

# Quina es la problemàtica de *Listeria monocytogenes* en aliments?

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*Listeria monocytogenes*: Prevenció i control  
Jornada AVHIC. Bcn 11/11/11

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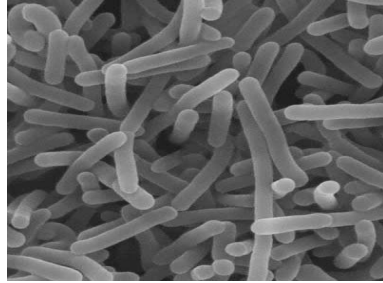


## “Histeria vs Listeria”



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## Listeria monocytogenes

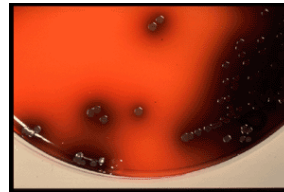
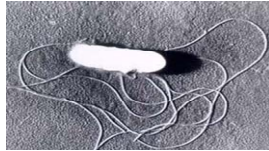


T<sup>a</sup> (-0,4 a 45 °C)  
pH (4,39 - 9,40)  
Aw ≥ 0,92



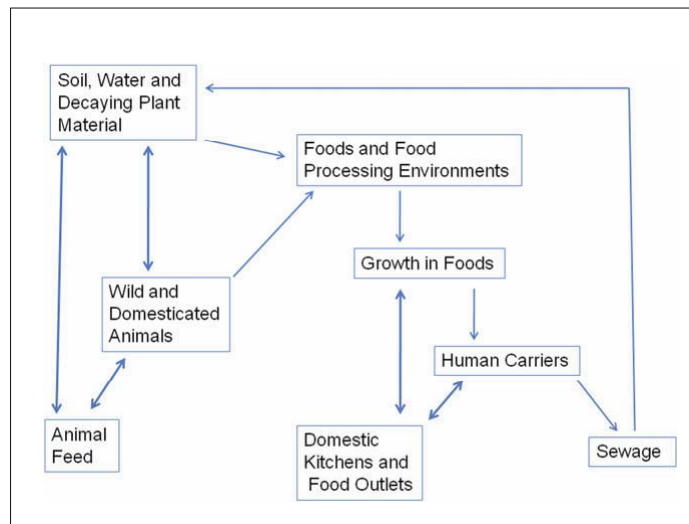
Gram positivo, anaerobio facultativo, psicótrofo

Ubicuo (tierra y agua)  
Sobrevive en condiciones salinas elevadas (20%)  
y baja Aw (0,91)



12 serotipos 1/2b, 3b, 4b, 4d, 4e

## Rutas de diseminación



Swaminathan & Gerner-Smidt, 2007

## Breve repaso histórico

- ◆ *Listeria monocytogenes* fue descrita por primera vez en 1926 cuando fue aislada de conejos enfermos con un nivel de monocitos anormalmente elevado (Murray et al. 1926)
- ◆ Se le designó originalmente *Bacterium monocytogenes*. Más tarde, 1941, en honor a Lord Lister, se le cambió el nombre por el de *Listeria monocytogenes*
- ◆ provoca infecciones asociadas al consumo de alimentos contaminados: **listeriosis**
- ◆ Los síntomas aparecen al cabo de 2-90 días después y se convierten en graves para los grupos de riesgo.
- ◆ El primer brote descrito se remonta al 1981 en Canadá (ensalada de repollo), 41 casos y 18 muertes (pral. embarazadas y neonatos)

Table 1. Selected outbreaks of listeriosis within North America and Europe from 1979 to 2008

