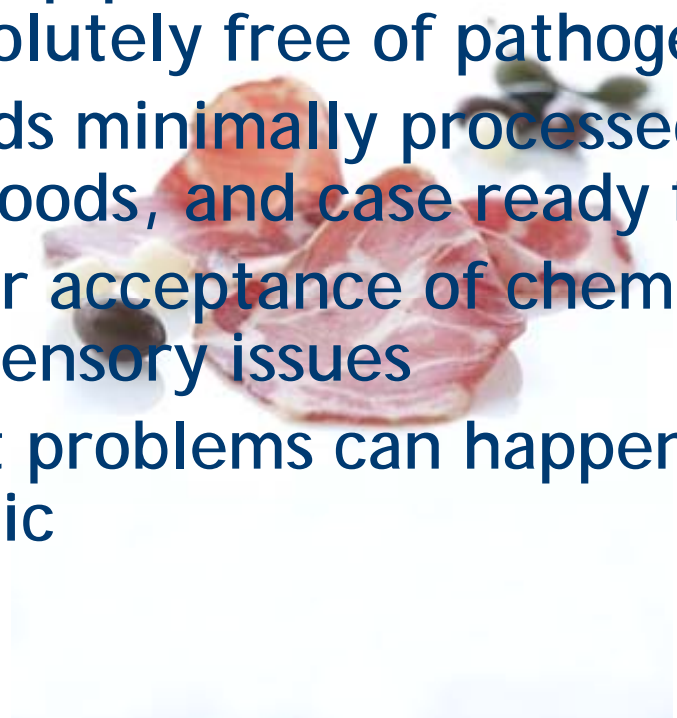




"Enhancing The Safety and
Quality of Meat Products Using
Bioprotective Cultures"

Market Trends - Food Safety

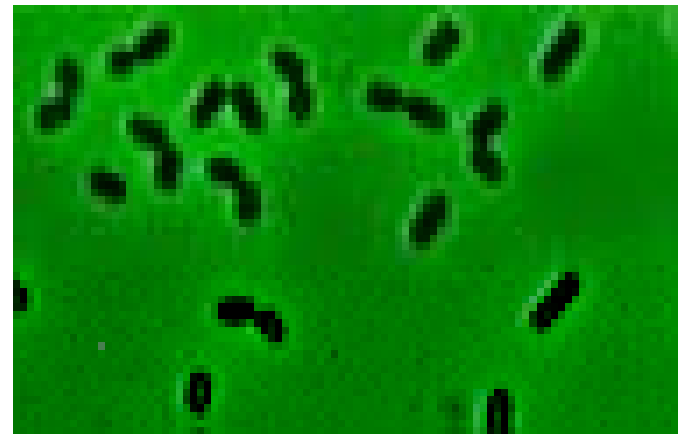
- ▶ Increased consumer awareness and demand for microbial safety of foods (2007 FMI report: Consumer confidence in food safety declining)
- ▶ Difficult to keep production facilities and raw materials absolutely free of pathogens
- ▶ Trends towards minimally processed, ready to eat refrigerated foods, and case ready fresh meats
- ▶ Less consumer acceptance of chemical additives - labeling and sensory issues
- ▶ Reality is that problems can happen anytime and can be catastrophic



Bioprotection - definition revisited

Application of lactic acid bacteria (LAB) to a product in order to control the flora **without significantly altering the sensory properties of the product**

- ▶ Improving quality by delaying growth of *spoilage* bacteria
- ▶ Increasing safety by inhibiting and reducing *pathogens*

