



Thought related to the increase of listeriosis in Europe

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EU RL for *Listeria monocytogenes*

The presentation deals with:

- ❖ *Listeria* and listeriosis cases
- ❖ Reasons for the increase of listeriosis cases
- ❖ Potential studies
- ❖ Preventive measures

Listeria

It contains 8 species.

❖ *L. monocytogenes*

❖ *L. innocua*

❖ *L. ivanovii*

❖ *L. seeligeri*

❖ *L. welshimeri*

❖ *L. grayi*

❖ *L. rocourtiae*

❖ *L. marthii*

Listeria monocytogenes



- Gram-positive, non-spore forming bacteria.
- *L. monocytogenes* is psychrotrophic.
- *L. monocytogenes* can develop in difficult conditions:
 - ✓ temperature: -2°C
 - ✓ pH: 4.2
 - ✓ a_w : 0.93
- *L. monocytogenes* has considerable surface adhesion abilities.
- *L. monocytogenes* can be found in many foods.

Listeriosis

- ❖ Zoonotic disease.
- ❖ Transmitted to humans by foods.
- ❖ Incubation: from 2 days to 3 months (on average: 1 month).
- ❖ Listeriosis can cause:
 - bacteraemia, septicaemia
 - infections of the central nervous system
 - maternal-foetal infections that can lead to:
 - miscarriage
 - premature birth
 - infection in the newborn infant.

It can cause gastroenteritis, although this is rare.

- ❖ Lethality is high: around 20%.
- ❖ Asymptomatic carriage is estimated to be between 1 and 20% .

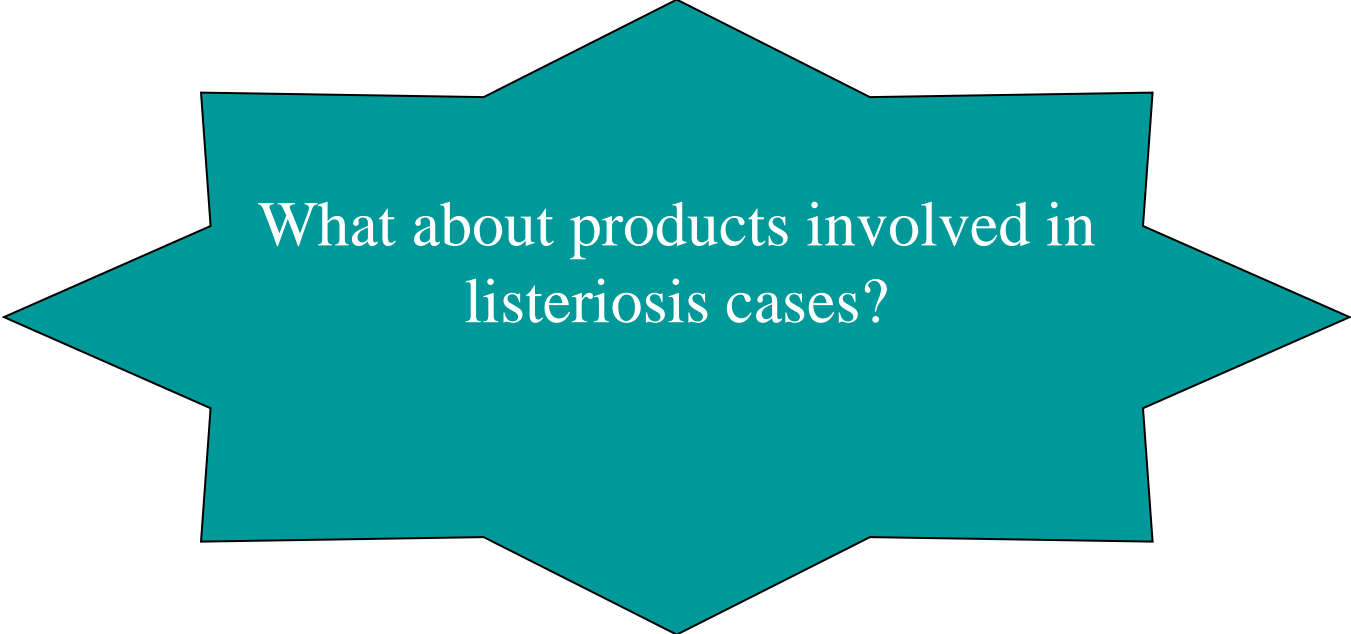
Population groups at risk

❖ People with a compromised immune system:

- Pregnant women
- Elderly people
- Patients (AIDS, cancers, dialysis patients, etc.)
- People suffering from cirrhoses
- ...