Year	Location	Cases (deaths)	Food vehicle	Reference
1979	USA	20 (5)	Raw Vegetables	Ho, Shands, Friedland, Eckind, & Fraser, 1986.
1981	Canada	41 (18)	Coleslaw	Schlech et al., 1983
1983	USA	49 (14)	Pasteurized Milk	Fleming, Cochi, & Macdonald, 1985
1985	USA	142 (48)	Mexican Cheese	Linnan et al., 1988
1983	Switzerland	122 (34)	Soft Cheese	Bula, Bille, & Glauser, 1995
1988	UK	>300	Pate	McLauchlin, Hall, Velani, & Gilbert, 1991
1989	USA	10	Shrimp	Riedo et al., 1994
1992	France	279 (85)	Deli meat	Salvat, Toquin, Michel, & Colin, 1995
1993	Italy	18	Rice salad	Salamina et al., 1996
1994	USA	48	Pasteurized Chocolate milk	Frye & Donnelly, 2005
1994	Finland	5	Smoked Trout	Lyytikäinen et al., 2006
1997	Italy	1556	Corn and Tuna Salad	Aureli et al., 2000
1998	USA	105	Hot Dog	Graves et al., 2005
1999	USA	2	Deli Meat	Centers for Disease Control and Prevention (CDC), 1999
1999	USA	5	Deli Meat	de Valk et al., 2001
1999	USA	4	Hot Dog	Kathariou et al., 2006
2000	USA	30	Deli Meat	Olsen et al., 2005
2000	USA	13	Queso Fresco	MacDonald et al., 2005
2001	USA	6	Deli Meat	Gottlieb et al., 2006
2001	Japan	38	Cheese	Makino et al., 2005
2002	USA	54	Deli Meat	Gottlieb et al., 2006
2003	USA	12	Queso Fresco	Moreno-Enriquez et al., 2007
2003	USA	3	Unknown	Varma et al., 2007
2004–2007	USA	135 (22)	Queso Fresco	Moreno-Enriquez et al., 2007 Conly & Johnston, 2008
2006	Switzerland	8 (3)	Tomme Cheese	Bille et al., 2006
2007	USA	5 (3)	Pasteurized Flavored Milk	Cumming et al., 2008
2008	Canada	65 (20)	Deli Meats	Anon, 2008
2008	Canada	23(1)	Soft Cheese	Anon, 2008

Warriner & Namvar, 2009

## L. monocytogenes en productos cárnicos RTE

### Major Reported Foodborne Listeriosis Outbreaks:

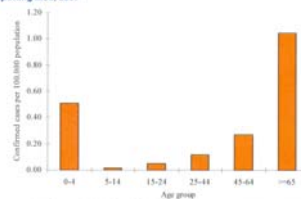
Table 2: Listeriosis Outbreaks Related to Meat and Poultry Products

Year	Location	Invasive/ Non-invasive	Number of cases (deaths)	Foods	References
1987-1989	United Kingdom and Ireland	Invasive	355 (94)	Pâté	McLauchlin <i>et al.</i> , 1991; Farber and Peterkin, 2000
1990	Australia	Invasive	11(6)	Pâté	Watson and Ott, 1990; Kittson, 1992
1992	France	Invasive	279 (85)	Jellied pork tongue	Goulet <i>et al.</i> , 1993; Jacquet <i>et al.</i> , 1995; Salvat <i>et al.</i> , 1995
1993	France	Invasive	39 (12)	Pork rillettes (pâté-like RTE meat)	Goulet, 1995; Goulet <i>et al.</i> , 1998
1998-1999	U.S.A.	Invasive	108 (14)	Meat frankfurters	Anonymous, 1998; Anonymous, 1999a; Mead <i>et al.</i> , 2006
1999	U.S.A.	Invasive	11	Pâté	Anonymous, 1999b
1999-2000	France	Invasive	10 (3)	Rilletes (pâté-like RTE meat)	de Valk <i>et al.</i> , 2001; Swaminathan <i>et al.</i> , 2007
1999-2000	France	Invasive	32 (10)	Jellied pork tongue	Dorozynski, 2000; de Valk <i>et al.</i> , 2001; Swaminathan <i>et al.</i> , 2007
2000	U.S.A.	Invasive	30 (7)	Deli turkey meat	Hurd <i>et al.</i> , 2000; Olsen <i>et al.</i> , 2005
2000	Australia	Non-invasive	31	RTE corned beef and ham	Sim <i>et al.</i> , 2002
2001	U.S.A.	Non-invasive	16	Precooked sliced turkey	Frye <i>et al.</i> , 2002
2002	U.S.A.	Invasive	54 (8)	Sliceable turkey deli meats	Anonymous, 2002; Gottlieb <i>et al.</i> , 2006
2008	Canada	Invasive	57 (22)	RTE deli meats	PHAC, 2008

<http://www.hc-sc.gc.ca>

## Listeriosis. Grupos de riesgo

Figure L12. Age-specific distribution of reported confirmed cases of human listeriosis, TESSy data for reporting MSs, 2007



