Unlocking Food Safety and Quality with High-Pressure Processing

Frank Jimenez, Chief Executive Officer
Christian Calex, Vice President of Food Safety & Quality

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What is High-Pressure Processing (HPP) Technology?

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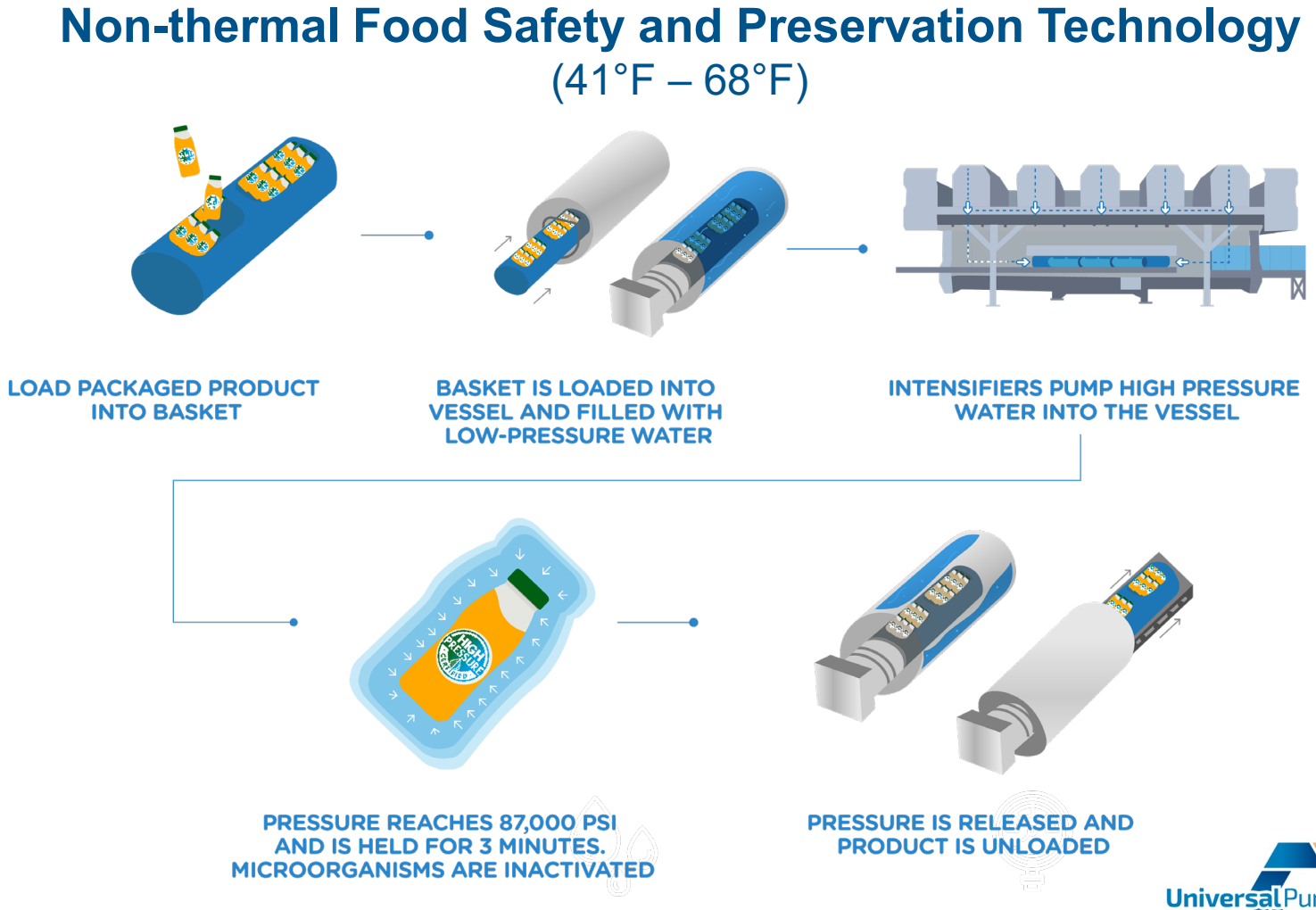
FOOD
navigator.com
Technology trends: HPP most important food technology – now and in the future
MENU
High-pressure method could make processed foods more natural, healthier
Healthy Benefits Help High-Pressure Food Processing Gain Ground
AS IF BY MAGIC

What is HPP Technology?

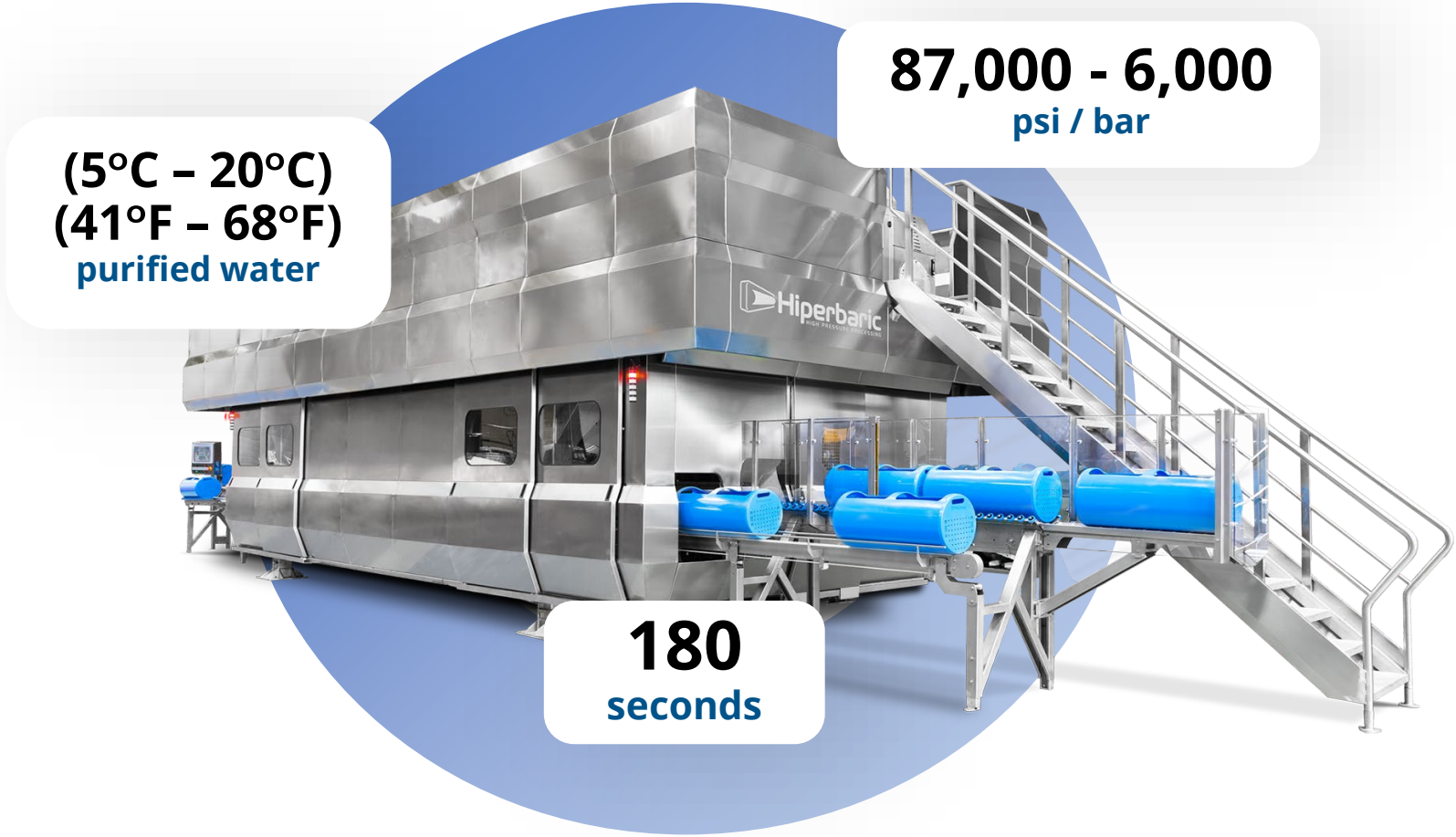
- A food safety and preservation method that uses **high pressure** transmitted by **water**, held for a few minutes.

