



# Interagency Focus on *Listeria monocytogenes* in Delis

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# Food Safety and Inspection Service (FSIS)

The Food Safety and Inspection Service is the *public health* agency in the U.S. Department of Agriculture responsible for ensuring that the nation's commercial supply of meat, poultry, and egg products is safe, wholesome, and correctly labeled and packaged.





## What is *Listeria monocytogenes* (*Lm*)?

- Pathogenic Gram-positive, non-spore forming, rod-shaped bacterium that causes invasive foodborne disease (listeriosis)
- Notorious post-processing contaminant
  - direct contact with a contaminated surface
  - can contaminate food from environmental sources



## What is *Lm*?

- Grows (slowly) at refrigeration temperatures
- Survives a wide variety of conditions (heat, salt, nitrite, acidity, low oxygen)
- Is destroyed by proper sanitation, cooking, pasteurization (at processing establishment) and cooking (in-home)
- Develop resistance after exposure to low pH and high temperatures



## Where does *Lm* come from?

- Common in the environment
  - soil, silage, sewage, dust, water
- Food manufacturing and retail environments, in foods, in the home
- Can be isolated from healthy humans and domestic and wild animals



## *Listeria* in the Food Chain

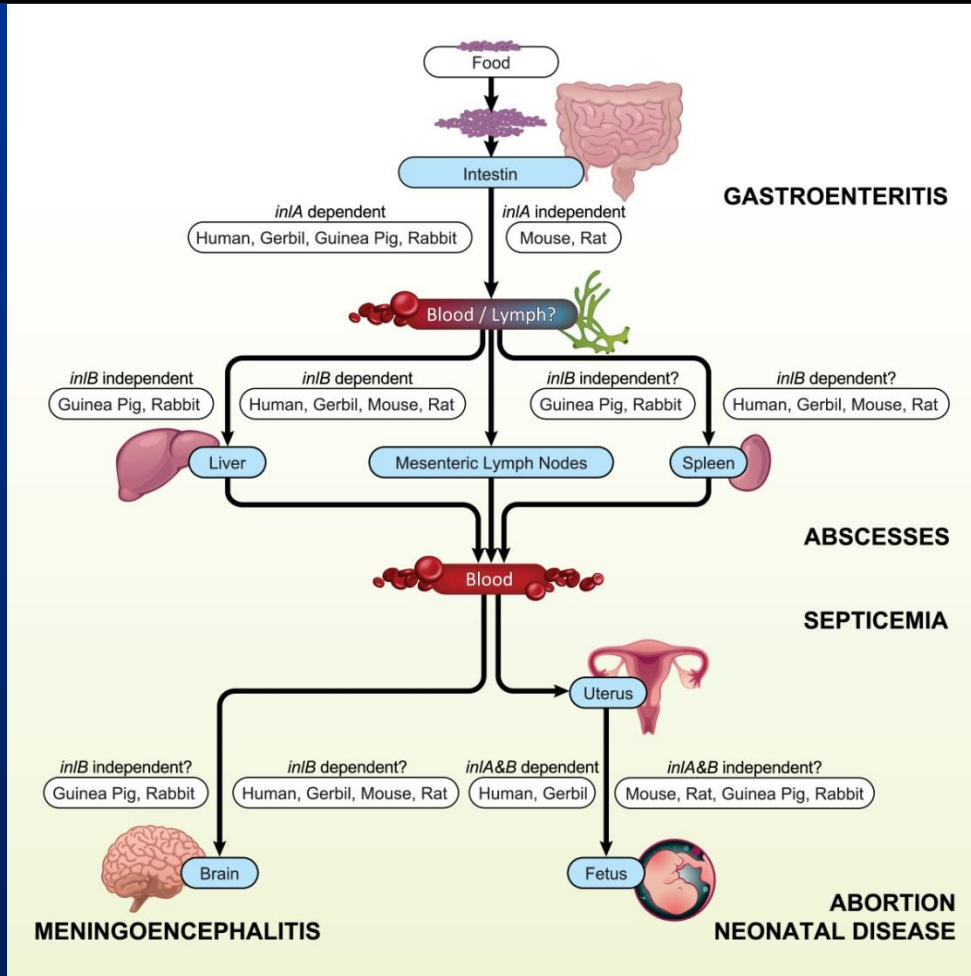
- Production Environment  
↓
- Retail → Consumer Homes  
↓
- Facilities (Hospitals/long term care facilities)