Source: All EU/MSs except CY, MT, PT and RO (N = 1,556)

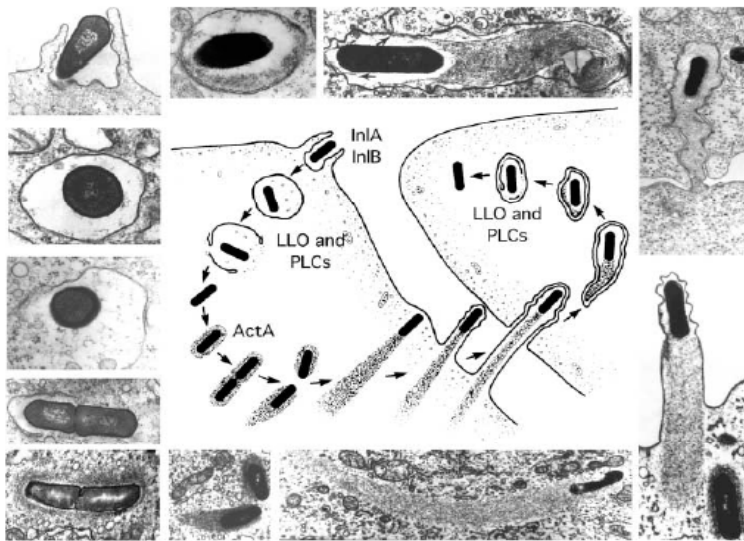
- Niños pequeños
- Mujeres embarazadas
- Tercera edad (> 65 años)
- Personas con sistema inmune deprimido (SIDA, cancer,...)

❖ Dosis infectiva ? >100 UFC

❖ Las personas con un sistema inmune en buen estado , generalmente no sufren la enfermedad.

❖ 15-25% de las personas infectadas fallece!





*L. monocytogenes* tiene capacidad de multiplicarse en células de diferentes órganos y puede migrar de una célula a otra, "escapando" así del sistema defensivo del huésped

## Human listeriosis in the EU

◆ Datos EFSA (2011)

En 2009 se confirmaron:

198.252 Campilobacteriosis

108.614 Salmonelosis

3.573 *E.coli* VTEC

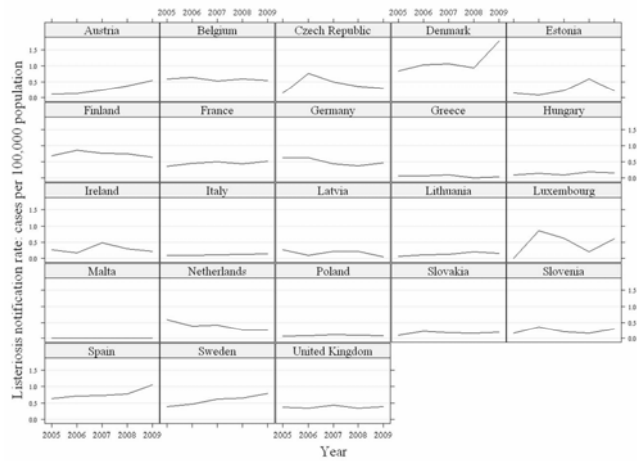
**1.645 Listeriosis**

◆ En general, el total de casos confirmados de listeriosis se ha visto incrementado los últimos años. 19% vs 2008.

◆ Muertes humanas en 2009:

***L. monocytogenes* 270**, *Salmonella* 60, *Campylobacter* 40.

### Notification rates of reported confirmed cases of listeriosis in human per MS (2005-2009)



EFSA Journal 2011;9(3):2090

### Listeriosis en la UE

- Alimentos “tradicionalmente” implicados en brotes de listeriosis: quesos de pasta blanda, pâté, pescado ahumado, deli meats, vegetales crudos...



