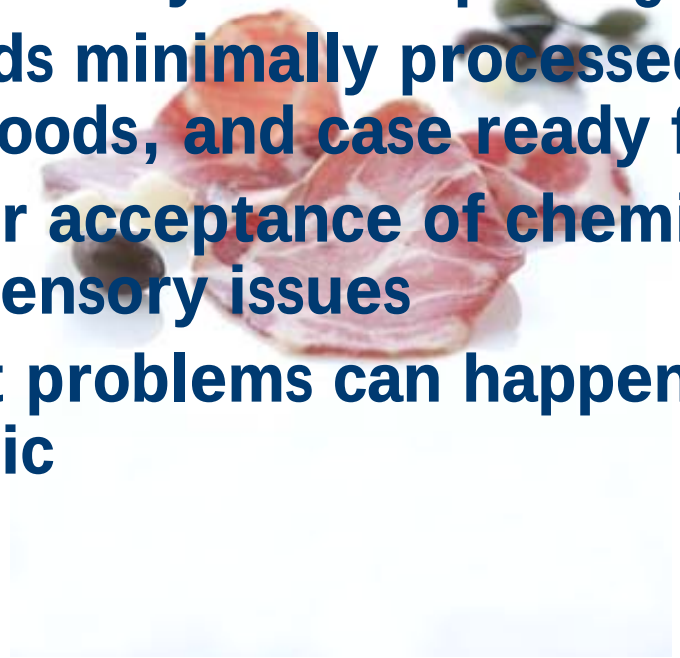
"Enhancing The Safety and Quality of Meat Products Using Bioprotective Cultures"

Market Trends – Food Safety

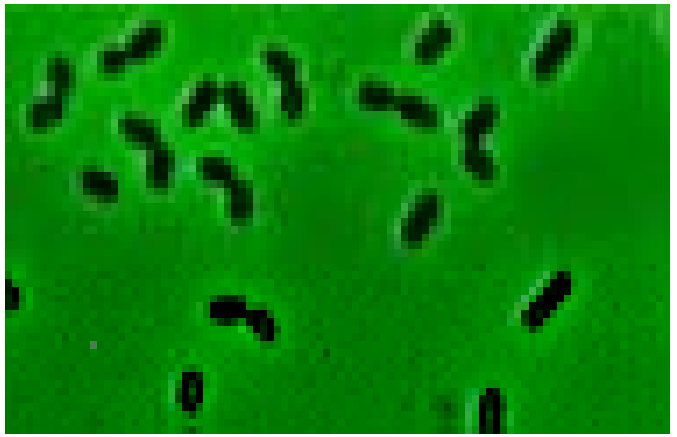
- **Increased consumer awareness and demand for microbial safety of foods (2007 FMI report: Consumer confidence in food safety declining)**
- **Difficult to keep production facilities and raw materials absolutely free of pathogens**
- **Trends towards minimally processed, ready to eat refrigerated foods, 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***