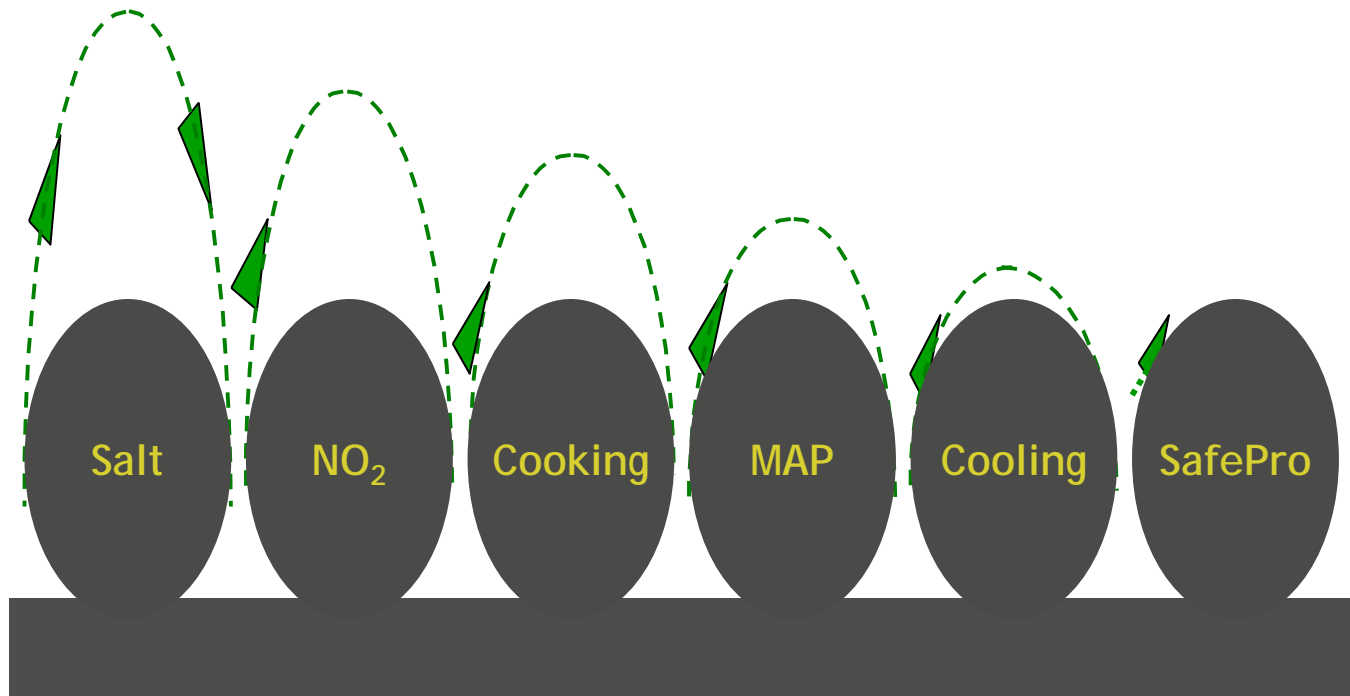


Example: Lactobacillus

Bioprotection Concept

An Additional Hurdle

The storage stability of processed meat products depends on a combination of several hurdles



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BS420
1987-2022

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How Do Bioprotective Cultures Work?

- ▼ Compete with the indigenous flora
 - ▶ Grow well at the storage conditions
 - ▶ Use easily fermentable nutrients
 - ▶ Take up space for growth
 - ▶ Remove oxygen, i.e. lower redox potential
- ▼ Inhibit the indigenous flora
 - ▶ Produce inhibitory organic acids
 - ▶ Produce bacteriocins



Benefits Of Using Bioprotective Cultures

- ▶ Additive-free labels are a strong trend among consumers and retailers
- ▶ Many preservatives give an off-flavor in the efficient doses
- ▶ Cold meat cuts that are stabilized by modified atmosphere packaging are prone to deterioration by *Listeria monocytogenes* after opening

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- ▶ All natural solutions - label friendly
- ▶ Higher safety due to the extra protective barrier
 - ▶ Listeria protection
- ▶ Fresher appearance towards the end of shelf life
 - ▶ gasiness, acidity, slime, off-color and off-flavor



SafePro® range of bioprotective cultures

	Name	Content	Application	Microbial target
NON-fermented meat products	B-2	<i>Lb. sakei</i>	Cold meat cuts Hot dog sausages	Spoilage bacteria (heterofermentative LABs, <i>Brochothrix thermospacta</i> , ..)
	B-LC-48	<i>Lb. curvatus</i>	Fresh sausages Fresh meat ?	
	B-FM	<i>Lb. sakei</i> <i>S. xylosus</i>	Fresh sausages	<i>Listeria monocytogenes</i>
Fermented meat products	F-LC	<i>P. acidilactici</i> <i>Lb. curvatus</i> <i>S. xylosus</i>	Starter cultures for dried sausage (salami) with different speed	Spoilage bacteria <i>Listeria monocytogenes</i>
	B-LC-35	<i>P. acidilactici</i> <i>Lb. curvatus</i> <i>S. xylosus</i>	Works at 18-43°C	
	B-LC-20	<i>P. acidilactici</i>	Adjunct culture for Dried sausage (< 26°C) Cured meats	<i>Listeria monocytogenes</i>