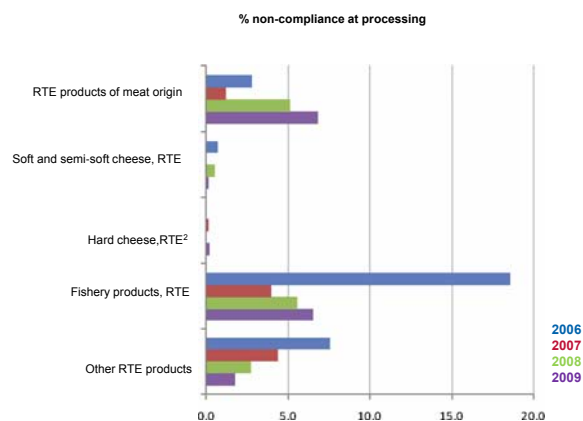
- Alimentos “nuevos” descritos: melon, humus



## EFSA opinion on *Listeria* in RTE foods

- Most listeriosis cases are due to foods markedly above the 100 cfu/g limit.
- Compliance of RTE foods to limits of “below 100 cfu/g” or “absence in 25 g” at consumption would both lead to very low numbers of listeriosis cases.
- The impact on public health depends whether levels markedly above 100 cfu/g are reached
- As the application of MC is only one of several management activities to ensure that RTE foods are of low risk for humans, application of GHP in combination with HACCP should be consistently applied to minimise the initial contamination at manufacturing level, and/or reducing the potential for growth of *L. monocytogenes*.
- The chill chain especially at the domestic level and dietary and food storage advice (particularly for the elderly) should be improved to reduce the risk of listeriosis.

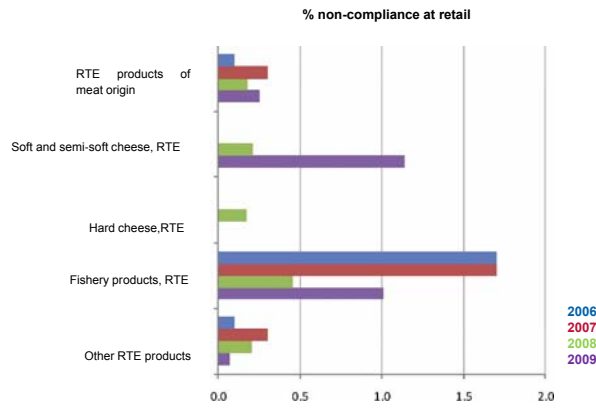
### Proportion of single samples at processing in non-compliance with EU *L. monocytogenes* criteria, 2006-2009



Note: RTE: ready-to-eat products. Data are only presented for sample size  $\geq 25$ .

<sup>2</sup>. In 2006, there were no investigations with 25 samples or more reporting results for evaluation of non-compliance in hard cheese.

**Proportion of single samples at retail<sup>1</sup> in non-compliance with EU *L. monocytogenes* criteria, 2006-2009**



Note: RTE: ready-to-eat products. Data are only presented for sample size  $\geq 25$ .  
1. Retail include data with unspecified sampling stage.

**Prevención**

❖ *L. monocytogenes* prefiere ambientes fríos y húmedos, y aventaja, en dichas condiciones, a otros microorganismos.



Frecuente en plantas de procesamiento de alimentos

Table 3. Prevalence of *Listeria monocytogenes* within processing facilities within North America and Europe

Facility	Prevalence
Cheese processing	8%
Milk processing	2.3%
Ice cream	6%
Beef processing	28–92%
Poultry processing	13.3%
Fish processing	12.8%
Domestic refrigerators	20%

Taken from Kornacki & Gulter, 2007.

- ❖ Mantener una correcta higiene y desinfección. Evitar biofilms. Minimizar aerosoles → Ambiente seco
- ❖ Educar al consumidor

## Fuentes de contaminación (patógenos)

Tradisausage QLK1CT2002-02240.

Superficies (n=60)

*L. monocytogenes* presencia 10%  
*Salmonella* / *E.coli* O157:H7 no detectadas

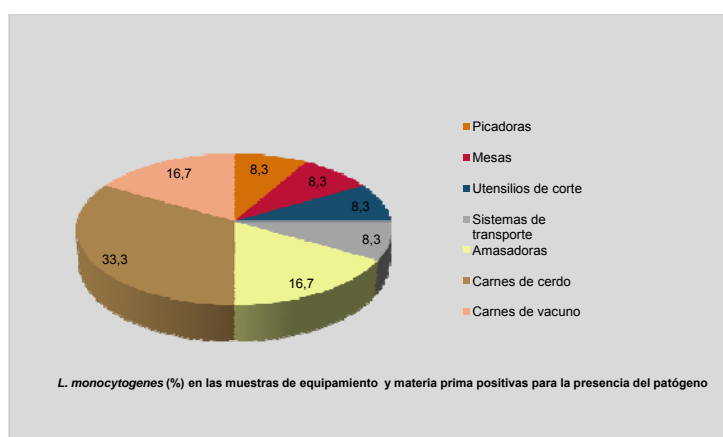
Masa cárnica (n=10)