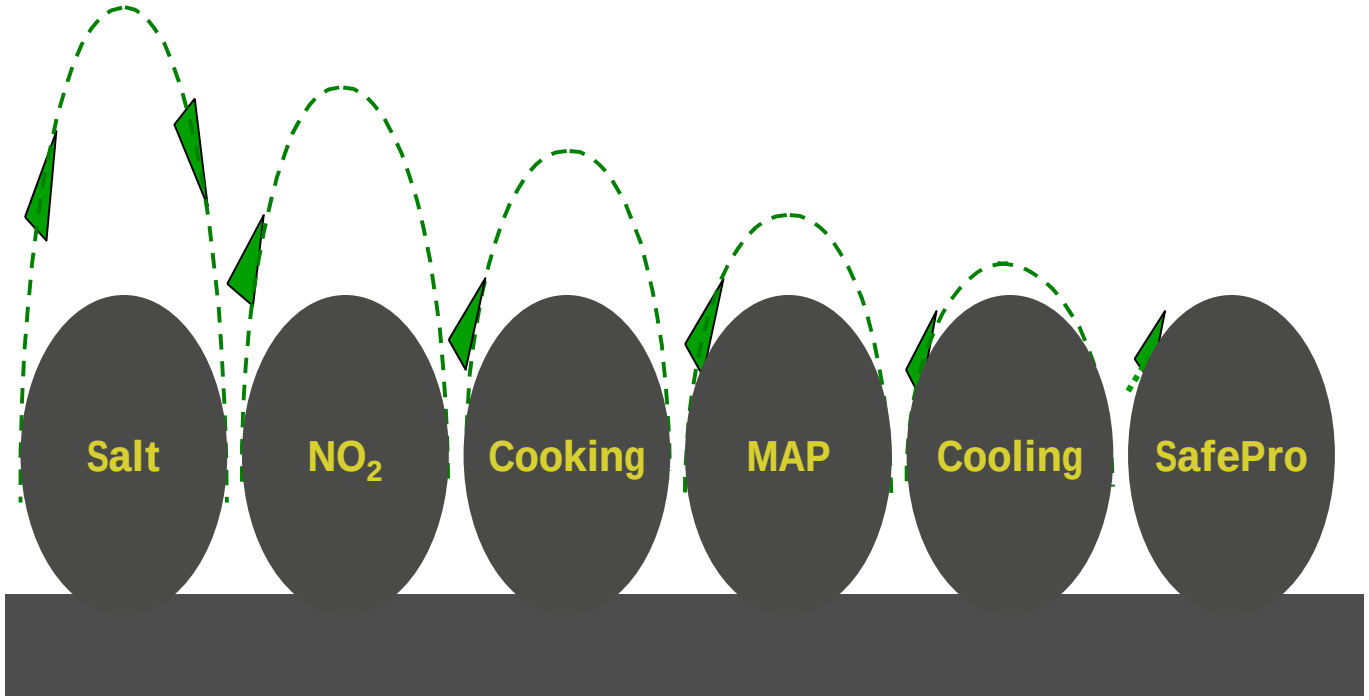


Example: Lactobacillus

Bioprotection Concept

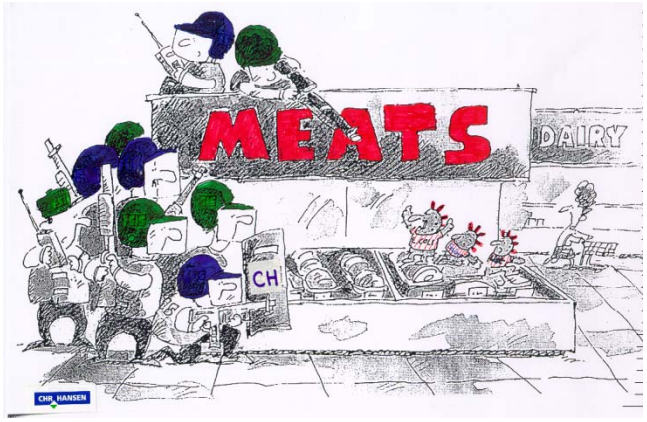
An Additional Hurdle

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



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

SafePro®

- 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	*Lb. sakei*	Cold meat cuts Hot dog sausages Fresh sausages Fresh meat ?	Spoilage bacteria (heterofermentative LABs, *Brochothrix thermospacta*, ..) *Listeria monocytogenes*
	B-LC-48	*Lb. curvatus*		
	B-FM	*Lb. sakei* *S. xylosus*	Fresh sausages	
Fermented meat products	F-LC	*P. acidilactici* *Lb. curvatus* *S. xylosus*	Starter cultures for dried sausage (salami) with different speed Works at 18-43ºC	Spoilage bacteria *Listeria monocytogenes*
	B-LC-35	*P. acidilactici* *Lb. curvatus* *S. xylosus*		
	B-LC-20	*P. acidilactici*	Adjunct culture for Dried sausage (< 26ºC) Cured meats	*Listeria monocytogenes*