# Listeriosis – Low Morbidity, High Mortality Foodborne Infection

- At risk groups - elderly, immunocompromised adults, pregnant women and their newborn infants
- 94% hospitalization rate
- 15.9% mortality rate
- Accounts for 19% of all food-related deaths in US

# Listeriosis is a very serious clinical disease



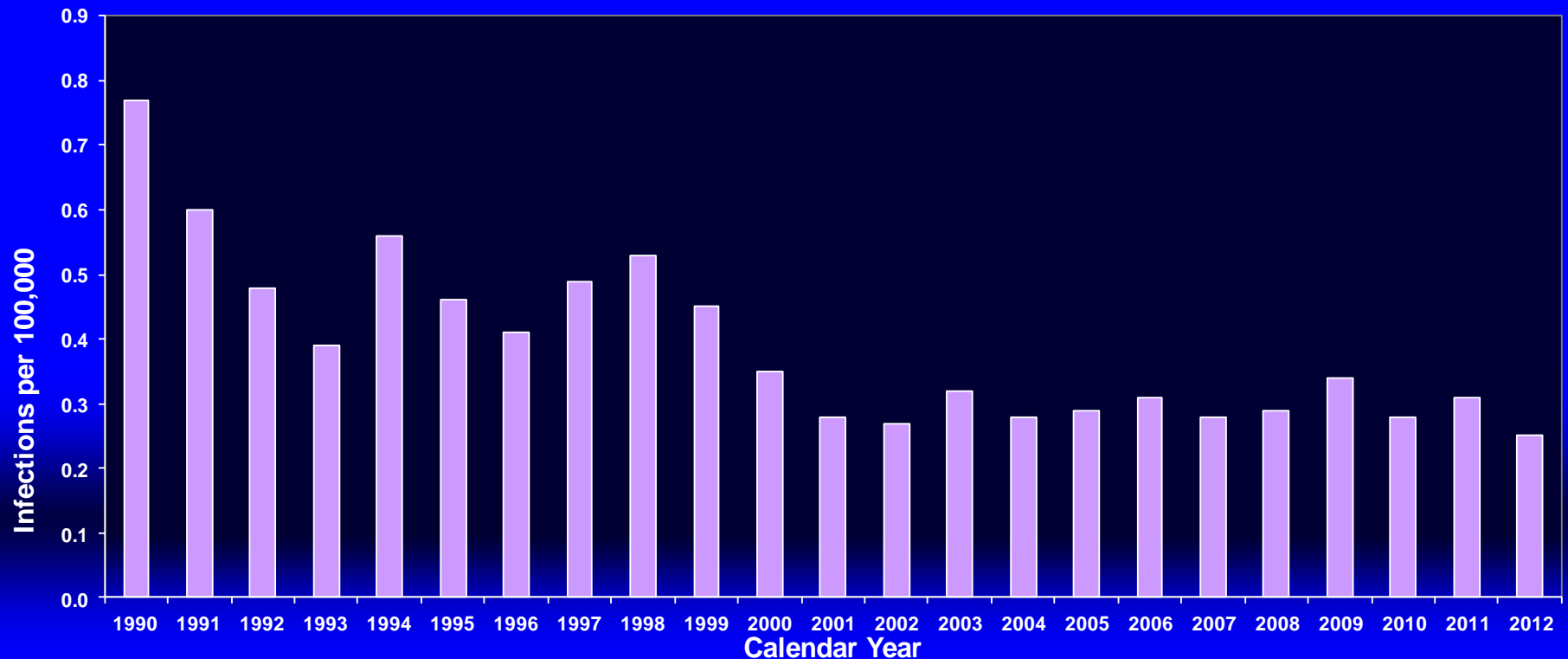
## The clinical picture

- Gastroenteritis
- Septicemia
- Meningitis / encephalitis
- Stillbirth / fetal loss / neonate infected
- Other (e.g., joints, skin)





