

# INTABIOTECH Platform · Tortilla & Egg Solutions™

Combined strategy PureNis™ + ACETIPRO™ + Protosorb™ in potato omelette and other egg-based products.



# Modular Preservation Approach

For manufacturers of tortillas and egg-based products, INTABIOTECH proposes a multi-hurdle strategy specifically designed to address the critical microbiological challenges of the sector.

This modular platform allows manufacturers to configure solutions ranging from "very clean label" approaches to aggressive ESL (Extended Shelf Life) systems, adapting to the specific needs of each distribution chain and brand positioning. The technological architecture combines three complementary pillars that act synergistically on different matrices and microbiological risk vectors.



# Pillar 1: PureNis™

## Composition

Preparation of nisin (E 234), a natural bacteriocin produced by fermentation of *Lactococcus lactis*

## Microbiological Target

Specific control of pathogenic and spoilage Gram-positive bacteria: *Listeria monocytogenes*, *Bacillus cereus*, *Clostridium* spp.

## Area of Action

Egg phase and internal product matrix. Acts in bulk on the main post-processing risk vector

## Technological Advantage

Authorised in liquid pasteurised egg products with specific maximum levels according to Regulation (EC) 1333/2008

# Pillar 2: ACETIPRO™

## Buffered Vinegar System

ACETIPRO™ is a liquid buffered vinegar that combines acetic acid with specialised buffer systems, designed to optimise preservative efficacy without compromising the sensory profile of the final product.

### Key Functions

- **Fine-tuning of target pH** – Allows the product to be precisely positioned within the optimum range (5.0–5.6) in a controlled and reproducible manner
- **Antimicrobial reinforcement** – Provides additional pressure on Gram– bacteria and spoilage psychrotrophic flora
- **Sensory stability** – The buffer systems prevent excessive acidity peaks, maintaining a balanced flavour
- **Clean label positioning** – Declared as "vinegar" or "vinegar extract" depending on formulation and market

📌 **Synergy with nisin:** The pH controlled by ACETIPRO™ significantly enhances the antimicrobial activity of PureNis™, creating a multiplying barrier effect against Gram+ pathogens

# Pillar 3: Protosorb™ and complementary systems

To complete the hurdle technology strategy, INTABIOTECH incorporates preservative systems specifically aimed at the potato phase, vegetable ingredients, and the finished product's surface.



## Protosorb™ (E 200–E 202)

Specific reinforcement against yeasts, moulds, and accompanying bacterial flora. Particularly useful in pre-treated potato and vegetable components.



## Targeted application

Protection of surface and ingredients most vulnerable to recontamination and fungal growth during shelf life.



## Regulatory compliance

Always within the MPL and authorised categories according to Regulation (EC) 1333/2008 consolidated text 2024 and updates.

The objective is to achieve maximum microbiological robustness with the minimum number of SKUs, creating an adaptable platform ranging from very clean label solutions to aggressive ESL configurations for complex and long distribution chains.

# Product Architecture: Zone-based Strategy

In a refrigerated RTE potato omelette (0–4 °C, shelf life 25–40 days), we identify three critical zones with differentiated microbiological risk profiles that require specific intervention strategies.

<b>Egg Phase</b> Main vector for post-processing <i>Listeria</i> and heat-treatment surviving spores	<b>Potato/Vegetable Phase</b> Yeasts, moulds, <i>Pseudomonas</i> spp. and psychrotrophic spoilage flora	<b>Surface + Atmosphere</b> Risk of recontamination, condensation, handling during slicing/packaging
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## Strategic Allocation of Technologies

### PureNis™

→ Egg phase / global mass

Control of Gram-positive bacteria in bulk, especially *Listeria monocytogenes*

### ACETIPRO™

→ Egg phase + global environment

pH adjustment and pressure on Gram-negative and psychrotrophic spoilage flora

### Protosorb™

→ Potato, vegetables, surface

Reinforcement against fungi, yeasts, and microbial load of ingredients

# Module 1: PureNis™ + ACETIPRO™

## The Backbone of the System

The combination of PureNis™ and ACETIPRO™ forms the fundamental core of the INTABIOTECH platform for potato omelette, creating a powerful and versatile antimicrobial synergy.



### PureNis™ targets Gram+

Nisin (E 234) acts on the cell membrane of pathogenic and sporulated Gram+ bacteria, especially effective in combination with heat treatment.



### ACETIPRO™ optimises pH

The buffered system fixes the pH in the optimum range of 5.0–5.6, enhancing nisin and creating pressure on Gram– without negative sensory impact.



### Synergistic Effect

The combination generates a robust antimicrobial barrier that maintains food safety and predictably extends shelf life.