*L. monocytogenes* en 25g 40%  
*Salmonella* en 25g 30%  
*E.coli* O157:H7 ausencia en 25g

Globalmente (n=314), 54 pequeñas industrias (UE) embutidos tradicionales presentaron *Salmonella* (4,8%) y *L. monocytogenes* (6,7%) contaminación residual de les superficies limpias y desinfectadas (Talon et al. 2007).

## *Listeria monocytogenes*

Detectada en el 10% del equipamiento (limpio y desinfectado) empresas productoras de carne picada y preparados de carne



Garriga y col. 2011

## Compliance with microbiological criteria

The *L. monocytogenes* criteria laid down by Regulation No (EC) 2073/2005, cover primarily RTE food products, and require that:

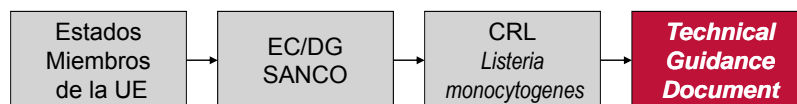
□ in RTE products intended for infants and for special medical purposes *L. monocytogenes* must not be present in 25 g.

□ *L. monocytogenes* must not be present in levels above 100 cfu/g during the shelf life of other RTE products.



for RTE food that support the growth of the bacterium, *L. monocytogenes* may not be present in 25 g at the time of leaving the production plant. However, if the producer can demonstrate, to the satisfaction of the competent authority, that the product will not exceed the limit 100 cfu/g throughout shelf life this criterion does not apply.

## ANTECEDENTES – MARCO LEGISLATIVO

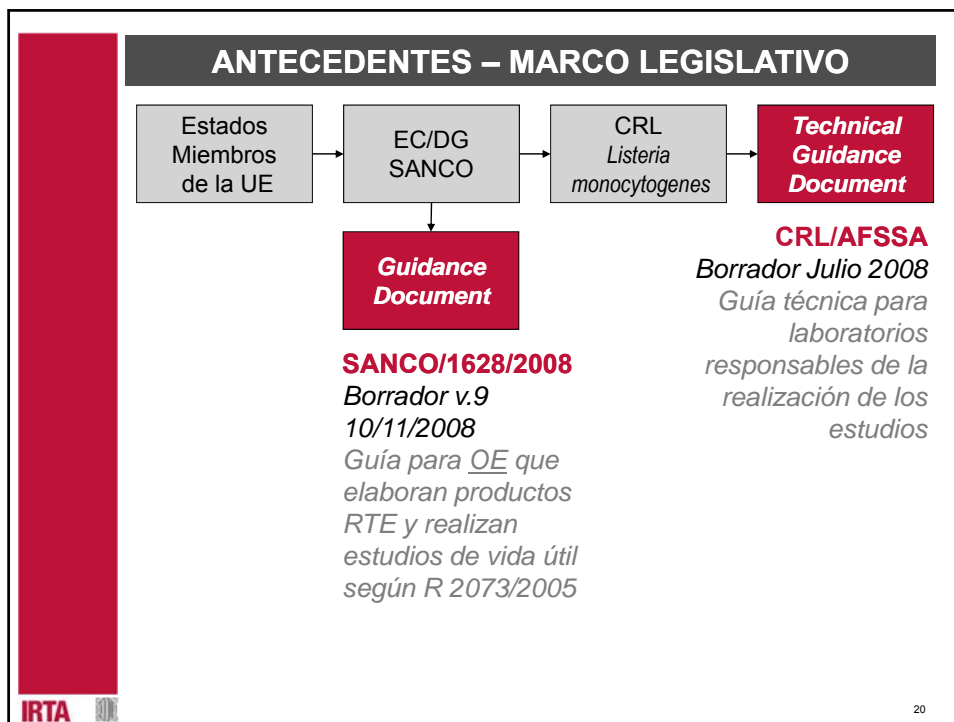


REGLAMENTO (CE) nº 2073/2005 DE LA COMISIÓN Artículo 3  
de 15 de noviembre de 2005