# Incidence of Listeriosis, 1990 - 2012



Source: CDC; 2012 data preliminary



# Listeriosis Outbreaks: 1998 - 2008

Year	Total no. cases‡	No. deaths	Deaths/Cases (% Mortality)	Food vehicle
<b>1998</b>	<b>108</b>	<b>14</b>	<b>13%</b>	<b>Frankfurters</b>
<b>1998</b>	<b>4</b>	<b>NA</b>	<b>NA</b>	<b>Frankfurters</b>
1999	6	NA	NA	Unknown
<b>1999</b>	<b>4</b>	<b>NA</b>	<b>NA</b>	<b>Frankfurters</b>
<b>1999</b>	<b>5</b>	<b>1</b>	<b>20%</b>	<b>Deli meat</b>
<b>1999</b>	<b>11</b>	<b>NA</b>	<b>NA</b>	<b>Pâté</b>
<b>1999</b>	<b>2</b>	<b>1</b>	<b>50%</b>	<b>Deli meat</b>
2000	13	0	0%	Mexican-style cheese
<b>2000</b>	<b>30</b>	<b>4</b>	<b>13%</b>	<b>Deli meat</b>
<b>2001</b>	<b>28</b>	<b>0</b>	<b>0%</b>	<b>Deli meat</b>
<b>2002</b>	<b>54</b>	<b>8</b>	<b>15%</b>	<b>Deli meat</b>
2003	3	NA	NA	Unknown
2003	12	1	8%	Mexican-style cheese
2005	6	0	0%	Unknown
<b>2005</b>	<b>3</b>	<b>0</b>	<b>0%</b>	<b>Grilled chicken</b>
<b>2005</b>	<b>13</b>	<b>1</b>	<b>8%</b>	<b>Deli meat</b>
2005	12	0	0%	Mexican-style cheese
2006	2	1	50%	Unknown
<b>2006</b>	<b>2</b>	<b>0</b>	<b>0%</b>	<b>Taco or nacho salad</b>
2006	3	1	33%	Cheese
2007	5	3	60%	Milk
2008	5	3	60%	Tuna salad
2008	20	0	0%	Sprouts
2008	8	0	0%	Mexican-style cheese
<b>Total</b>	<b>359</b>	<b>38</b>	<b>11%</b>	

‡Includes laboratory-confirmed and epidemiologically linked cases.

\*NA, no data available.

Adapted from Cartwright *et al.* 2013



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**Tuna Salad**

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# Listeriosis Outbreaks, 2009 - 2011

Year	Multistate	Total Cases*	Consumption Setting	Implicated Food Vehicle
2009	Yes	18	Private homes	Mexican-style cheese
	Yes	8	Private homes	Mexican-style cheese
2010	No	8	Private homes	Hog head cheese (meat)
	No	2	Private homes	Sushi rolls
	No	4	Hospital food service	Undetermined
	No	10	Hospital food service	Pre-cut celery
	Yes	6	Private homes	Mexican-style cheese
2011	No	2	Unknown	Undetermined
	No	2	Private home & restaurant	Chive cheese and ackawi cheese
	Yes	147	Private homes	Whole cantaloupe
	No	2	Private homes	Mexican-style cheese
	Yes	15	Wedding banquets	Aged, blue-veined cheese