# PureNis™: mechanism of action

## Nisin (E 234) – Natural Bacteriocin

Nisin is authorised in pasteurised liquid egg products with specific maximum levels defined in Annex II of Regulation 1333/2008 (consolidated text).

### Main targets

- ***Listeria monocytogenes*** – Critical pathogen in chilled RTE products
- ***Bacillus cereus*** – Toxigenic spore-former resistant to moderate heat treatments
- **Other spore-formers** – *Clostridium* spp. and spoilage Gram+ bacteria

📌 **Technological key:** Nisin activity is optimised in acidic to slightly acidic pH, which is why its combination with ACETIPRO™ is fundamental to maximise efficacy



# ACETIPRO™: pH control and sensory profile

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## Target pH Adjustment

Enables precise and reproducible positioning of the omelette within the 5.0–5.6 pH range, batch after batch, eliminating variability.

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## Barrier Against Gram-negative Bacteria

Significantly reduces the growth rate of psychrotrophic spoilage flora (\*Pseudomonas\*, enterobacteria).

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## Nisin Potentiation

The controlled pH optimises the solubility and antimicrobial activity of PureNis™ against Gram-positive bacteria.

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## Organoleptic Stability

Buffer systems maintain the acid-base equilibrium, preventing excessively acidic flavours or fluctuations during shelf-life.

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## Recommended Base Strategy

For standard refrigerated RTE (Ready-to-Eat) Spanish omelette (0–4 °C) with a target shelf-life of 25–35 days and national distribution, the conceptual technological scheme combines both systems in the pre-coagulation beating phase.

### PureNis™ Dosage

Calculated to provide an effective concentration of active nisin in the egg phase, typically in the range of 2.5–6.25 mg/kg of active nisin in the matrix. The exact dose is adjusted according to current legislation, specific formulation, and validated challenge test results.

### ACETIPRO™ Dosage

Adjusted to reach and fix the final pH in the target range of 5.0–5.6, considering the natural buffering capacity of the egg and other ingredients. The system ensures consistency between batches and prevents deviations during storage.

# Module 2: Reinforcement with Protosorb™

## Shelf-life Extension and Surface Control

For production lines requiring extended shelf-life (30–45+ days), facing complex logistics, or presenting a higher environmental risk of contamination, INTABIOTECH recommends incorporating a complementary module specifically aimed at the potato/vegetable phase and product surface.

### Protosorb™ (E 200–E 202)

A system based on sorbic acid (E 200) and potassium sorbate (E 202), widely used preservatives in the EU for controlling yeasts and moulds in bakery products, desserts, prepared vegetables, and ready-to-eat meals.

#### Regulatory Basis

MPLs defined in Annex II of Regulation 1333/2008 and updates. Recent adjustments focus on purity specifications and heavy metal limits, without modifying the logic of technological use.

#### Spectrum of Action

Highly effective against yeasts and moulds. Additional activity against some surface bacterial flora, especially in pH-controlled systems.

#### System Synergy

Perfectly complements the action of PureNis™ (Gram+) and ACETIPRO™ (pH + Gram–), closing the circle of protection against all critical microbial families.

# Application of Protosorb™: Pre-treated Potatoes



## Ingredient Treatment

Pre-treated potatoes (cubes, slices, diced) represent one of the critical entry points for fungal and spoilage flora into the final product. Treatment with **Protosorb™** before mixing with egg significantly reduces this initial load.

## Application Methods

- **Immersion** – Bath in an aqueous Protosorb™ solution with controlled time and concentration
- **Spray/Sprinkling** – Surface application using an in-line process sprinkling system

The dosage is adjusted according to the legal category of the final product (ready meal, vegetable preparation, egg-based product) and the applicable MPLs in each specific case.

**Objective:** To reduce the initial load of fungi, yeasts, and surface flora before setting, improving the microbiological robustness of the finished product.

# Protosorb™ Application: Surface and Fillings

## Stuffed Omelettes

In dishes prepared with peppers, onions, mushrooms, or other vegetables, Protosorb™ protects these ingredients, which are more vulnerable to fungal growth.

## Sauces and Coatings

In systems with lower pH, where sorbate achieves maximum efficacy, protective sauces or coatings can be designed for surface application.

## Product-Packaging Interface

Protection of the surface most exposed to condensation, post-processing recontamination, and fluctuations during distribution.

📌 **Key condition:** In all cases, usage must fit within the actual legal category of the finished product, strictly adhering to the MPLs and labelling requirements according to current regulations ('preservative' function + code E 200/E 202).

# Other Preservative Alternatives

In addition to the PureNis™ + ACETIPRO™ + Protosorb™ platform, other preservative systems can be evaluated on a case-by-case basis, always subject to legal compliance within the product's specific category and the availability of efficacy data.