* Allowed in Canadian foods

Documentation of Effect

Fermented Meat Products

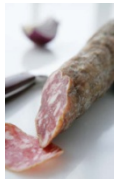
Bioprotective cultures for fermented sausages

- F-LC

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

- B-LC-20

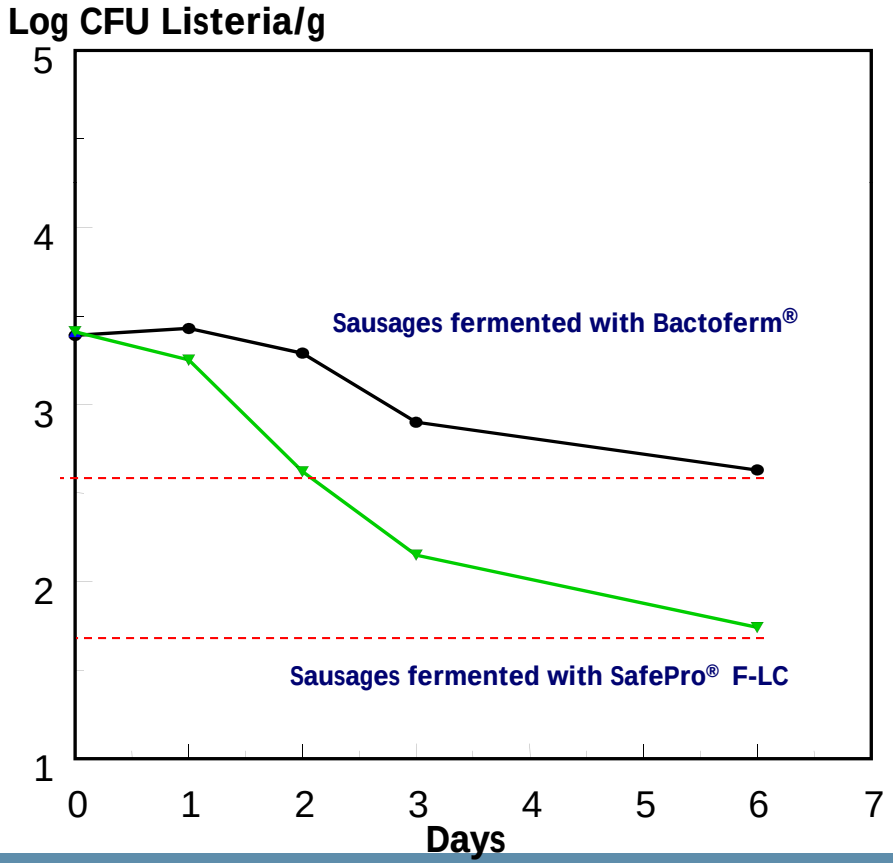
  Adjunct culture for reducing *Listeria* in existing recipes without altering the final sausage quality - to add on top of existing starter cultures