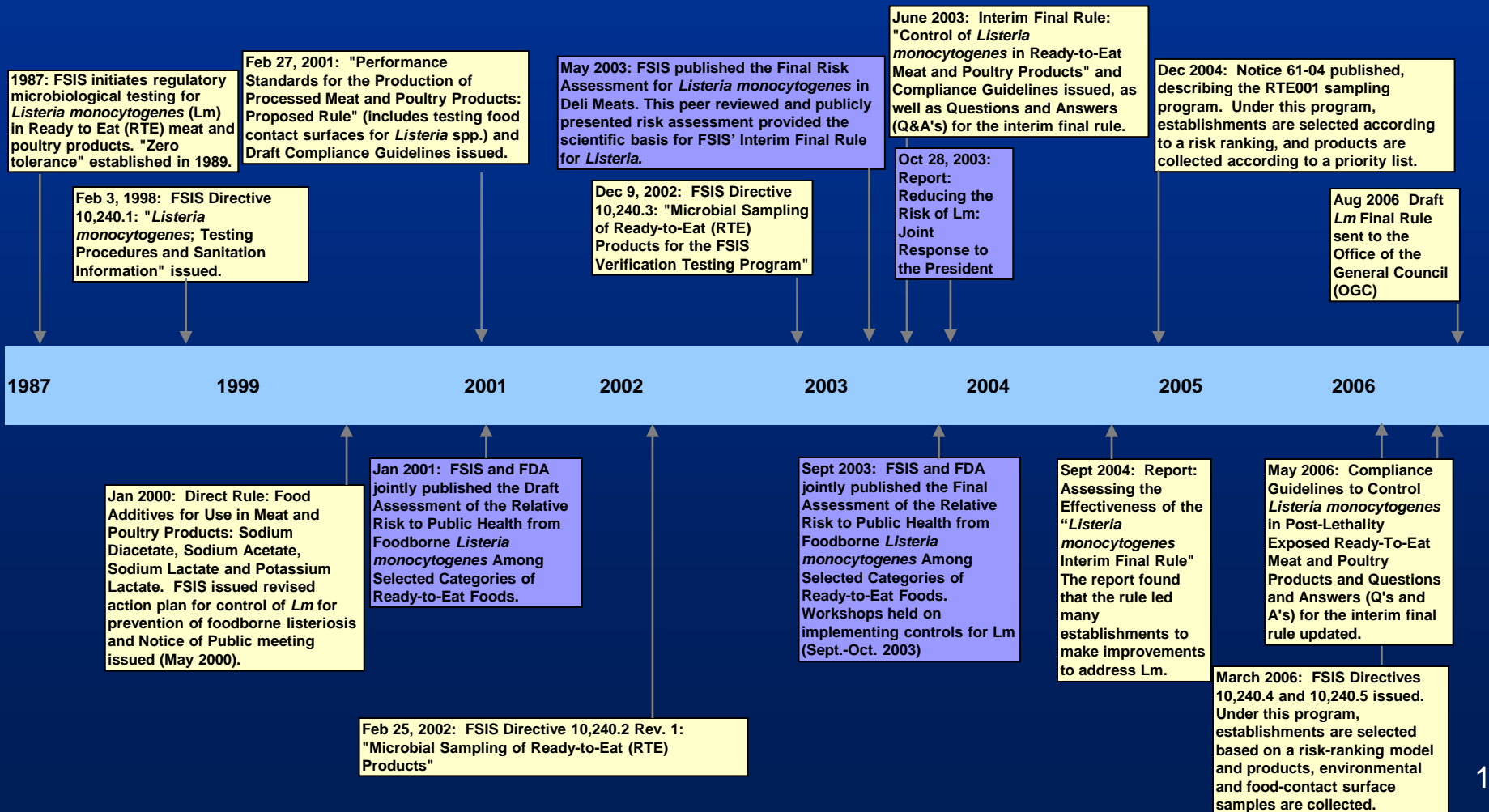


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# Timeline of FSIS Regulations Related to *Listeria monocytogenes*, 1987-2006





# Timeline of FSIS Regulations Related to *Listeria monocytogenes*, 2007-2013

August, 2009: As mandated by OIG, RLM/Food Safety Assessment is to be conducted in every establishment with post-lethality exposure once every four years.

Feb 2009: Revised FSIS Directives 10,240.4, 10,240.5, and 10,300.1 issued. These modified product selection criteria and provided verification instruction for RTE products when disposition occurs off-site, and provided information on collecting product, food contact, and environmental samples during routine risk-based *Lm* (RLM) sampling, and Intensified Verification Testing (IVT) performed in response to positive results from other sampling programs

May 2010: Final Comparative Risk Assessment for *Listeria monocytogenes* in Ready-to-eat Meat and Poultry Deli Meats was published.

January 2, 2012: RLMPROD and INTPROD sample collection increased from 3 to 5 per sampling unit, with testing of five 25-g analytical units. This helps achieve consistency with *Codex alimentarius* RTE product testing guidelines.

Sept 2012: Revised *Listeria* Guideline issued. The revised guideline provides: clarified guidance on meeting the requirements of the *Listeria* Rule, updated technical information regarding *Listeria* controls, detailed instructions on sampling program development, and corrective actions in response to positive sampling results.

May 2013: Draft Interagency Risk Assessment – *Listeria monocytogenes* in Retail Delicatessens made available for public input.

2007

2008

2009

2010

2011

2012

2013

2008: Draft Comparative Risk Assessment for *Listeria monocytogenes* in Ready-to-eat Meat and Poultry Deli Meats was completed. Showed that 83% of listeriosis cases attributed to deli meat are associated with those sliced at retail

June 2009: Public Meeting to announce the Interagency Risk Assessment – *Listeria monocytogenes* in Retail Delicatessens. Public input was requested.