* Allowed in Canadian foods

Documentation of Effect Fermented Meat Products

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Bioprotective cultures for fermented sausages

- ▶ F-LC

Starter culture for fermentation of dry sausage with the added value of *Listeria* reduction

- ▶ B-LC-20

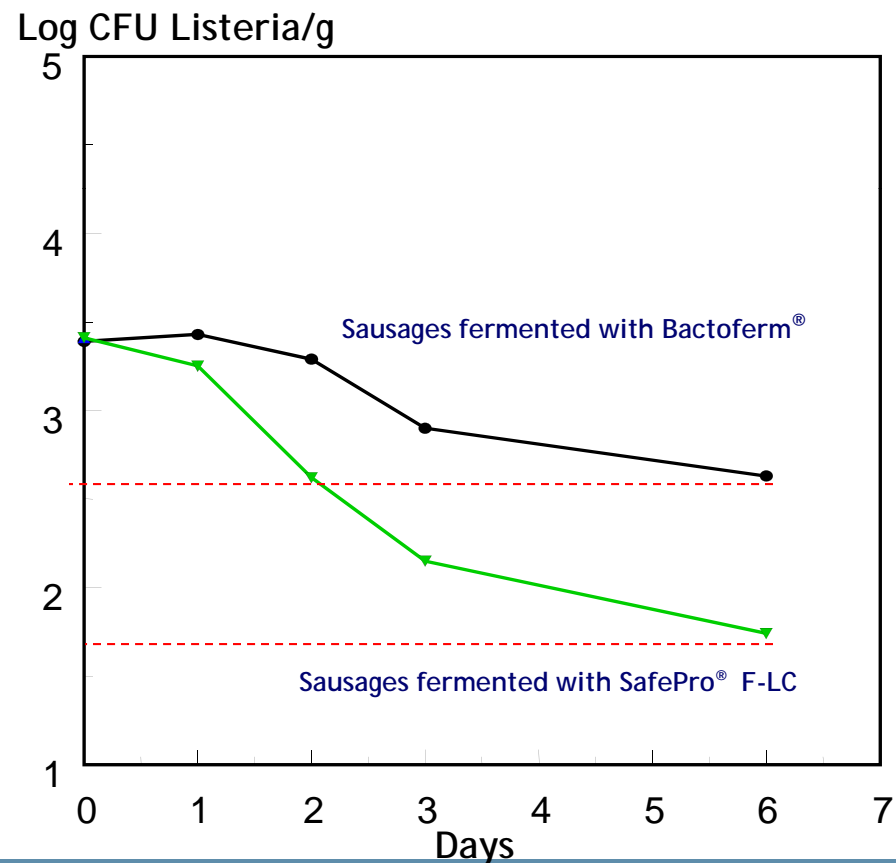
Adjunct culture for reducing *Listeria* in existing recipes without altering the final sausage quality - to add on top of existing starter cultures



Reduction of *Listeria* with F-LC

- ▶ The raw materials for fermented sausages may contain *Listeria*. Even though fermented sausages are cured, acidified and dried *Listeria* often survive the process
- ▶ F-LC not only acts as an excellent starter culture, it also suppresses the growth of *Listeria* due to bacteriocin as well as acid production

Sausages inoculated with *L. monocytogenes* fermented at 24°C



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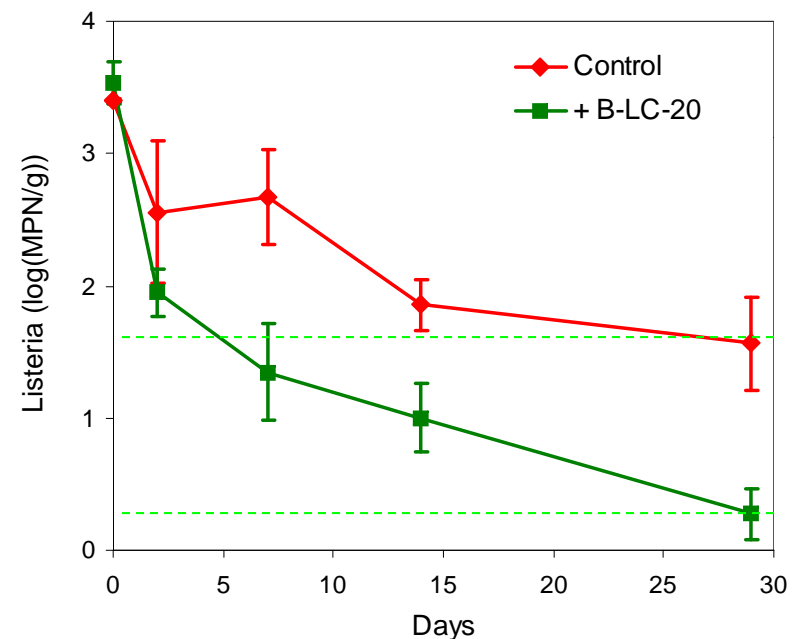
BS40
1989-2022