- The pressure is transmitted isostatically which achieves an **effect equivalent to pasteurization**, without the use of heat.



Non-thermal Food Safety and Preservation Technology

HPP Parameters: Pressure, Time, Water Temperature




Product loading in the baskets
Hiperbaric

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What are the Advantages of HPP Technology?

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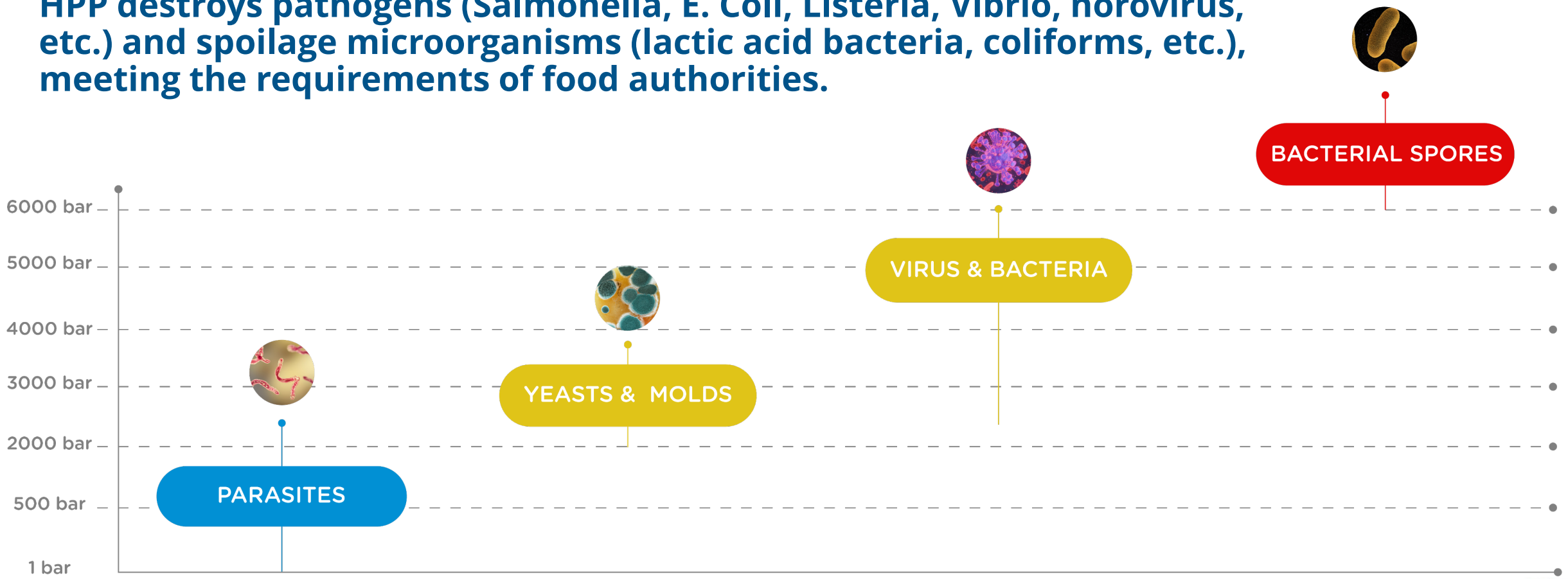
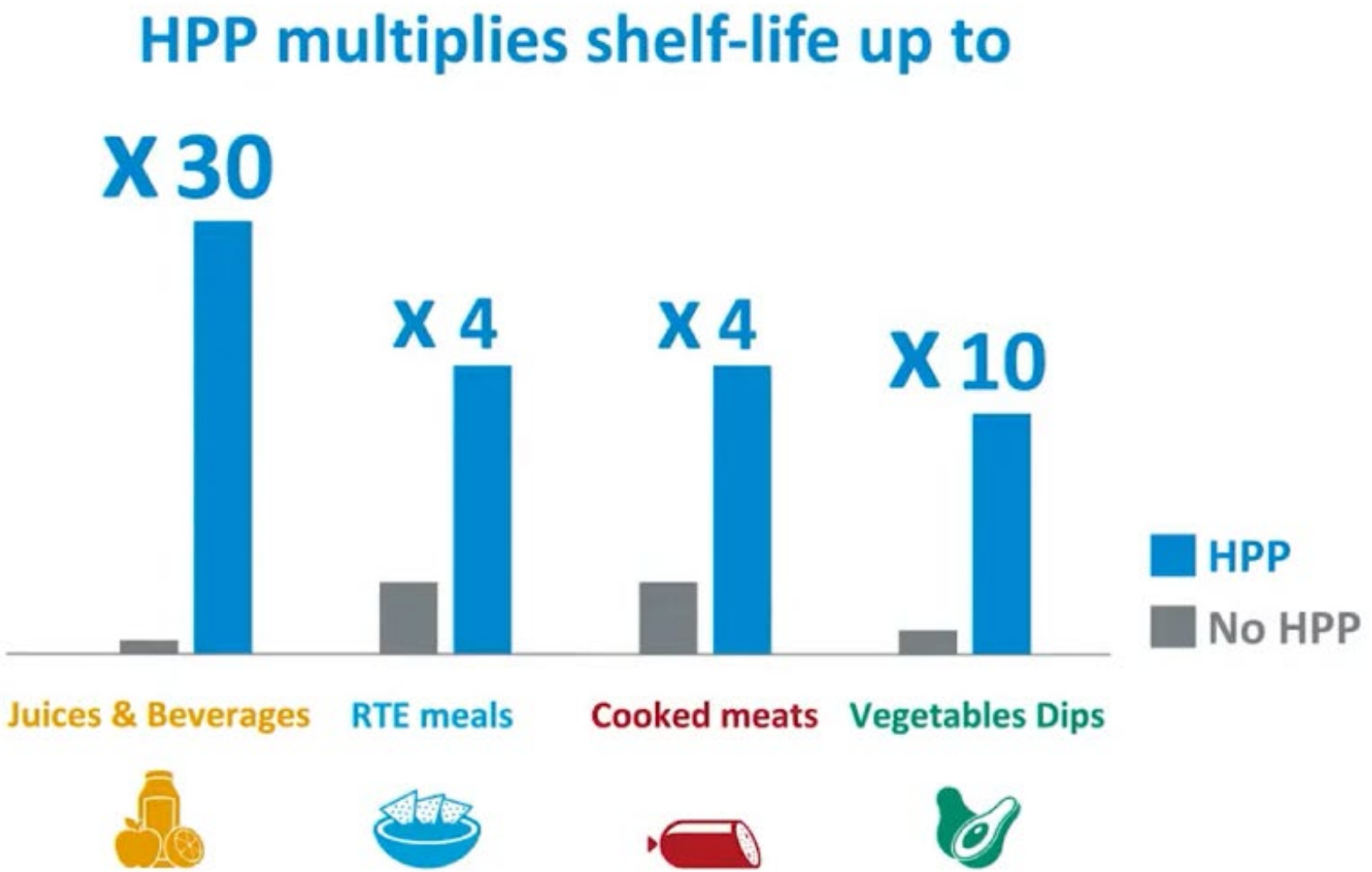
Brand protection against recalls
Control of pathogens and spoilage
Minimal processing of food without heat
Preserve quality of fresh food
Open opportunities to new markets
Natural appeal without additives
HIGH PRESSURE
TECHNOLOGY