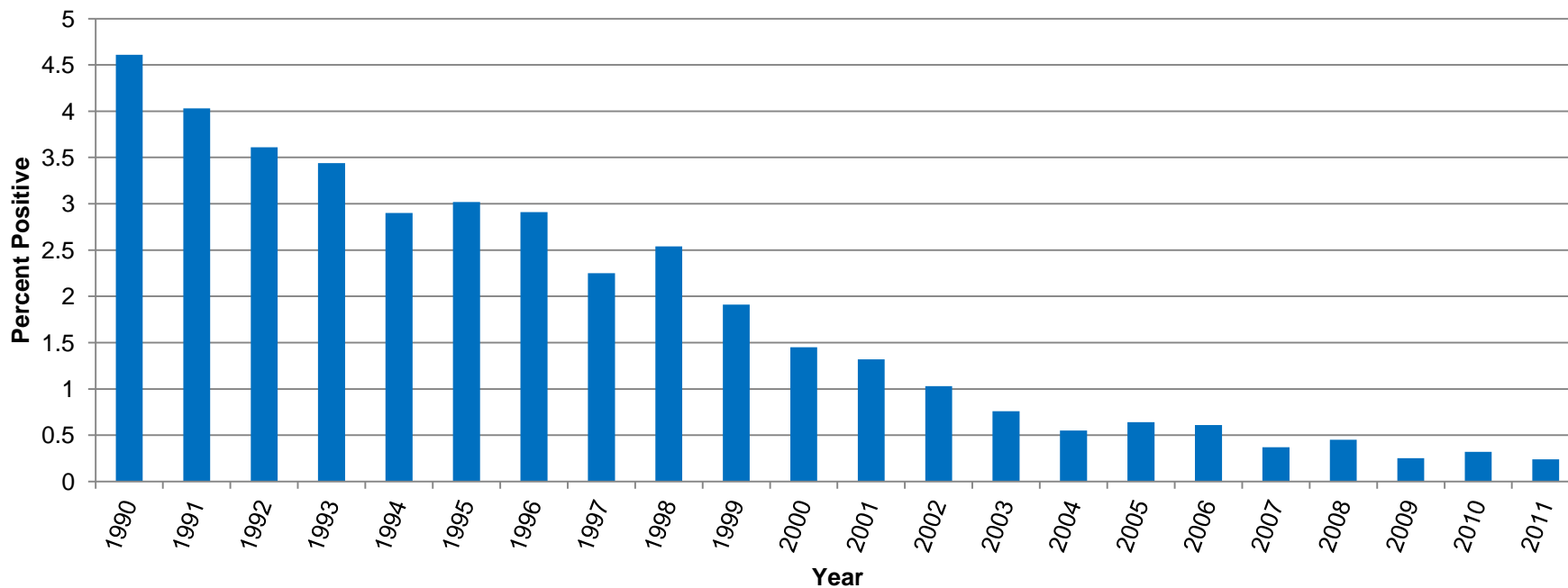
Sept 2010: Results of Data Analysis for the *Listeria monocytogenes* RLM Risk-based Sampling Program Calendar Year 2008 published. Showed that between an establishment's *Listeria* control alternative did affect the number of *Lm* positive in FSIS sampling and that there was a downward trend in the percentage of establishments with at least one *Lm*-positive sample.

March 2013 Revised FSIS Directives 10,240.5 and 10,300.1 issued. These revised directives provide information on ensuring that establishments hold and control product that FSIS has tested for pathogens, compositing product and environmental samples (for RLM), and sampling product treated with High Pressure Processing (HPP).