## PreserFood™ Meat

Lactate/acetate system designed for meat products. It may be applicable in omelettes/tortillas with meat ingredients (ham, chorizo, bacon) where it legally fits into the formulation.

## Vegetable Extracts

Preparations with demonstrable technological function (e.g., rosemary extract). Possible declaration as "flavourings" or "vegetable preparations" with a secondary preservative effect.

**Limitation:** Potential excessive spicing/flavouring in classic omelettes/tortillas.

## Fermented ingredients

Fermentative ingredients with documented antimicrobial metabolites. Requires a robust database and compliance with the client's clean label declaration.

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**Key Recommendation:** For classic egg-and-potato omelettes/tortillas, the optimal technological approach remains:

PureNis™ (egg matrix) + ACETIPRO™ (pH & Gram-) + Protosorb™ in potato/vegetables (moulds/yeasts) + validated thermal process + MAP/vacuum + strict cold chain.

# Protosorb™: Technical Specifications

PROTOSORB™ is the INTABIOTECH solution based on legally authorised preservatives (including sorbic acid salts and other compatible components depending on formulation) specifically designed for the egg products and chilled ready meals sector.

## A Targeted Control of Yeasts and Moulds

Antimicrobial spectrum optimised for the most frequent filamentous fungi and yeasts in potato, vegetables, and surfaces exposed during processing.

## B Reduction of Accompanying Flora

Additional activity on part of the saprophytic bacterial load present in vegetable ingredients and pre-treated potato, improving overall stability.

## C Synergistic Integration

Designed to work in combination with PureNis™ + ACETIPRO™, within the usage limits and categories of Regulation (EC) 1333/2008 consolidated text.

## Validated Conceptual Applications

### 1. Pre-treated Potato

Treatment by immersion or spray with PROTOSORB™ solution adjusted to the legal category of the final product (ready meal / vegetable preparation / egg product) and applicable MRLs. Reduces initial load before mixing with egg.

### 2. Surface and Vegetable Components

Use in vegetable fillings, sauces, or associated aqueous phases. Protects the interface most exposed to recontamination and mould/yeast growth during chilled shelf life.

# Modular Configurations

## Solutions tailored to every need

INTABIOTECH offers three standard configurations, allowing each manufacturer to select the strategy that best suits their business model, brand positioning, and distribution requirements.



### Option A – Advanced Clean Label

- Technologies: **PureNis™ + ACETIPRO™**
- Target final pH: **5.1–5.5**
- Indicative shelf life: **25–30 days**
- Profile: Short declaration, maximum label cleanliness
- Ideal for: Premium brands that prioritise clean label without compromising robust microbiological safety



### Option B – ESL Reinforced with PROTOSORB™

- Technologies: **PureNis™ + ACETIPRO™ + PROTOSORB™** in potato/vegetables/surface
- Indicative shelf life: **30–40+ days** (according to challenge tests)
- Profile: Maximum shelf life extension with comprehensive protection
- Aimed at: Large manufacturers, national/international distribution, greater tolerance to temperature deviations



### Option C – High RTE Safety

- Basis: **Option B + intensive validation programmes**
- Mandatory challenge tests: *Listeria monocytogenes*, *B. cereus*, moulds/yeasts
- Complete documentation for IFS/BRC/retailer audits
- Ideal for: Suppliers to large chains with extreme food safety and documented traceability requirements

# Validation and Technical-Regulatory Support

For all configurations incorporating PureNis™, ACETIPRO™ and PROTOSORB™, INTABIOTECH recommends following a structured validation protocol to ensure regulatory compliance and the microbiological effectiveness of the system.

## 1. Legal Definition

Exact classification of the product (RTE tortilla, ready meal, egg-based product) and determination of the applicable category in Annex II of Regulation 1333/2008

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## 2. Regulatory Verification

Confirmation of MPL compliance for each integrated preservative component. Review of labelling requirements according to Regulations 1333/2008 and 1169/2011

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## 3. Validation Studies

Execution of shelf-life studies under real conditions and targeted challenge tests with relevant strains (*Listeria*, *Bacillus*, moulds/yeasts) following standardised and traceable protocols

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## 4. Client Deliverables

Complete technical-legal report, specific formulation and dosage recommendations, modular proposal (A/B/C) adapted to the manufacturer's process and commercial objectives

## Support Documentation

- Technical data sheets for PureNis™, ACETIPRO™ and PROTOSORB™
- Technological justification for the use of each component
- Application of the carry-over principle where appropriate
- Adapted HACCP scheme with identified critical points
- Proposed labelling declarations



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