Food Safety

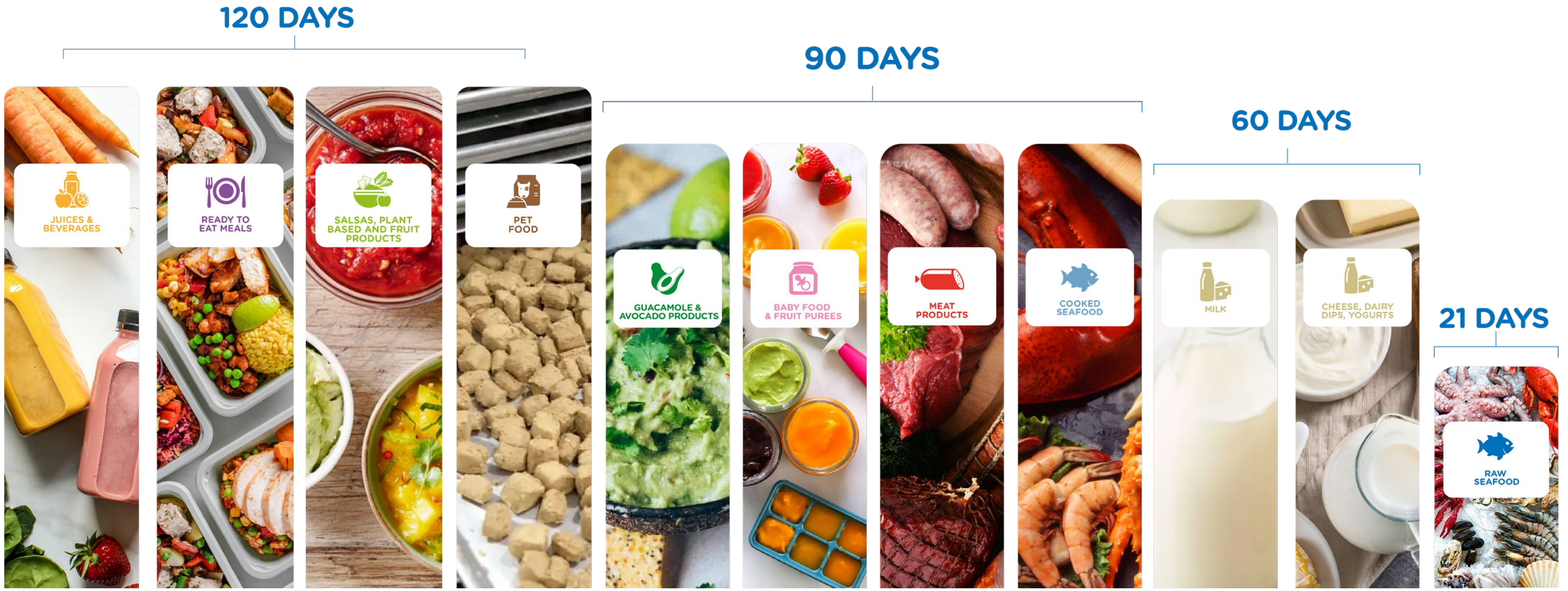
HPP destroys pathogens (Salmonella, E. Coli, Listeria, Vibrio, norovirus, etc.) and spoilage microorganisms (lactic acid bacteria, coliforms, etc.), meeting the requirements of food authorities.




HPP multiplies shelf-life up to
X 30
X 4
X 4
X 10
HPP
No HPP
Juices & Beverages
RTE meals
Cooked meats
Vegetables Dips

Extended Shelf Life

HPP maintains the freshness of food products up to 4 months after being packaged.



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Clean Label

Defined by the Institute of Food Technologists (IFT):

"Few ingredients as possible and making sure those ingredients are items that consumers recognize and think of as wholesome or can find at home."

01.

Fresh Ingredients

Ingredients that consumers can pronounce.

02.

No preservatives or additives

Reduce or eliminate the use of preservatives or additives in food and beverages.

Plant Based Queso Dip

GOOD FOODS™ HIGH PRESSURE CERTIFIED

INGREDIENTS: cauliflower, water, cucumber, almonds, cashews, lemon juice, garlic, apple cider vinegar, dill, sea salt, mint, chia protein, black pepper

Refrigerated Salsa

COCINA FRESCA™ Salsa HIGH PRESSURE CERTIFIED

INGREDIENTS: diced tomatoes, fresh onions, jalapeño peppers, green peppers, fresh cilantro, garlic, salt, vinegar, spices

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What are the HPP Applications and Market?