# *Lm* at Federally FSIS-Regulated Establishments, 1990 - 2011

**FSIS Regulatory Testing – Percent of Ready to Eat (RTE) Products positive for *Lm***



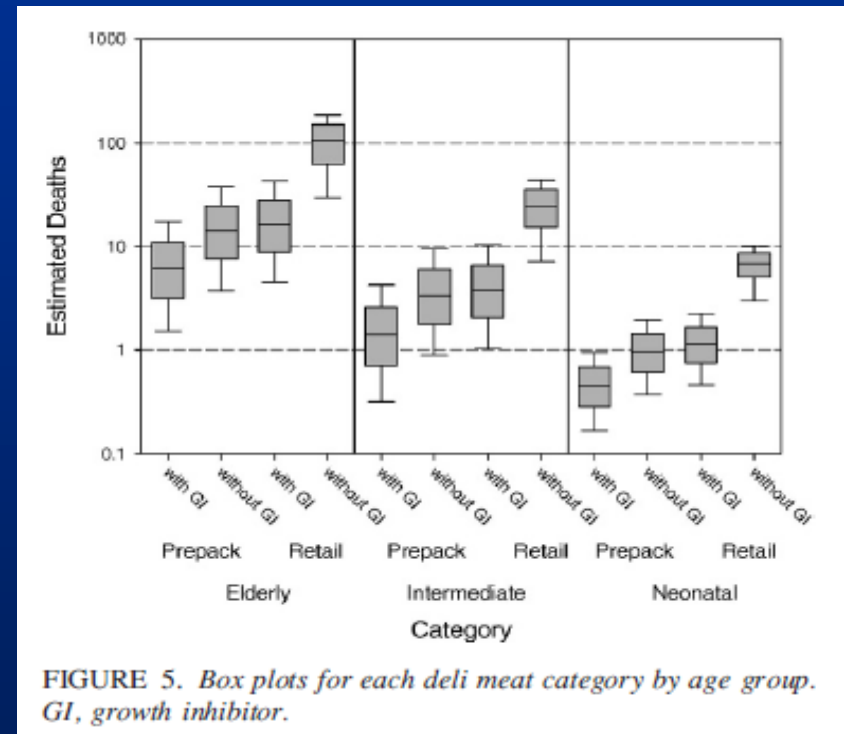


## *Lm* Issues at Retail



## *Lm* at Retail

- FSIS relies on a 2010 Comparative Risk Assessment<sup>1</sup> which estimates that of listeriosis attributed to deli meat, 83% are associated with deli meat sliced and packaged at retail.
- Food surveys - higher rates of *Lm* in deli meats at retail than at manufacturing.



<sup>1</sup>Endrikat et al. (2010). A comparative risk assessment for *Listeria monocytogenes* in prepackaged versus retail-sliced deli meat. *Journal of Food Protection* 73(4): 612-19



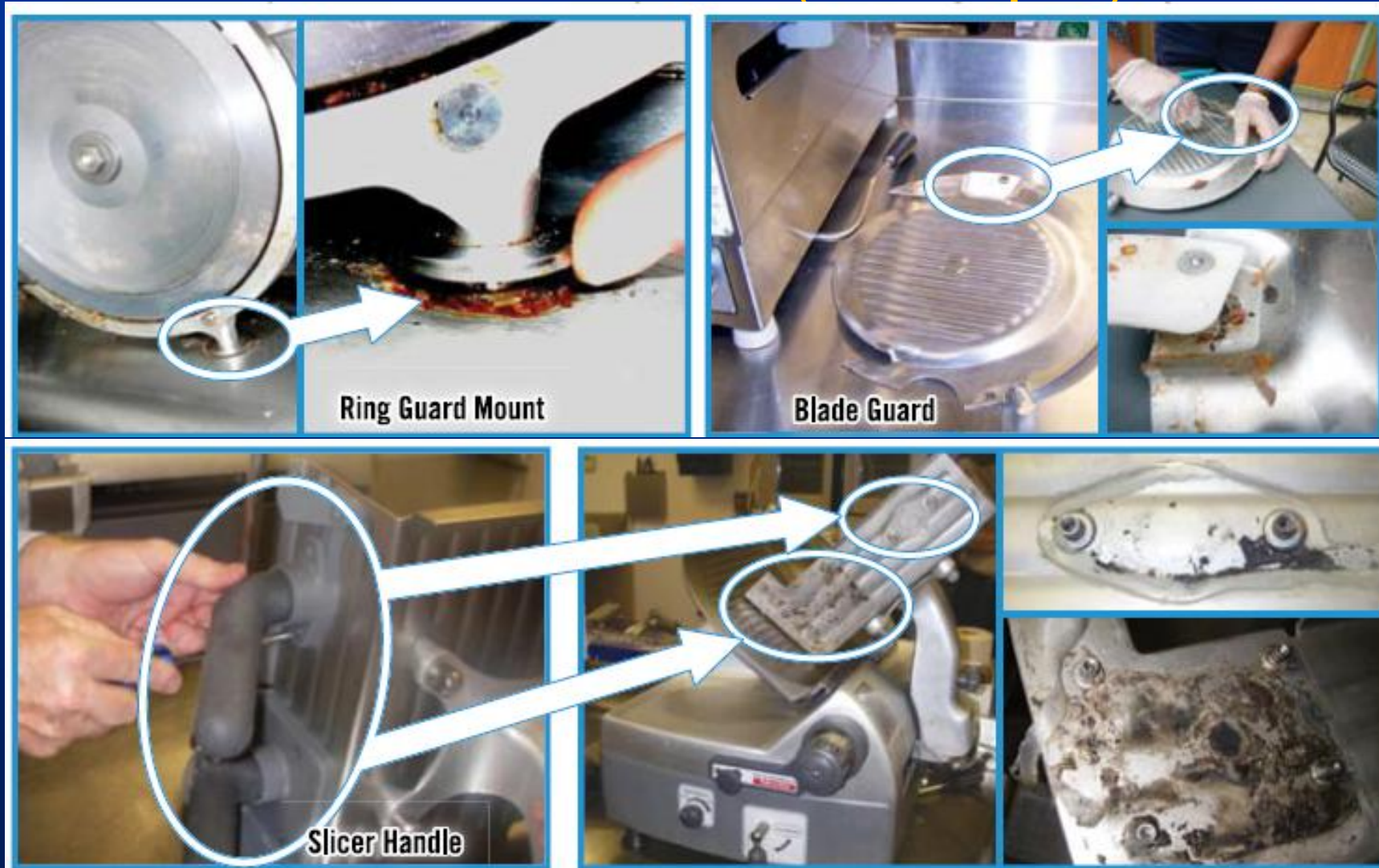
# Contamination at Retail Drives Listeriosis Risk