Reduction of *Listeria* with F-LC

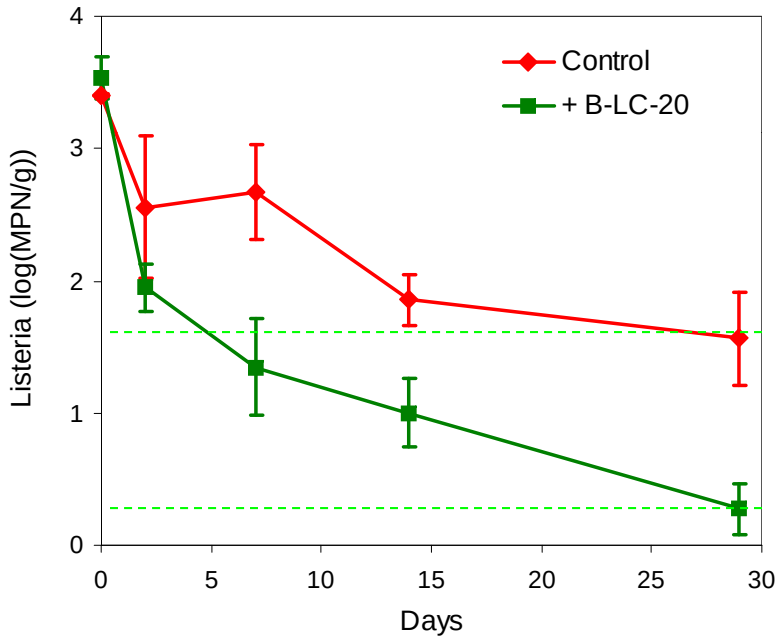
- The raw materials for fermented sausages may contain Listeria. Even though fermented sausages are cured, acidified and dried Listeria often survive the process
- F-LC not only acts as an excellent starter culture, it also suppresses the growth of Listeria due to bacteriocin as well as acid production

Sausages inoculated with *L. mono-cytogenes* fermented at 24°C



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

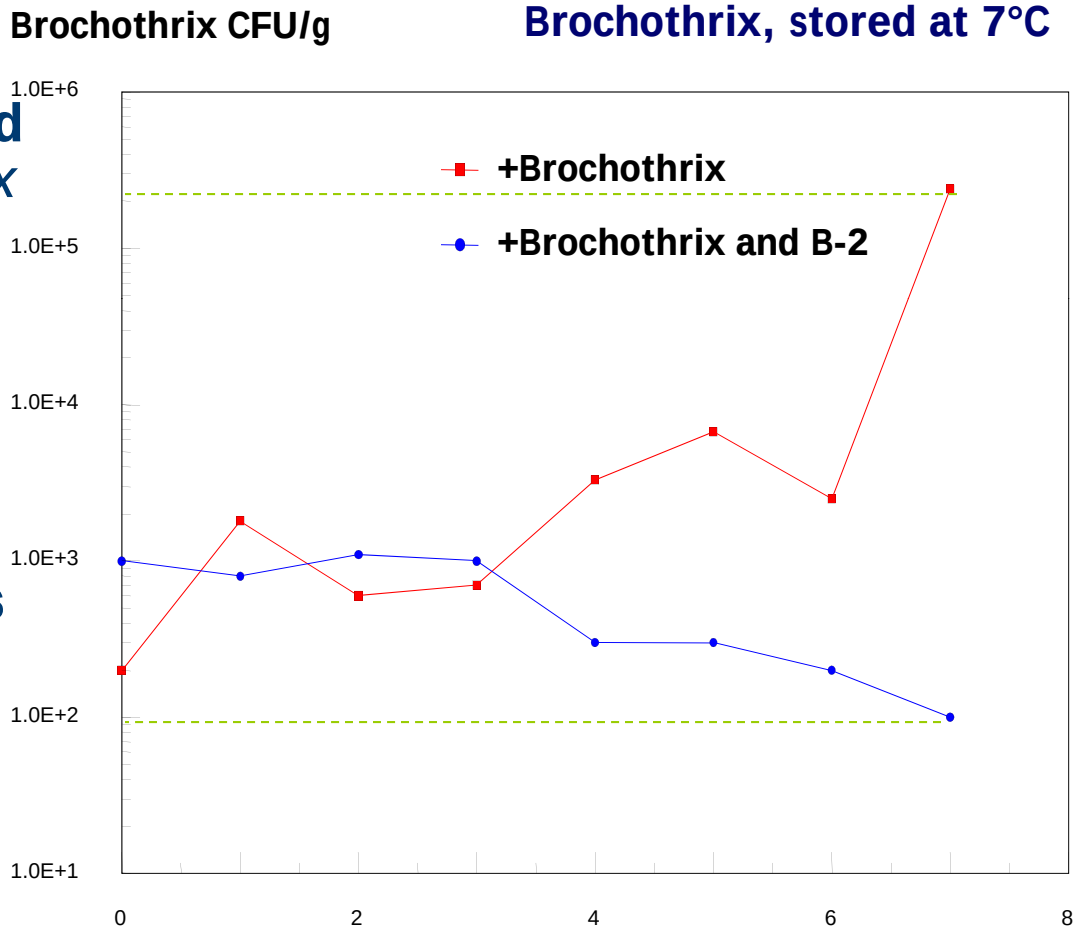
Bioprotective cultures for NON-fermented products

