the crumb to be calculated more accurately.



5. Target Dose in Final Product

The following doses represent the conservative approach recommended for the initial industrial validations. It is essential to adjust the levels not only for technical efficacy, but also for sensory impact and compliance with current European regulations.

Active	Final target in crumb
Total ascorbate / ascorbic acid	150–250 mg/kg (expressed as ascorbic acid)
Citrates / citric acid	500–1,500 mg/kg depending on pH and taste
Green tea / olive polyphenols	50–150 mg/kg of extract; adjust for taste
Rosemary / carnosic acid-carnosol	Keep low; adjusted legally according to % fat

EU Regulatory Framework

Compliance with **Regulation (EC) 1333/2008** is mandatory and must be verified in each final formulation:

Ascorbic acid (E300/E301/E302)
Limit: **300 mg/kg** expressed as ascorbic acid in tuna.

Citric acid / citrates
Quantum satis in unprocessed fish.

Rosemary extract E392
15 mg/kg if fat \leq 10 %; **150 mg/kg** if fat > 10 %.

6. Selection of Ingredients and INTABIOTECH Products

A correct selection of ingredients/products is key to the commercial and technical success of TunaShield™. Below is a breakdown of which products in the INTABIOTECH portfolio are a direct fit for this application, and which should be ruled out or reserved for different applications.

✓ Recommended Ingredients

The infographic consists of five orange-bordered boxes arranged in two rows. Each box has a white background and a right-pointing arrow icon in an orange circle at the top center. The boxes contain the following text:

- ZOELTAR™**
Ideal commercial and technical umbrella. Already geared towards omega-3 stabilisation, preventing oxidation, odour, flavour, colour and tinned foods.
- GreenShield™**
Green tea/EGCG has solid technical support in tuna.
Critical note: at moderate doses (200 mg/kg EGCG works better than 400 mg/kg). Do not over-dose.
- CarnoShield™ / RosmarShield™**
Especially recommended for flesh from fatty areas or with long frozen storage.
- OliveShield™**
Natural anti-oxidation with a clean, Mediterranean narrative. Very well received by canning manufacturers.
- INTABIOX™**
Platform where ascorbate, citrate and tocopherols can be included to adjust cost/effectiveness according to the customer.

7. Critical Risk: Histamine

⊗ **TunaShield™ does NOT eliminate histamine.** It can only help indirectly through improved stability, reduced oxidative load, and integration into a properly validated cold, hygienic process.

In tuna, histamine is a regulatory issue of the utmost criticality. Its formation is microbiological and depends fundamentally on the cold chain and hygienic practices. No antioxidant system can replace temperature control or claim action on accumulated histamine.

The **Regulation (EC) 2073/2005** establishes the following microbiological criterion for fishery products of species with a high histidine content:

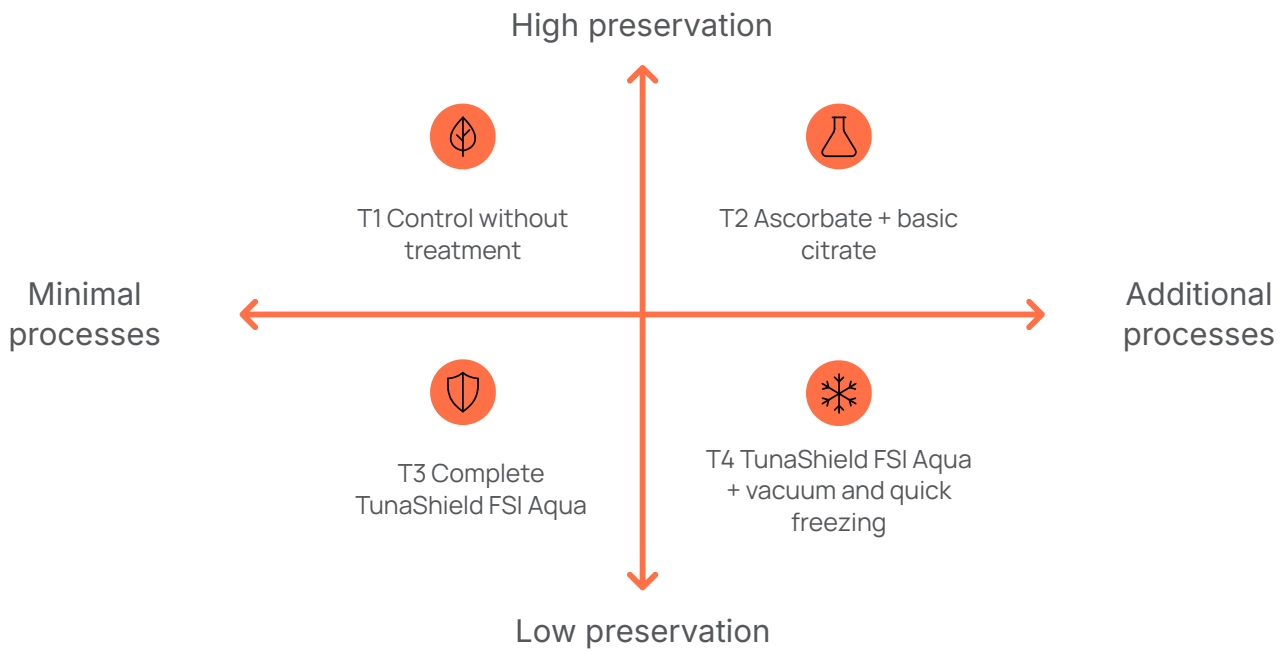
Sampling plan	Limit m	Limit M
n = 9 samples, c = 2 results permitted between m and M	100 mg/kg – The batch is satisfactory if the average does not exceed this value	200 mg/kg – No individual value may exceed this threshold