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Reduction of *Listeria* with B-LC-20

▼ Fermented sausages

- ▶ Test performed at IRTA, Spain in two independent trials
- ▶ Sausage mince inoculated with *L. monocytogenes*
- ▶ Fermentation for 3 days at 24°C; drying for 26 days at 14°C
- ▶ Reduction of *Listeria* due to bacteriocin production by the adjunct culture
- ▶ Safer product



Documentation of Effect

Non-fermented meat products

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Bioprotective cultures for NON-fermented products

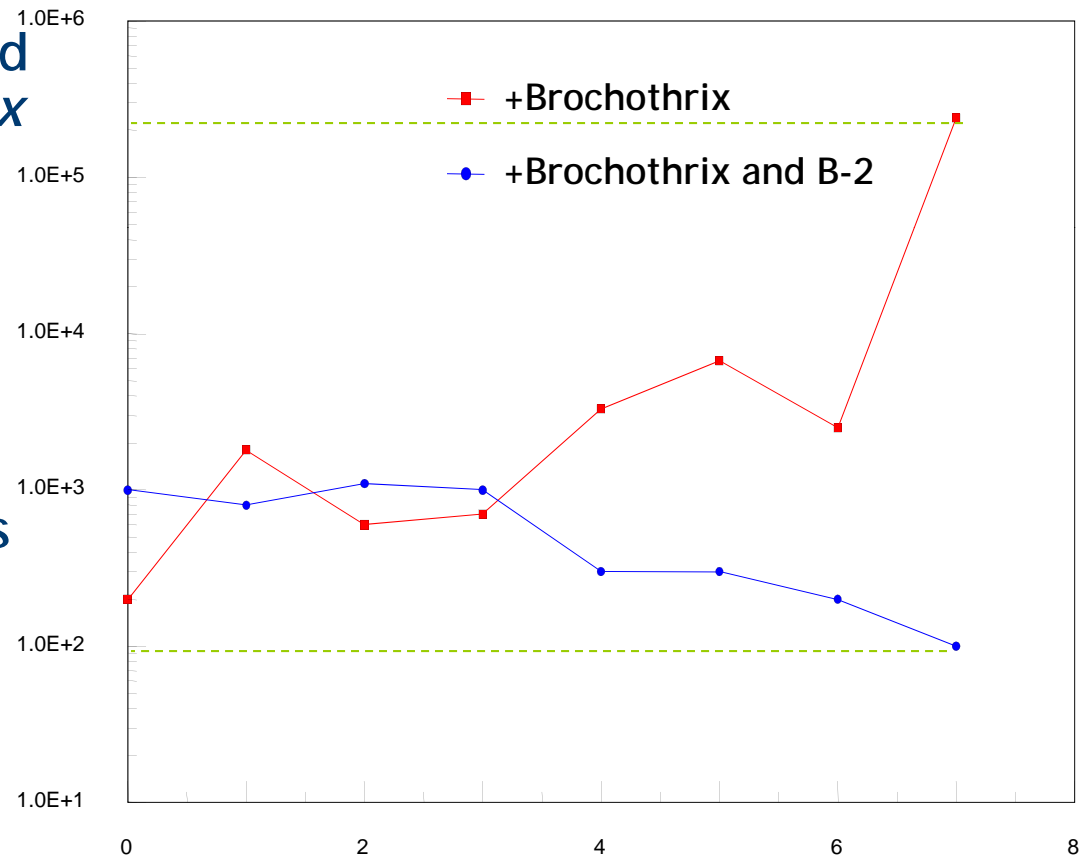
- ▶ **B-2**
Inhibition of spoilage bacteria and *Listeria*
- ▶ **B-FM**
Inhibition of spoilage bacteria and *Listeria* plus flavor and color formation
- ▶ **B-SF-43**
Inhibition of spoilage bacteria and reduction of *Listeria*