- **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

- **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**

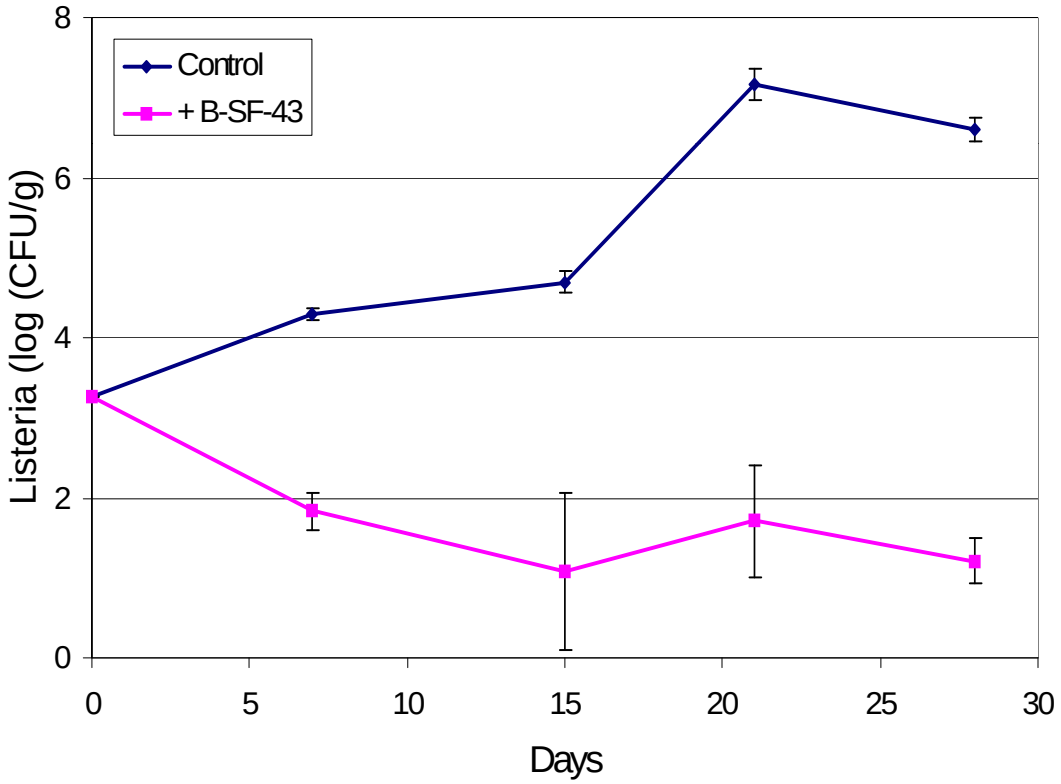
Smoked filet inoculated with Brochothrix, stored at 7°C



Reduction of *Listeria* with B-SF-43

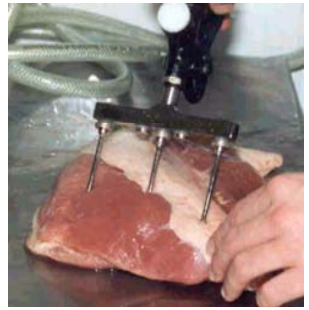
- Ready-to-eat frankfurters are very vulnerable to re-contamination after cooking and during packaging
- Addition of B-SF-43 reduces listerial growth due to competitive exclusion and acid and bacteriocin production that inhibit *Listeria*

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

Questions