relativo a los criterios microbiológicos aplicables a los productos alimenticios

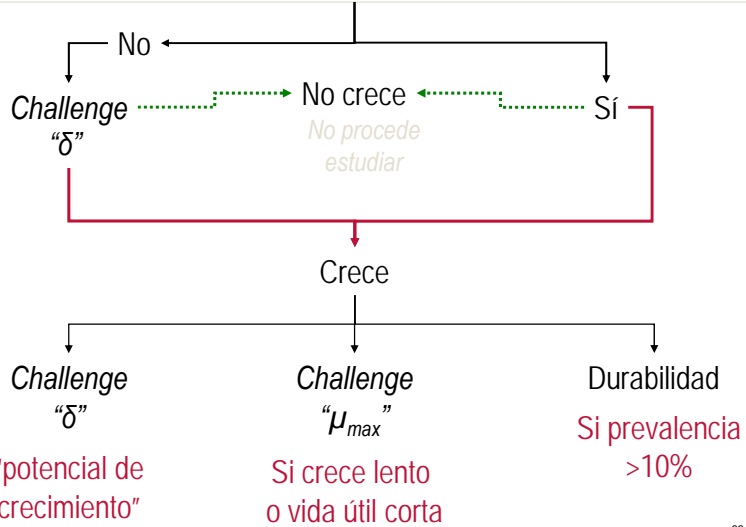
2. Cuando sea necesario, los explotadores de las empresas alimentarias responsables de la fabricación del producto realizarán estudios conforme a lo dispuesto en el anexo II para investigar el cumplimiento de los criterios a lo largo de toda la vida útil. Esto es aplicable especialmente a los alimentos listos para el consumo que puedan permitir el desarrollo de *Listeria monocytogenes* y puedan suponer un riesgo para la salud pública en relación con dicha bacteria.

En las guías de prácticas correctas contempladas en el artículo 7 del Reglamento (CE) nº 852/2004 podrán incluirse directrices para el desarrollo de dichos estudios.



### Selección del procedimiento adecuado

¿El OE tiene datos sobre el crecimiento de LM en el producto?



### Reflejo del esfuerzo industria y el gobierno

- Para implementar BPF y aplicar APPCC para reducir la frecuencia y alcance de *L.monocytogenes*

#### ZONAS DE RIESGO IMPORTANCIA LIMPIEZA Y DESINFECCIÓN

- Para mejorar la cadena de frío durante fabricación, distribución y consumo para reducir la incidencia de abuso de temperatura
- Estimular la comunicación del riesgo, especialmente para los consumidores de riesgo

### Message map addressing Food Industry, Catering Companies, and Restaurants

<b>Listeriosis</b> in humans caused by <i>Listeria monocytogenes</i> in RTE foods is an <b>ongoing problem</b>	<i>Listeria monocytogenes</i> bacteria should be <b>controlled during food processing</b> to avoid contamination of foods	Adequate <b>shelf-life</b> and correct characterisation of the <b>growth potential</b> of RTE foods are crucial to control <i>Listeria</i> at retail and in consumers homes
This is relevant for food industries producing RTE foods and for caterers and restaurants.	Key control measures to minimize and/or prevent the contamination and/or the growth of <i>L. monocytogenes</i> in RTE foods have been described. Several industry guidelines are available.	Determination of an adequate shelf life for a ready-to-eat food is a key factor to control <i>L. monocytogenes</i> .
Codex Alimentarius microbiological criteria for <i>Listeria monocytogenes</i> in RTE foods distinguish between RTE foods where growth of <i>Listeria</i> can occur and those where growth does not occur.	Guidance can be found as well in the <i>Codex Guidelines on the Application of General Principles of Food Hygiene to the Control of L. monocytogenes in RTE Foods</i> (CAC/GL 61-2007) with recommendations for an environmental monitoring program in processing areas.	Prudence is needed for examination of the growth potential of an RTE food to control the risk of consumers' exposure to the pathogen at a later point in time. Guidance on challenge studies is provided, e.g., by the European Commission, the CRL for <i>L. monocytogenes</i> and from food industries.
For RTE foods in which <i>L. monocytogenes</i> growth will not occur under conditions of storage and use that have been established for the product, the microbiological limit is "100 CFU g <sup>-1</sup> ". Unless lack of growth is proven the limit is "Absence in 5 samples of 25g"	For caterers and personnel in restaurants, it is of utmost importance to follow the recommended shelf life given for each RTE food. Moreover, avoidance of cross-contamination and strict adherence to temperature control are crucial to prevent/control <i>Listeria</i> .	If a food's shelf life is dependent on factors delivered by its package, clear information must be provided to consumers about proper handling and the time frame in which the food can be consumed once the package is opened.