Diagnosis, treatment

- Diagnosis: made from clinical samples.
- Treatment: based on antibiotics.
- Antibiotics resistance: rare.
- No vaccine.



What about products involved in
listeriosis cases?

Milk products implicated in listeriosis cases

(milk, icecreams, cheeses, butter)

Country	Product implicated	Thermal treatment	Year(s)
Germany	Milk ★	Raw	1949-57
USA	Milk ★	Pasteurised	1983
Switzerland	Vacherin Mont D'Or ★	Raw, heat treated	1983-87
USA	Soft cheese ★	Pasteurised	1985
England	Soft cheese ★	-	1986
Belgium	Camembert ★	-	1986
USA	Butter ★	-	1987
England	Anari (soft cheese) ★	Raw	1988
Luxembourg	Camembert ★	-	1989
Belgium	Ice cream ★	-	1989
Denmark	Blue cheese ★	-	1989-90
USA	Chocolate milk ★	Pasteurised	1994
France	Brie de Meaux ★	Raw	1995
France	Livarot Pont-L'évêque ★	Raw	1997
France	Epoisses ★	Raw	1999
Finland	Butter ★	Pasteurised	1998-99
USA	Soft cheese ★	Raw	2000-2001
Japan	Washed rind soft cheese ★	-	2001
Sweden	Soft cheese ★	-	2001
Canada	Cheese ★	Raw	2002
United States	Mexican type cheese ★	-	2003
United Kingdom	Butter ★	-	2003
Switzerland	Soft cheese ★	Pasteurised	2005
USA	Milk ★	Pasteurised	2007







Delicatessen products implicated in listeriosis cases

(pâtés, sausages, ready-to-eat foods)

Country	Products implicated	Year(s)
United Kingdom	Pâté ★	1987-89
Australia	Pâté ★	1990
France	Jellied pork tongue ★	1993
France	Rillettes (potted meat) ★	1993
USA	Hot dog ★	1998-99
USA	Delicatessen meat ★	1999
France	Rillettes ★	1999-2000
France	Jellied pork tongue ★	1999-2000
USA	Turkey meat (RTE) ★	2000
USA	Turkey meat (RTE) ★	2002
France	Sausage spread ★	2002
France	Mortadella ★	2003
Canada	RTE meats ★	2008

Seafood products implicated in listeriosis cases

(shellfishes, crustaceans, gravad fish)

Country	Products implicated	Year(s)
New Zealand	Shellfish–Raw fish 	1980
USA	Shrimp 	1989
Australia	Smoked mussels 	1991
New Zealand	Smoked mussels 	1992
Sweden	Marinated trout (gravlax) 	1994-95
Canada	Crab 	1996

Vegetables implicated in listeriosis cases

(raw vegetables)

Country	Products implicated	Year(s)
USA	Frozen vegetables	-
USA	Salad	1976
Australia	Raw vegetables	1981
Canada	Coleslaw	1981

Other foods implicated in listeriosis cases

(sandwiches and salads)

Country	Products implicated	Year
United Kingdom	Sandwiches ★	1999
United Kingdom	Sandwiches ★	2003
United Kingdom	Sandwiches ★	2004
United Kingdom	Sandwiches ★	2007
Italy	Rice salad ◆	1993
Italy	Sweet corn (and tuna?) salad ◆	1997

A teal-colored starburst shape with a black outline, centered on a white background. The shape has eight points, with the top and bottom points being the most prominent. The text "What about listeriosis cases?" is written in white serif font inside the starburst.

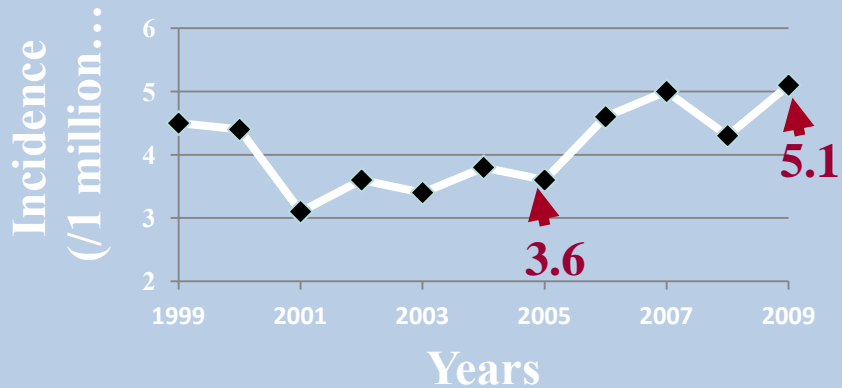
What about listeriosis cases?