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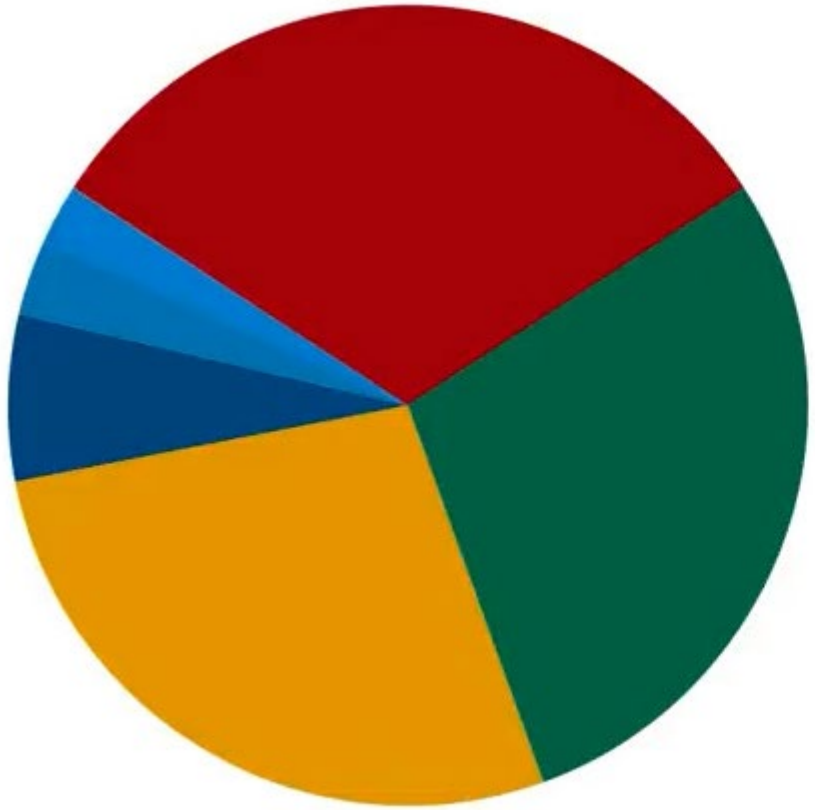
HPP Food Sectors

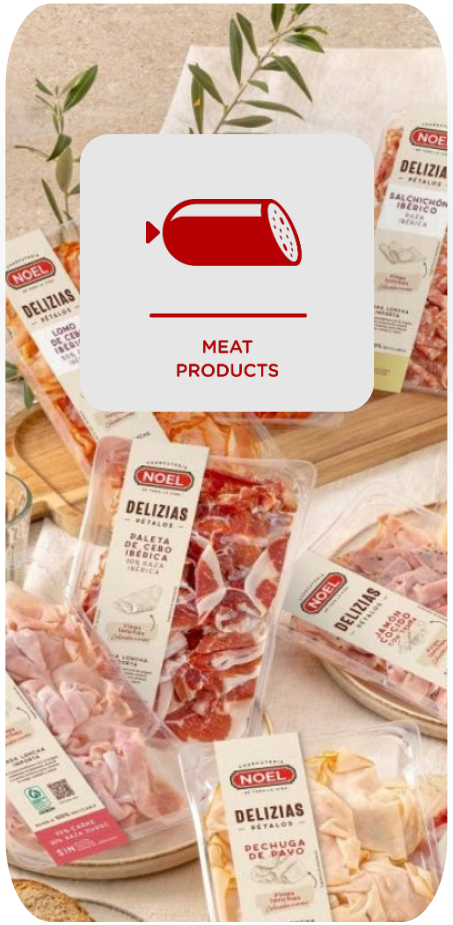


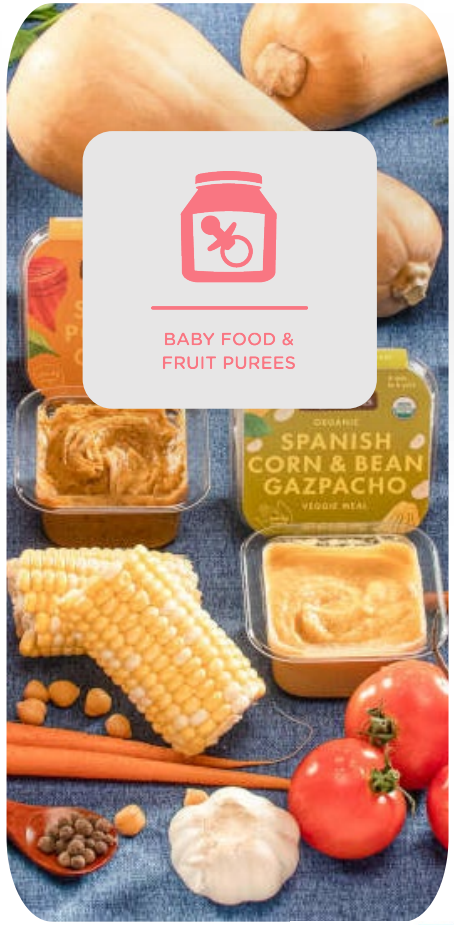
- Meat products
- Fruit and vegetables products
- Juices and beverages
- Seafood products
- Ready to eat meals
- Dairy products

Global HPP production > 1.5 million t/year

HPP Applications

HPP is a highly versatile technology, which can be applied to a wide range of foods.