Luber et al. 2011

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### Message map addressing Consumers

<b>Listeriosis</b> is a disease that can seriously affect pregnant women, newborns, immunocompromised persons, and the elderly	<i>Listeria monocytogenes</i> bacteria are naturally occurring in the soil and environment and occasionally <b>can be present in foods</b>	<b>Proper food handling prevents listeriosis</b>
Listeriosis is a rare disease caused by the bacterium <i>Listeria monocytogenes</i> . In some cases it can cause serious, potentially life threatening complications.	For the majority of people, <i>Listeria</i> will only cause disease when it is present in high numbers in a food. Cooking procedures kill the bacterium, but it can be potentially present in raw foods and certain ready-to-eat foods	Whereas food industry and caterers take specific care to keep foods free of <i>Listeria</i> , proper food handling in the home is necessary as well to help prevent listeriosis.
Listeriosis is a food-borne disease, which is non-transmissible from person to person.	<i>Listeria</i> bacteria can grow and multiply in certain foods even if these are under refrigeration.	Key factors for controlling <i>Listeria</i> in foods are maintaining an appropriate refrigeration temperature in fridges and following shelf life/cooking and storage recommendations given on food packages.
When detected at early stage, treatment of listeriosis can prevent complications. Pregnant women with any flu-like symptoms should consult a doctor, because <i>Listeria</i> can cause premature delivery, miscarriage, or foetal death.	People in high-risk groups, e.g., those who are immunocompromised, should avoid eating certain ready-to-eat foods, unless they are further cooked. These include all types of non-dried deli meats, pâtés (non-canned), soft cheeses, smoked fish and crustaceans.	Basic rules of kitchen hygiene help as well in preventing listeriosis. Examples are avoiding cross-contamination and regular cleaning of refrigerators.

Luber et al. 2011. Controlling *Listeria monocytogenes* in ready-to-eat foods: Working towards global scientific consensus and harmonization - Recommendations for improved prevention and control.

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## DEMANDAS DE LOS CONSUMIDORES

Vida útil más larga

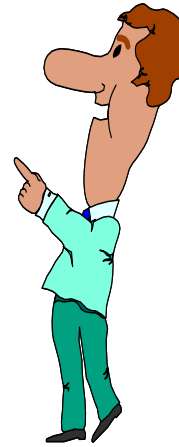
Sin conservantes químicos

Productos ligeros y suaves

Poco ácidos

Sin azúcares

Bajo contenido en grasas



↓  
¿ PERDIDA DE PROTECCIÓN EN PROCESOS SUAVES ?

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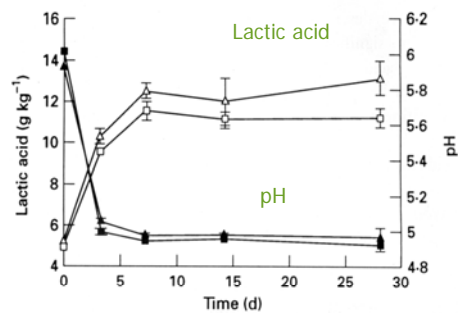
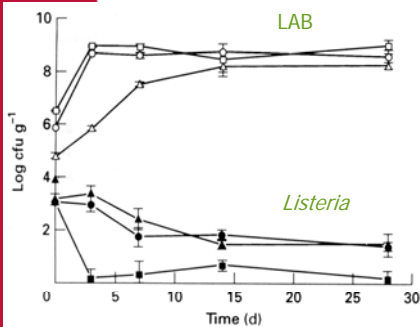
## Nuevas tecnologías de conservación