Frightening figures

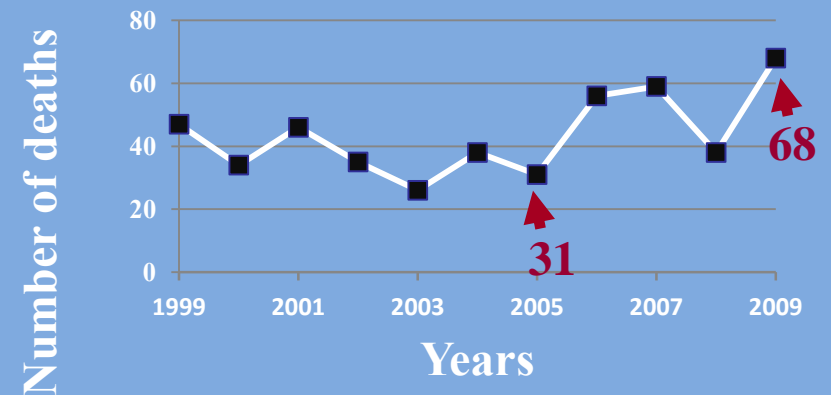
- 22 deaths in 2008 in Canada after consumption of meat products.
- 6 deaths in 2010 in Austria and Germany after consumption of raw milk cheeses.
- 23 deaths in 2011 in USA after consumption of cantaloupe.

In France, the number of listeriosis cases and the number of deaths have increased from 2005 to 2009

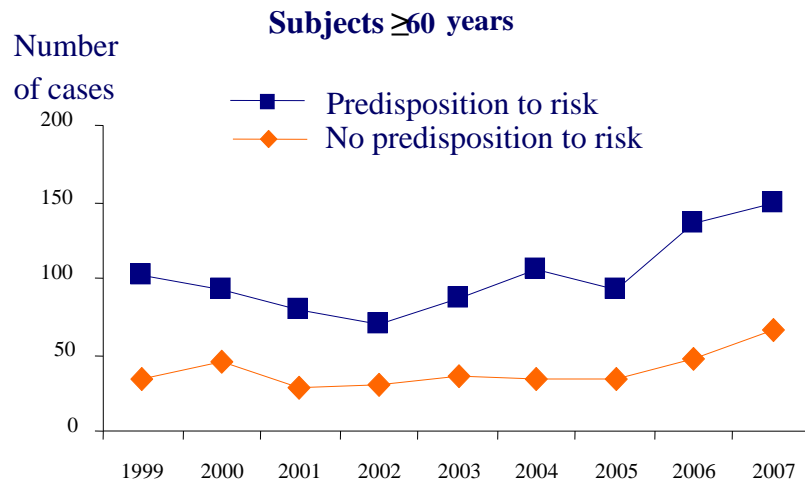
Incidence of listeriosis



Number of deaths



The increase was due to a rise of bacteriemic forms for people over 60 years



Source: InVS (mandatory reporting)




In France, we have looked for the reasons
for the increase of listeriosis cases.

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**What about the distribution
by genoserotype
for strains isolated from patients?**


**Strains isolated
from patients with bacteraemia/septicaemia.**

(Source: NCR for *Listeria*, Institut Pasteur)

	2005	2006	2007
Genosero type IIa	36 (34%)	52 (31%)	61 (34%)
Genosero type IIb	24 (23%)	31 (18%)	31 (17%)
Genosero type IIc	3 (3%)	9 (5%)	12 (7%)
Genosero type IVb	43 (41%)	77 (46%)	72 (40%) 
Genosero type L	0 (0%)	0 (0%)	1 (1%)
New genosero type (Serovar 4b)	0 (0%)	0 (0%)	1 (1%)
Total	106	169	178


**Strains isolated
from patients with an infection of the central nervous system.**

(Source: NCR for *Listeria*, Institut Pasteur)