HPP Applications

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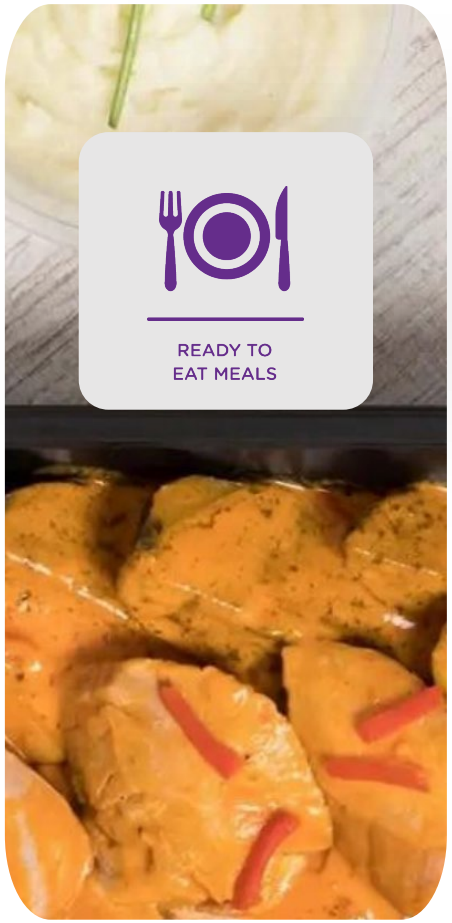
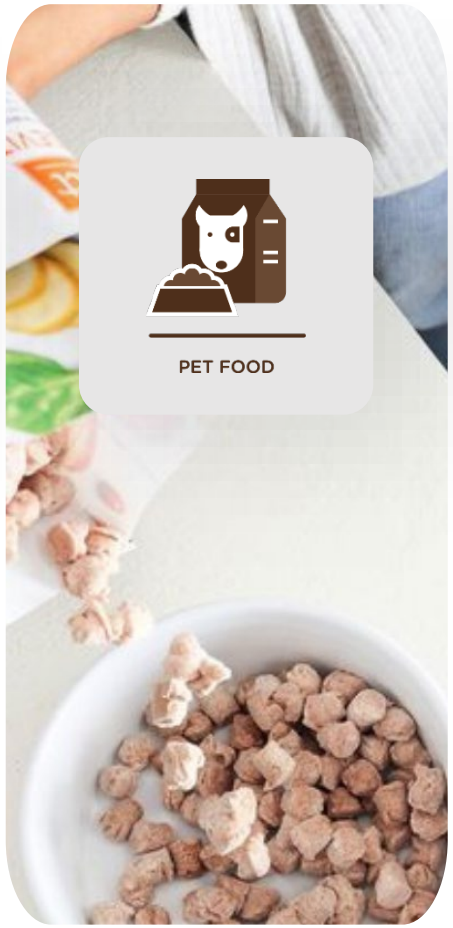
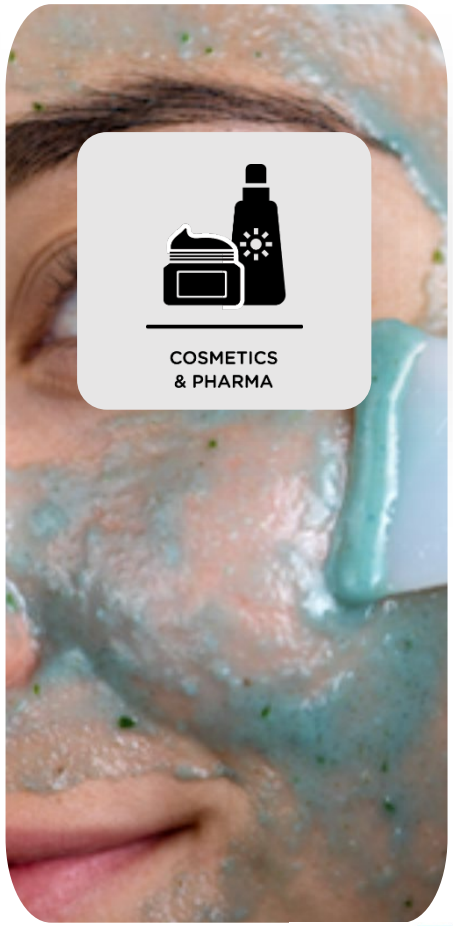
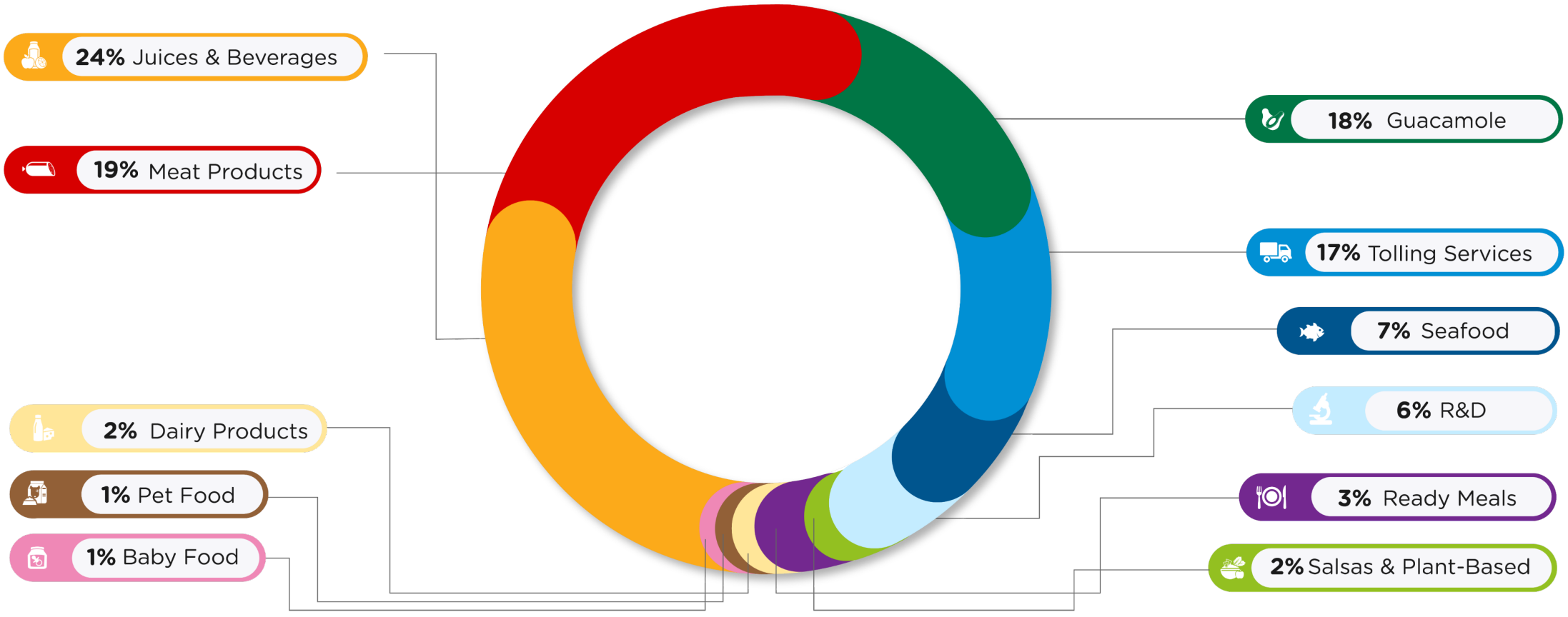






HPP Applications: Market Overview



HPP Market: Juices & Beverages

Cold-Pressed Juice

Functional Shots

Smoothies

Veggie Soups

Fruit-Based Water

HPP Market: Meat Products

Raw Meat

Cooked Meat

Cured and Deli

HPP Market: Meat Products

Guacamole

Avocado Puree

Avocado Halves

Avocado Dressing

HPP Market: Salsas, Plant-Based, and Fruit Products

Hummus

Fresh Salsa

Dips

Salad Dressings

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HPP Market: Dairy Products

Raw Milk

Fresh Cheese

Dips

Dairy Beverages

HPP Market: Baby Food Products

Fruit/Veggie Cups

Fruit/Veggie Pouch

HPP Market: Ready-to-Eat (RTE) Meals

Protein Meals

Seafood Meals

Plant-based Meals

HPP Market: Pet Food Products

Raw Formulas

Raw, Meaty Bones

Raw, Freeze Dried

Fresh, Cooked

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HPP Market: Seafood Shucking

Lobster

Oysters

Crab

HPP Market: Seafood Products

Cooked Crab	Algae	Fish Salad	RTC Fish	Cooked Octopus
				

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What are the HPP Key Factors for Successful Products?

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HPP Key Factors: Water Activity (Aw)

> 0.96

HPP efficiency depends on Aw

- High inactivation of microorganisms: **> 0.96**
- Minimum water activity required = **0.87**

Fruits, Vegetables, Meat, Fish & Milk

0.95-1.00

Cheese & Cured Meat

0.91-0.95

Fermented Meat Products

0.87-0.91

Dry Products Not Suitable

- ✔ Spices, and Powders
- ✔ Dried Nuts or Fruits
- ✔ Bread and Pastries
- ✔ Extracts

HPP Key Factors: Temperature and pH

Bacterial spores are highly resistant to high pressure, however, proper pH and refrigerated storage can prevent germination and spore growth.