- La bioconservación
  - cultivos iniciadores bac+
- Envasado activo antimicrobiano
  - bacteriocinas
- Las altas presiones hidrostáticas

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## CI bioprotectores (bac+)



Treatments:  
 Control (▲)  
*Lact. curvatus* CTC371 Bac- (●)  
*Lact. sakei* CTC494 Bac+ (■)

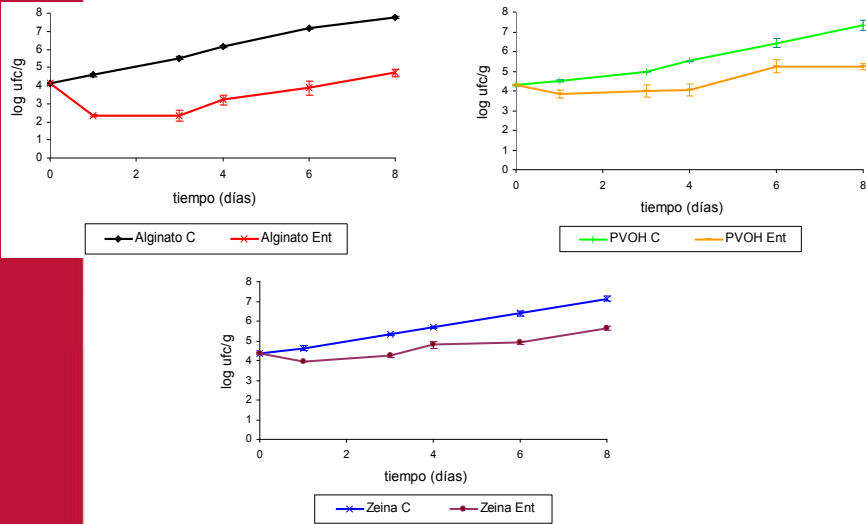
Treatments:  
*Lact. curvatus* CTC371 Bac- (▲)  
*Lact. sakei* CTC494 Bac+ (■)

Values are the average of three experiments. *Listeria* counts are given in log MPN/g

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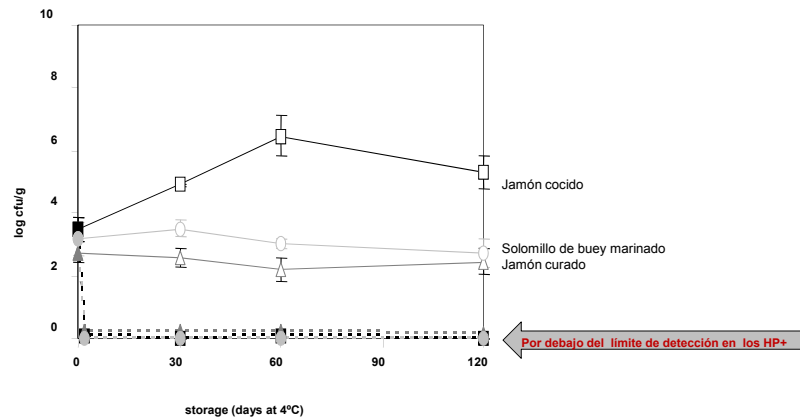
(Hugas et al., 1995)

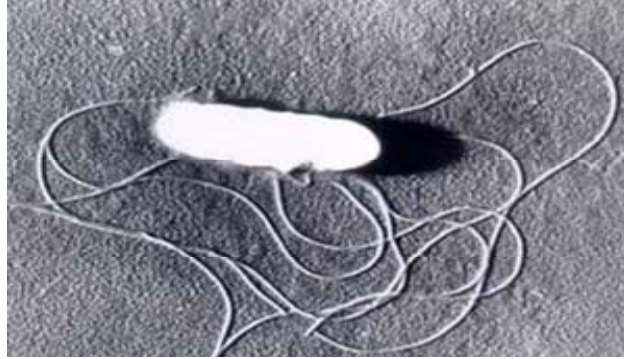
### L. monocytogenes en jamón cocido loncheado (6°C) envasado en láminas con enterocina incorporada



### Altas presiones hidrostáticas

L. monocytogenes en productos cárnicos loncheados, inoculados, sin tratar y tratados por alta presión (600 MPa 6 min)





Moltes gràcies per la seva atenció

*Listeria monocytogenes:*  
Prevençió i control  
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