	2005	2006	2007
Genosero type IIa	6 (10%)	14 (25%)	18 (27%)
Genosero type IIb	6 (10%)	8 (15%)	6 (9%)
Genosero type IIc	2 (3%)	2 (4%)	0 (0%)
Genosero type IVb	44 (76%)	30 (55%)	42 (64%) 
Genosero type L	0 (0%)	0 (0%)	0 (0%)
New genosero type (Serovar 4b)	0 (0%)	1 (1%)	0 (0%)
Total	58	55	66

**Strains isolated
from patients with a maternal-neonatal form.**

(Source: NCR for *Listeria*, Institut Pasteur)

	2005	2006	2007
Genoserotype IIa	5 (14%)	3 (10%)	7 (17%)
Genoserotype IIb	5 (14%)	5 (16%)	6 (14%)
Genoserotype IIc	0 (0%)	0 (0%)	1 (2%)
Genoserotype IVb	25 (71%)	23 (74%)	27 (64%) 
Genoserotype L	0 (0%)	0 (0%)	0 (0%)
New genoserotype (Serovar 4b)	0 (0%)	0 (0%)	1 (2%)
Total	35	31	42

- Genoserotype IVb is the one most frequently implicated.

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**What about the increase of
listeriosis cases in France?**

A working group tried to answer to 16 questions

- Is the notification of listeriosis cases better than before?
- Has the detection of *Listeria monocytogenes* bacteraemias improved?
- Is the increase of listeriosis due to the ageing population?
- Is the number of people with diseases posing a problem?
- Is the increase related to new treatments?
- Has immunity fallen because of a lower exposure?
- Is there emergence of certain clones?
- Is there an increase in strain virulence?
- Is there an increase in antimicrobial resistance?
- Was the exposure to *Listeria monocytogenes* suddenly higher?
- Was there a change leading to an increase of growth of *L. monocytogenes*?
- What about foods with a shelf-life of less than 5 days?
- What about storage temperature in aged people refrigerator?
- Is there modifications of consumption habits?
- Is there consumption of foods that have not been suitably prepared?
- Is the increase a consequence of EU regulation??

Is the notification of listeriosis cases better than before?

In 2001, the notification rate was estimated at 87% [84%-89%]

In 2006, it was estimated to be 92% [91%-94%]

▶ Increase of 6%

❖ Too limited to explain the current rise in listeriosis cases.

Has the detection of *Listeria monocytogenes* bacteraemias improved?

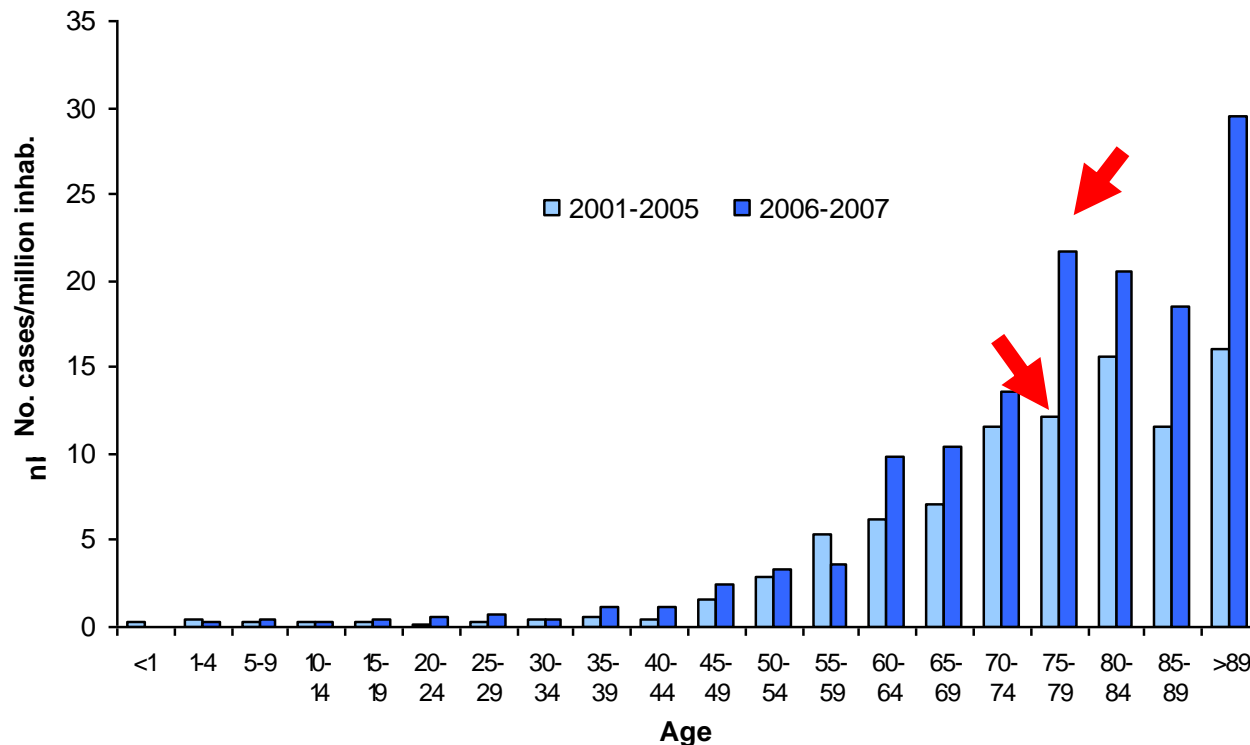
The protocol for sampling blood has changed (transition from a single sample to multiple samples).