< 4.6
pH

(4-6) °C

(39-43) °F

HPP Key Factors: Packaging

Flexible **Water Resistant**

PACKAGE TYPE		BASE MATERIALS	CLOSURE TYPES	CLOSURE	BARRIER MATERIALS
	Bottles	PET, HDPE	Cap (induction foil possible)	PP, HDPE (Al, LDPE)	EVOH
	Pouches	LDPE, HDPE	Film Seal or cap	PP, HDPE	EVOH, Nylon
	Tubs	PET, PP, HDPE	Top film seal	PET, PE, PP	EVOH
	Trays	PE, PP, APET, CPET, HDPE	Top film seal	PET, PE, PP	EVOH
	Vacuum Pack	PE, PET	Film seal	N/A	EVOH, Nylon

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In-pack HPP packaging

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Getting Your Product HPP-Ready

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Getting Your Product HPP-Ready

1. DEFINE YOUR OBJECTIVE FOR HPP
2. ASSESS FOOD CHEMISTRY & HPP COMPATIBILITY
3. SELECT HPP-COMPATIBLE PACKAGING
4. ARRANGE PRELIMINARY HPP TESTING
5. CONDUCT VALIDATION & SHELF-LIFE STUDIES
6. CONSIDER OPERATIONAL FACTORS

1. Define Your Objective for HPP

HPP PRODUCT APPLICATIONS

RTE/RTC Proteins

Premium Beverages

Dips & Salsas

RTE Meals

Baby Food

Dairy Products

Seafood Products

Fresh Pet Food

OBJECTIVE FOR USING HPP

A) ENSURE FOOD SAFETY

PATHOGEN REDUCTION
OF PERTINENT PATHOGENS

B) EXTEND SHELF-LIFE

REDUCE COUNTS OF SPOILAGE
MICROORGANISMS

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2. Assess Food Chemistry & HPP Compatibility

	ENSURE FOOD SAFETY	EXTEND SHELF-LIFE
pH ACIDITY OF FOODS	➢ pH 4.6 or lower ➢ pH 4.6 or greater + antimicrobials	➢ pH 4.6 or lower ➢ pH 4.6 or greater + antimicrobials
Water Activity (a_w) FREE WATER AVAILABLE IN FOODS	➢ aw 0.95 or higher ➢ Inefficient below aw 0.95	➢ aw 0.80 to 0.95 ➢ Inefficient below aw 0.80
Food Nutrients PROTEIN, FATS & OILS, CARBOHYDRATES, VITAMINS	➢ Food components may protect microorganisms against lethal pressure effects ➢ i.e., high fat & oil content; increased salt/sugar concentration. ➢ Nutrients may allow microorganisms to recover after HPP under certain conditions ➢ pH, a_w, packaging, etc.	
Applications EXAMPLES OF COMMON HPP PRODUCTS	Juices & Beverages; Wet Salads, Dips & Salsa; RTE Meals; Meat & Poultry; Fresh Pet Food; Seafood Products; Dairy Products	Wet Salads, Dips & Salsa; RTE Meals; Meat & Poultry; Fresh Pet Food; Seafood Products; Dairy Products

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3. Select HPP-Compatible Packaging

Properties

- **Flexible:** withstands pressure and recovers its shape upon pressure release
- **Barrier (seal/lidding):** prevents water ingress during HPP cycle, or gas migration (i.e., oxygen) during storage
- **Minimal Headspace:** reduces package stress that could result in bursting or cracking

Decoration

- **Clarity:** appropriate opacity for light sensitive products
- **Labeling:** dry-off set print, in-mold labels, shrink sleeve

Sustainability

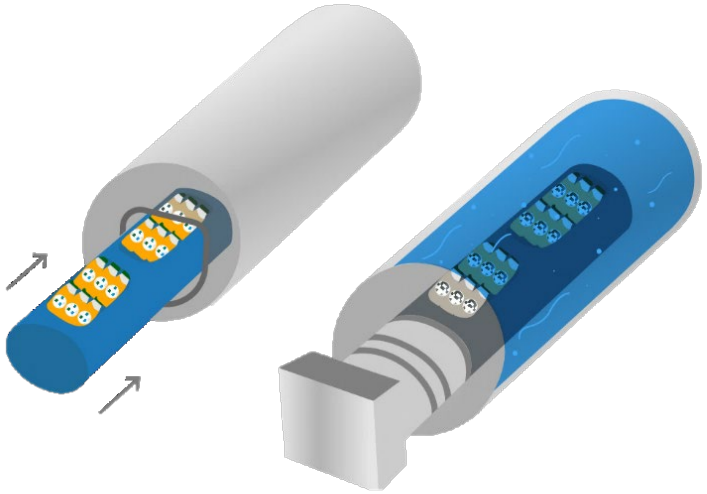
- **Environmental impact:** packaging design to maximize recyclability, reusability and/or degradability

4. Arrange Preliminary Testing with Toller

Tolling Partner Facilitates HPP Test Run of Product Samples

Customer Monitors Product Evolution During Refrigerated Shelf-Life

Customer Adjusts Product and/or Packaging Format as Needed



5. Conduct Validation & Shelf-Life Studies

Validation Studies

REGULATORY COMPLIANCE

- **Evaluates** the **process parameters** (pressure level, pressure holding time) **& food characteristics** (pH, water activity, nutrient content, antimicrobial concentration, etc.) **that ensure food safety throughout the target shelf life.**
- **Designed by a Process Authority** (an individual with expertise in food safety and HPP recognized among technical peers and industry experts.
- **Restricted to laboratories** that have access to **HPP equipment**, and biosecurity levels that **handle health hazardous microorganisms**.

Shelf-Life Studies

QUALITY ASSURANCE

- **Determines the impact of HPP** on **food sensory properties** such as texture, taste and appearance throughout the refrigerated shelf-life.
- **Monitors basic microbial indicators** to determine if recovery limits the shelf life of foods.
- Completed in **local food laboratories.**

Food Chemistry

IMPACT ON FOODSAFETY & QUALITY

- **Evaluates changes on food components** (protein, fats, carbohydrates, vitamins) and **physicochemical properties** (pH, aw, etc.).
- Most completed in **local food laboratories**.