Therefore, the product is marketed and communicated exclusively as an **antioxidant and stabiliser of sensory and nutritional quality**, and not as a solution to histamine issues. This distinction is fundamental both to the scientific integrity of the product and to avoiding regulatory liabilities with clients and competent authorities.



8. Industrial Validation

To market TunaShield™ FSI Aqua with technical rigour to canneries and exporters, it is essential to design and carry out a controlled trial with four differentiated treatments. This minimum protocol provides robust and distinctive evidence versus generic solutions on the market.



The four treatments allow the contribution of each component to be isolated and demonstrate the distinctive value of the complete solution versus simpler alternatives.

Parameter	Validation objective
TBARS (lipid oxidation)	Reduction \geq 30–50 % vs. control
Peroxides (PV)	Lower formation during frozen storage
Colour Lab* (a^* , L^*)	Less loss of a^* and less browning
Odour / flavour	No detectable herbal, acidic or metallic notes
Exudate / drip loss	Do not increase losses compared with the control
Histamine	Cold control; do not attribute any effect to the antioxidant product
TVB-N / TMA-N	Monitoring of protein deterioration and shelf life
Aerobic / psychrotrophic counts	Validation of hygiene and microbiological shelf life
Cooking / canning test	Confirm that it does not affect the flavour of the final canned product

9. Commercial Proposal and Final Recommendation

TunaShield™ FSI / ZOELTAR™ Tuna Protect is a multibarrier antioxidant solution designed to stabilise tuna flesh intended for export and canning manufacture. It combines **redox protection, metal chelation and selected natural antioxidants** to reduce rancidity, darkening, loss of sensory quality and deterioration of fatty acids during storage and transport.

"Helps to delay lipid and protein oxidation, preserve colour and odour, reduce rancidity and improve the stability of tuna flesh during refrigerated/frozen storage, always within a validated process of cold chain, hygiene and histamine control."

Recommended SKU Architecture

TunaShield™ FSI Aqua

For lean or standard flesh.

- Ascorbate/citrate base + GreenShield™ + OliveShield™
- Clean label, lower sensory impact
- More defensible with canning manufacturers
- Recommended entry point for pilot samples

TunaShield™ FSI Omega

For fatty flesh, ventresca or long export routes.

- Previous base + CarnoShield™/RosmarShield™
- Possible tocopherol/lipophilic microdispersion
- Greater potency against rancidity
- For customers with clear rancidity in frozen storage

- ✔ Operational recommendation: start with **TunaShield™ FSI Aqua** in a pilot sample. It will be easier to apply, cleaner sensorially and more defensible with canning manufacturers. The second SKU is reserved for customers with specific rancidity issues in frozen storage or high-fat flesh.

Commercial Contact INTABIOTECH

Our team is ready to assist you



Álvaro Robles

CCO (Chief Circulation Officer)

☎ +34 609 825 416

✉ a.robles@intabiotech.com



Sue Rodríguez

Customer Relations & SPM

☎ +34 604 068 683

✉ sr.ndpharma@europe.com



José Ramón Castells

Commercial Manager

☎ +34 674 001 716

✉ jr.ndpharma@europe.com



General Contact Details

- ☎ (+34) 613 812 425 (Mobile) / (+34) 881 092 720 (Land Line)
- ✉ intabiotech@intabiotech.com
- 🌐 www.intabiotech.com
- 📍 Registered Office: Botiguers, 3, 1ª Planta, Parque Empresarial Táctica, 46980, Paterna, Valencia, España
- 🏭 Industrial Site: Avda. Ferreiros, 143, Polígono Industrial Rio Do Pozo, 15578, Narón, A Coruña, España

✔ INTABIOTECH, S.L. – A Licensed Commercial Company of The ND Pharma & Biotech Co.