Perhaps, it is an improvement.

❖ The level of application of this new protocol is unknown.

Is the increase of listeriosis due to the ageing population?

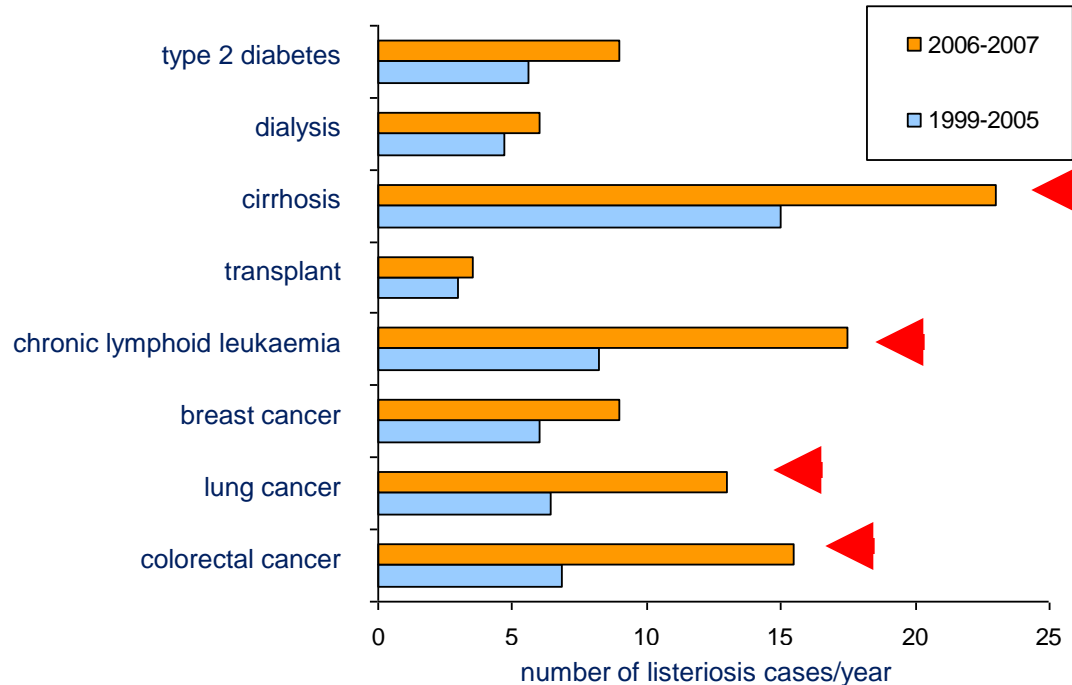
The number of listeriosis cases per million of inhabitants according to the age for 2 periods: after 2006 and before.



❖ For elderly people, there is a big increase for the second period compared with first period.

Is the number of people with diseases posing a problem?

The number of listeriosis cases per year according to some diseases for 2 periods.



❖ The number of listeriosis is specially high for people with cirrhosis, leukaemia, lung cancer, colorectal cancer.

Is the increase related to new treatments?

- The use of **new molecules in chemotherapy**
- and **new “anti-rejection” treatments**
 - causes a prolonged lack of immunity.
- The use of **treatments aiming to reduce gastric acidity**
 - prevents *Listeria monocytogenes* from destruction.