Laboratory Partners

Hiperbaric HIGH PRESSURE TECHNOLOGIES

JBT Marel

THE FOOD PROCESSING CENTER

Cornell University

Certified Laboratories

UniversalPure

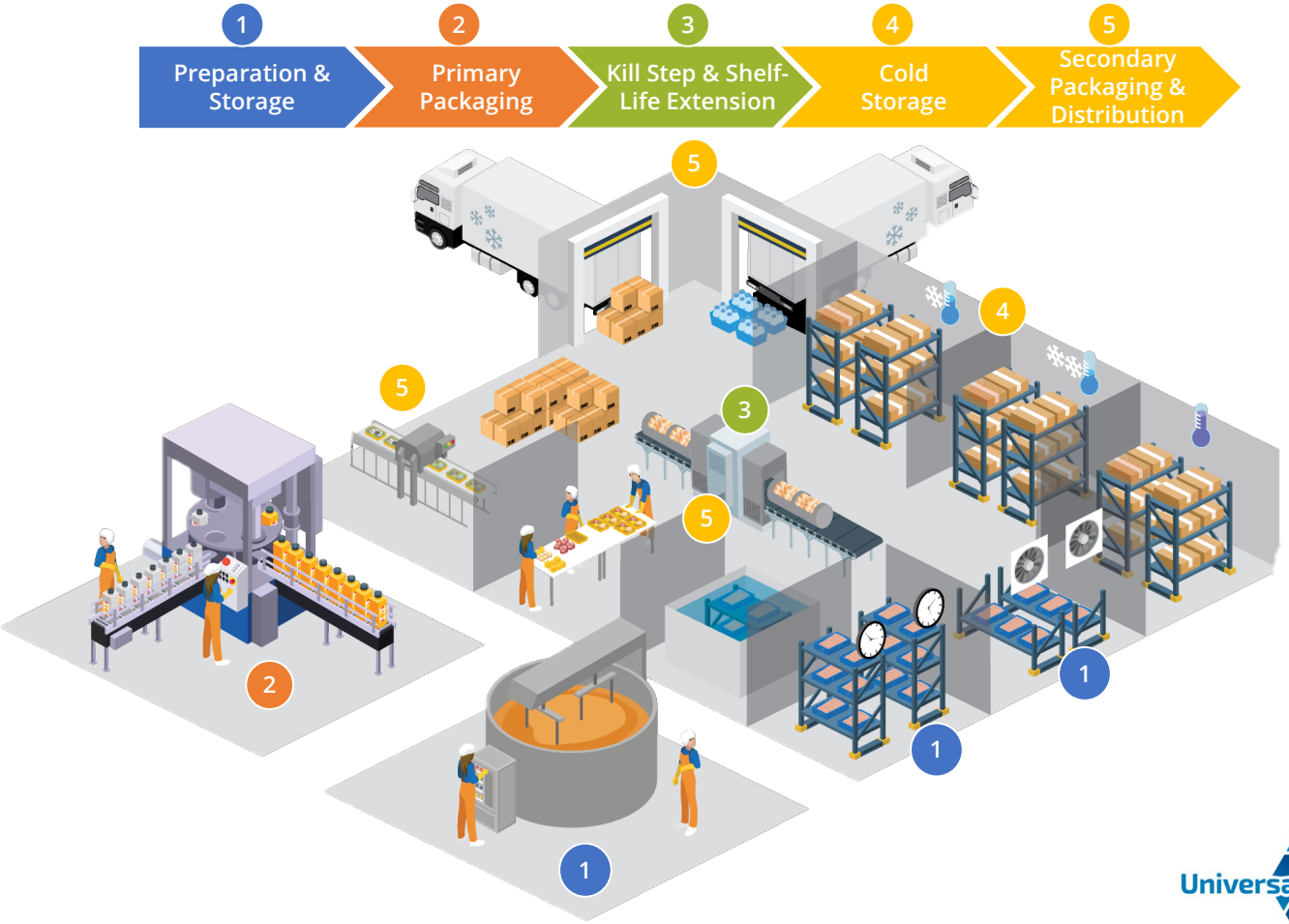
6. Consider Operational Factors

HPP OPERATIONAL CONSIDERATIONS

- HPP Filling Ratio (product/pounds per cycle)
- Pressurization Time
- Receiving & Shipping Logistics
- Additional Service Integration

1. Preparation & Storage
   - Tempering, Dry Aging, Blending
2. Primary Packaging
   - Bottling
3. Kill Step & Shelf-Life Extension
   - High Pressure Processing
4. Cold Storage
5. Secondary Packaging & Distribution
   - Kitting, Labeling, Distribution Services

ONE-STOP-SHOP



Your Product is HPP-Ready!

Why HPP Now?

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Helping Create a Safe Food System is Mission Critical!

Yu Shang Food Inc. Recalls Ready-to-Eat Meat and Poultry Products Due to Possible Listeria Contamination

Nearly 12 million pounds of ready-to-eat chicken products recalled over listeria risk

Millions of pounds of meat are being recalled. Here's what to look for in your fridge

Food recalls became more widespread and more deadly in 2024, report finds

Dunkin' Included In Massive Baked Good Recall—Here's What You Need To Know

The FDA Announces Recall on Cat Food Due to Bird Flu Risk

Enhanced Scrutiny on Unhealthy Ingredients

Beyond The Label – Consumers Want The Truth About Product Ingredients

By Gary Drenik , Contributor. ⓘ Gary Drenik is a writer covering AI, analytics an... Follow Author

Jul 18, 2024, 10:00am EDT

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Consumer Reading Product Labels ADOBESTOCK_206668128

LIVESTRONG.com

Harmful Effects of Preservatives in Foods

More evidence that ultra-processed foods harm health

News briefs

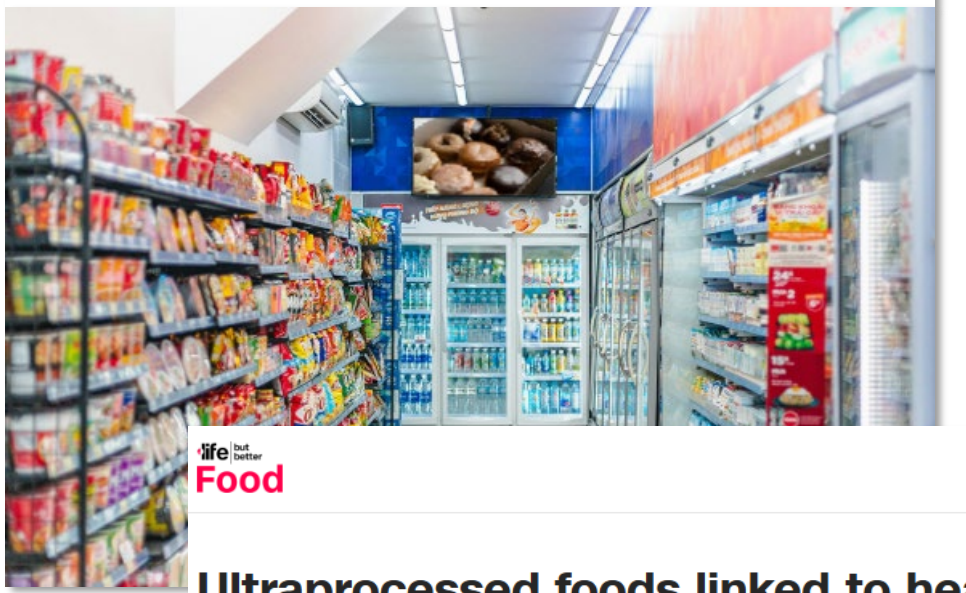
June 1, 2024

***By Heidi Godman**, Executive Editor, Harvard Health Letter*

Prioritizing Health | Ultra-Processed Foods: The Enemy in the Food System?

Jan 06, 2025

Cardiology Magazine



life but better

Food

Ultraprocessed foods linked to heart disease, diabetes, mental disorders and early death, study finds

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Enhanced Scrutiny on Unhealthy Ingredients

THE WALL STREET JOURNAL.