Control of spoilage flora with B-2

Smoked filet inoculated with
Brochothrix, stored at 7°C

- ▶ In MAP and vacuum-packed meat products *Brochothrix thermosphacta* is favored by low storage temperature and low oxygen content
- ▶ Addition of B-2 suppresses *Brochothrix thermosphacta* and the sensory quality is improved

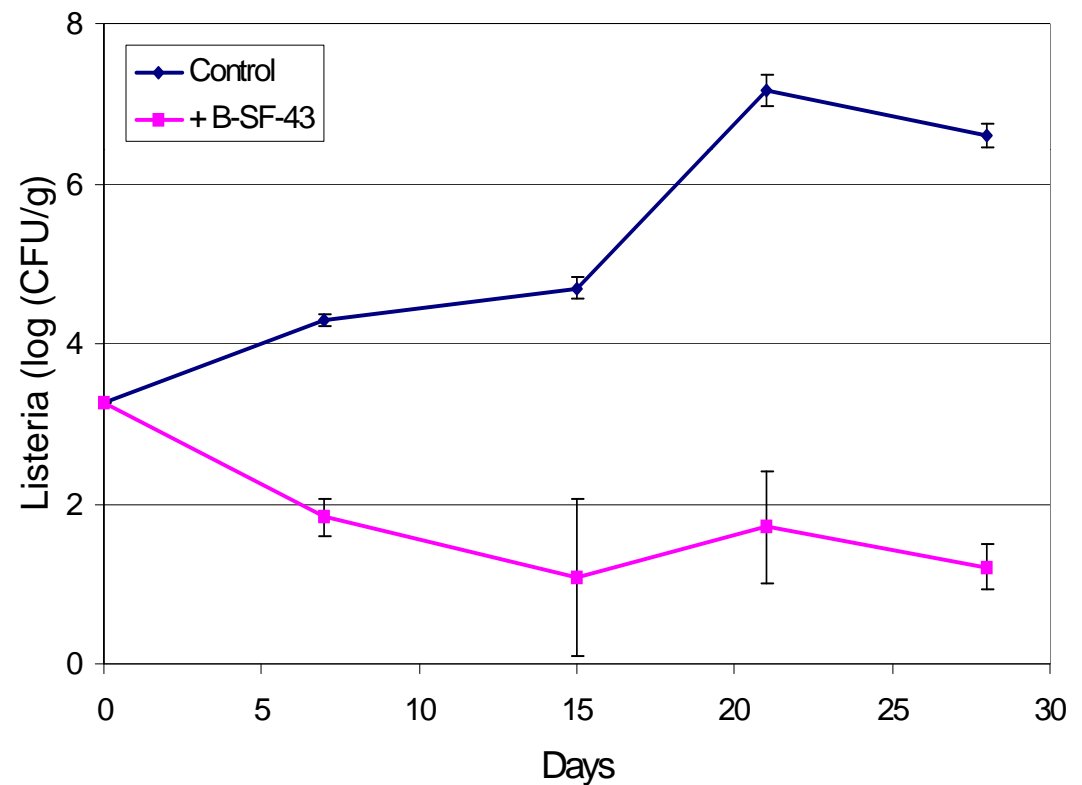
Brochothrix CFU/g



Reduction of *Listeria* with B-SF-43

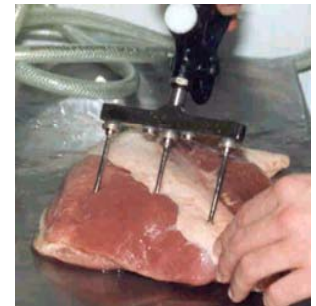
- ▶ Ready-to-eat frankfurters are very vulnerable to re-contamination after cooking and during packaging
- ▶ Addition of B-SF-43 reduces listerial growth due to competitive exclusion and acid and bacteriocin production that inhibit *Listeria*

Frankfurters inoculated with a 4-strain-cocktail of *L. monocytogenes*, vacuum-packed and stored at 7°C



Applying Bioprotective Cultures

- ▶ Cured whole muscle products: bacon, cured meats, filet, ...
 - ▼ In the brine
- ▶ Minced products: fermented sausages, non-cooked sausages, ...
 - ▼ Directly into the mince
- ▶ Ready to eat products: Cooked sliced ham, Mortadella, hotdog sausages, toppings,
 - ▼ After cooking and cooling
 - ▼ By spraying during slicing or during transportation on the conveyor belt



Applying Bioprotective Cultures



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BSA 20 meat systems
1949-2021

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Questions