❖ This could contribute to an increase in listeriosis cases. However, this hypothesis has not been confirmed.

Has immunity fallen because of a lower exposure?

Lavi (based on a mathematical model) developed the idea of a decreased immunity related to **lower exposure** (lack of antibodies).

❖ Sustainable immunity (following exposure) to *L. monocytogenes* has not been demonstrated in humans.

Is there emergence of certain clones?

❖ The use of PFGE (pulsed-field gel electrophoresis) did not show the emergence of any new clone of *Listeria monocytogenes* becoming established in France.

Is there an increase in strain virulence?

The laboratory methods used are:

- **Bioassays:** mouse and gerbil. These *in vivo* bioassays cannot be conducted in routine laboratories.
 - ***In vitro* cell cultures**, which assess strain pathogenicity, are a more economical method than bioassays. But it is slow and rarely applied.
- ❖ The use of **PCR to detect proteins and genes** associated with *L. monocytogenes* virulence opens up new opportunities.

Is there an increase in antimicrobial resistance?

L. monocytogenes is naturally susceptible to a wide range of antibiotics (that are active against Gram-positive bacteria).

❖ According to studies performed :

- on human strains (by the NRC for *Listeria*)
- on foodborne strains (by the NRL for *L. monocytogenes*)

→ there has been no increase in antimicrobial resistance (in circulating strains of *L. monocytogenes*).

Was the exposure to *Listeria monocytogenes* suddenly higher?

- Analyses from official controllers...
 - haven't highlighted an increase of the **prevalence** and **level of contamination of foods**.
- Nevertheless, the number of alerts has increased:
 - (270 in 2007 and 336 in 2008)
- ❖ But, it is not enough to explain the whole increase of listeriosis cases.

Was there a change leading to an increase of growth of *L. monocytogenes*?

AFSSA recommended reducing salt intake in the diet (in 2002)



Increase of a_w



Increase the growth of *L. monocytogenes*

- ❖ However, a survey showed a **stagnation in salt content for products such as delicatessen and cheeses** (2003 to 2008).

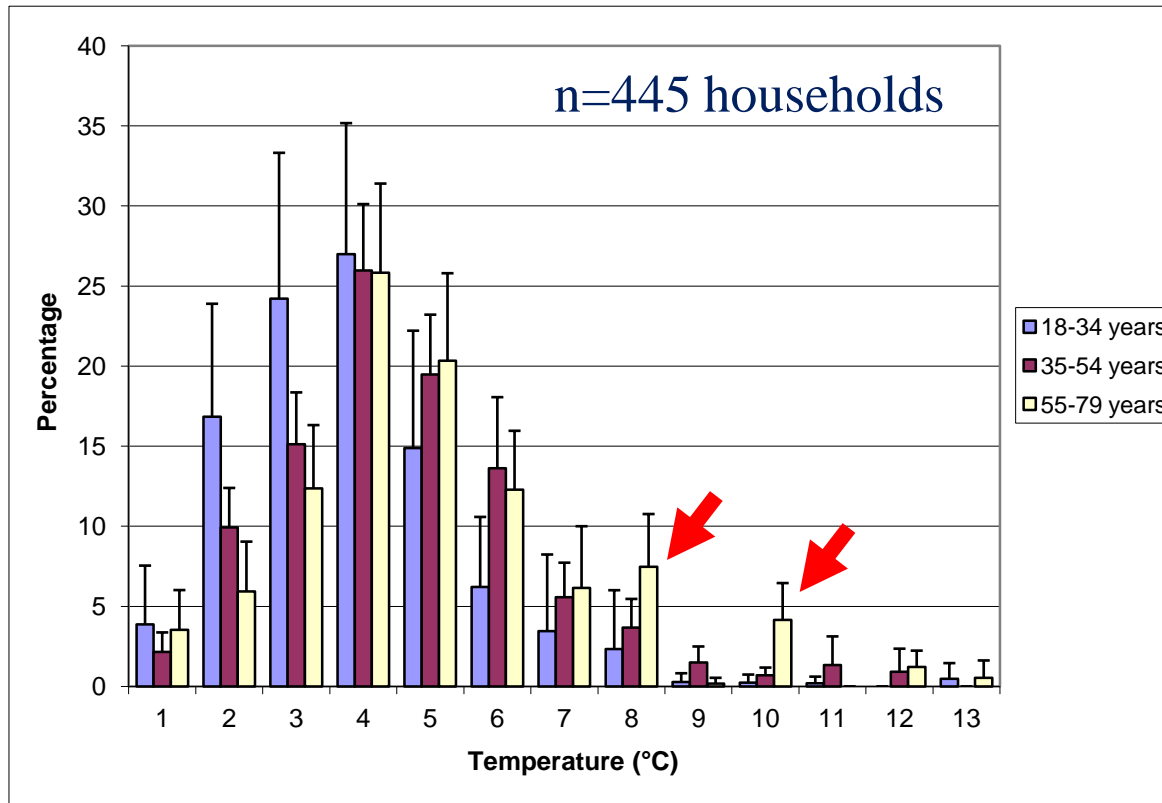
What about foods with a shelf-life of less than 5 days?