World **Business** U.S. Politics Economy Tech Markets & Finance Opinion Arts Lifestyle

HEALTH | WELLNESS

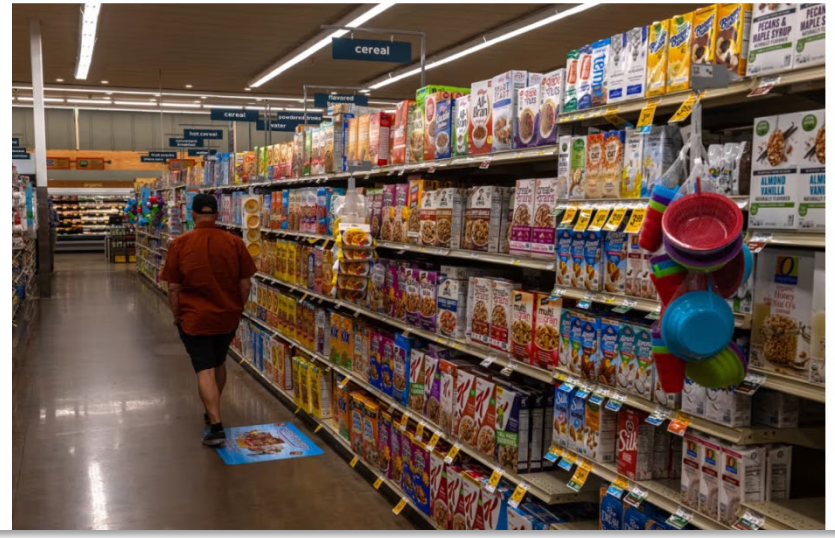
The FDA Wants to Put Warning Labels on the Front of Food Packages

Proposed Biden administration rule would require food manufacturers to flag salt, added-sugar and saturated-fat levels on front of packages

By Jesse Newman Follow

Updated Jan. 14, 2025 4:03 pm ET

Gift unlocked article Listen (5 min)



Nutrition Info

Per serving 1 container		% Daily Value
Saturated Fat	18%	Med
Sodium	37%	High
Added Sugars	5%	Low

FDA.gov

U.S. NEWS

18 Fast Food Favorites That Could Change or Disappear Under RFK Jr.'s Health Policies

By **Jake Beardslee** · December 27, 2024

18 Grocery Items That May Be Banned Under RFK Jr.'s Health Initiatives

Story by **Jake Beardslee** • 1mo

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Universal Pure

Leading the high-pressure processing market

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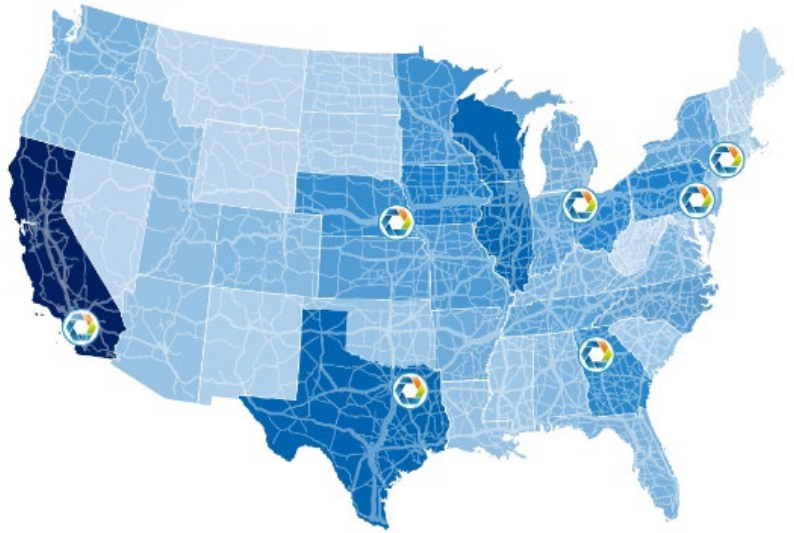
Universal Pure: Leading the High-Pressure Processing Market

Universal Pure is the **leader in the North American high-pressure processing (HPP)** and food safety market, with seven multi-service facilities and a full suite of value-added technical solutions.



We offer a **clean label, non-thermal food safety solution**, that preserves product taste, texture, color, and nutritional value, while extending shelf-life, which ultimately reduces food waste.

Mission: Help create a safer, higher quality food system.

Vision: Become the global leading provider of clean food safety and technical solutions to the consumer market.

Network & Service Offering

NATIONAL, STRATEGIC FOOTPRINT…

Leading provider with **differentiated scale** and **nationwide coverage** across seven geographic regions

…OF MULTI-SERVICE CENTERS…

Complementary, technical services anchored by HPP creates a **one-stop-shop** across the cold chain

Upstream	HPP	Downstream
Cold Storage Tempering Dry Aging Blending Bottling		Cold Storage Kitting Labeling Distribution Services

…THE LEADER IN THE MARKET.

7	22	150+	2B+
Geographic Regions	HPP Machines	Brands in Diverse Customer Base	Pounds Processed

UniversalPure

Multi-Service Facility Capabilities by Location

		2001	2014	2014	2015	2019	2021	2022
								
		Nebraska[1]	Georgia	Texas	Pennsylvania	Connecticut	California	Ohio
Upstream	Cold Storage	✓	✓		✓			✓
	Tempering	✓	✓	✓	✓	✓	✓	
	Dry Aging	✓						
	Bottling					✓	✓	
	HPP	✓	✓	✓	✓	✓	✓	✓
Downstream	Kitting	✓	✓	✓	✓			
	Labeling	✓	✓	✓	✓	✓	✓	✓
	Freezing	✓	✓	✓	✓	✓		
	Import/ Export	✓			✓		✓	
	DTC					✓	✓	
	HPP Machines	6	3	4	3	2	2	2

(1) 2 individual facilities at Lincoln, Nebraska location.

HPP & Food Safety Expertise

DEDICATED TEAM

- Corporate leadership, local operations, and food safety
- Engagement with OEMs, industry leaders, and academia

FOOD SAFETY

- 50+ Quality Assurance team members
- Salaried staff – 100+ years combined experience
- Corporate FSQA – 50+ years combined experience

Turnkey Solution

EXPERIENCE

- Operational expertise to run HPP machines
- Maintenance expertise to maintain HPP machines
- Value-Added service
- Cold chain expertise

CONTINUOUS IMPROVEMENT

- Share best practices
- Drive efficiency, reduce cost

QUALITY SERVICE PROVIDER ACROSS ALL RELEVANT CERTIFICATIONS

SQF HACCP CERTIFIED USDA ORGANIC Kosher USDA FDA

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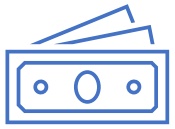
Benefits of Working with an HPP Service Provider

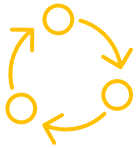


Time, Capital & Space Savings

- Eliminate expense for HPP equipment installation & replacement parts.
- Avoid facility retrofit including concrete pads, water lines, drains, and electricity.

Engineering Expertise

- Leverage years of HPP operational know-how and expertise.
- Avoid labor expenses for skilled HPP operators and maintenance staff.



Flexibility & Redundancy

- Simplify HPP integration without interrupting complex / continuous flow production lines.
- Gain redundancy with built-in ability to transfer product between machines and facilities.

Operational Efficiency

- Avoid HPP operations ramp-up time and learning curve.
- Maintain focus on core business and higher ROI primary production processes.

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