Regulation (EC) no. 2073/2005 has classified foods with a shelf-life of less than 5 days as products in which growth of *L. monocytogenes* is not possible.

❖ For these products we haven't observe any increase in foodborne illness outbreaks.

What about storage temperature in aged people refrigerators?

The refrigerator temperatures according to the age (INCA study/2006 – 2007)



❖ The higher temperatures are observed mostly in aged people refrigerators.

Is there modifications of consumption habits?

That's to say:

- Consuming without cooking products normally intended to be eaten cooked.
 - Consuming uncooked foods (Carpaccio....)
- ❖ A survey showed that these habits exist among aged people but also among young people.

Is the increase a consequence of EU regulation?

The Food Law has given a greater responsibility to food producers (in terms of hazard control).

What happened during the transition period?

- ❖ We noticed **no increase in any other diseases**, then this assumption about the impact of EU regulation on the increased listeriosis risk is not confirmed.

To conclude

There is no single assumption that can explain
the increased listeriosis risk.

This demonstrates a lack of knowledge.



**We tried to find
potential areas of study**

Potential areas of study

It would be interesting to get information on consumption habits

- Habits of people aged over 65 years.
- Habits about exceeding Use-By Date.
- Information about social class and its evolution.
- Information about treatments related to the listeriosis risk.

Potential areas of study

It would be useful to get information on the level of contamination of *L. monocytogenes*

- To include foods posing a risk into surveillance plans.
- To keep an eye on products to be consumed within 5 days.
- To get results from self-inspection at the production stage.
- To obtain data on RTE shelf-life.
- To conduct a survey on the reduction in salt content.

Potential areas of study

It would be necessary to launch studies on:

- The impact of several doses.
- The growth of *L. monocytogenes* in fat products.
- The Food Safety Objective (FSO) for susceptible population.

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**Meanwhile, the best is to take
preventive measures**

Recommendations for producers

- Define the shelf-life of the product at the design stage, taking into account the use by the consumer.
- Validate the shelf-life when the product is placed on the market. Challenge it each time there is a change in the composition of the food or the manufacturing technology.
- Conduct analyses of products at their UBD.
- Indicate the UBD clearly on the packaging.
- Take into account complaints by distributors and consumers.
- Take into account the comments of officers from the control services •

Recommendations for distributors

- Check the temperature of the cabinet before filling it.
- Respect the load limit for products.
- Take maintenance measures.
- Check regularly the temperature of the cabinet and the products.
- Take all necessary measures to avoid cross-contamination of products sold by weight.
- Collect and analyse the results of temperature monitoring and microbiological analyses.

Recommendations for consumers

- When installing the refrigerator

- Do not place the appliance near a source of heat.

- Ensure that ambient air can circulate freely behind the refrigerator.

- When purchasing products

- Adapt the quantities purchased to actual needs.

- If possible, transport refrigerated products in insulated containers.

- When loading the refrigerator

- Clean the refrigerator regularly.
- Remove excess packaging from products.
- Store the most perishable foods (meat and fish, in particular) in the coldest part (between 0 and +4°C).
- Leave space between products to facilitate air circulation.

- When using the refrigerator

- Check the refrigerator's temperature frequently and adjust when necessary.

- To keep the temperature low, limit the openings of the refrigerator.

- When using products

- Protect unpackaged products with films or place them in a container.
- Respect the UBD.
- Ensure that a home-made product is not kept for too long: no more than 3 days.
- Follow the preparation guidelines.
- Ensure that products are consumed rapidly once opened.
- If possible, refrigerate or freeze cooked dishes within 2 hours of preparation.
- For defrosting foods, use the refrigerator or microwave (but never at room temperature).