FSIS comparative risk assessment of  
*L. monocytogenes* in deli meats (2010):

## Highest risk for retail-sliced deli meats:

- Much greater risk than if pre-packaged
- Growth at retail contributes to risk
- Retail – sliced deli meats account for:
  - ~ **70 % of deli-meat associated deaths**
  - ~ **83 % of deli-meat associated illnesses**

# Issues at Retail (Example)





# Interagency Risk Assessment—*Listeria monocytogenes* in Retail Delicatessens

- This risk assessment was a collaborative process
- Members and resources from FSIS and FDA and in collaboration with CDC
- Several academic institutions generated specific data (e.g., Cornell, Virginia Tech, University of Maryland)
- Consumer groups and Industry actively involved throughout (>55 meetings)
- Risk assessment finalized based on independent peer review and public input (Public meeting: May 22, 2013)
- EHS-Net deli study data will provide robust data to update the risk assessment model

## Interagency retail deli risk assessment: Questions & Approaches.

### Risk management questions:

- 1. What practices and conditions lead to increases in *L. monocytogenes* contamination of RTE food products at retail?**
- 2. What is the predicted impact of selected risk management controls on the listeriosis risk?**

### Risk assessment approach:

#### **Fully quantitative risk assessment:**

- Discrete event model
- Tracks bacterial concentrations
- From contamination to consumption
- Models cross-contamination and complexity of retail operations
- Predicts listeriosis risk per serving
- Models sensitivity & uncertainty
- 126 scenarios (6 baseline, 22 'what-if')
- Data sources:
  - Commissioned research studies
  - Published data & models
  - Stakeholder involvement



## Risk Assessment Findings – Impact of Interventions

A combination of intervening steps may be the most promising approach:

- **Prevent *L. monocytogenes* at the source by reducing\* contamination of**
  - incoming product (reduction in predicted listeriosis risk: up to 24%)
  - environment / niches (reduction in predicted listeriosis risk: up to 4.5%)
  
- **Prevent *L. monocytogenes* from growing on product**
  - Increased growth inhibitor use (reduction in predicted listeriosis risk: ~ 95%)
  - Temperature control at retail (reduction in predicted listeriosis risk: 5 - 20%)
  
- **Prevent cross-contamination**
  - Maintain adequate sanitation (increase in predicted listeriosis risk: up to 50%)
  - Maintain adequate glove use (increase in predicted listeriosis risk: up to 8.5%)
  - Slicer key cross-contamination source:
    - no cross-contamination - reduction in predicted listeriosis risk: up to 61%

\* Reduction by a factor of 2 (i.e., from -9.2 to -9.5 log<sub>10</sub> cfu/g for product, transfer reduced by 50% for environment/niches)



# Next Steps





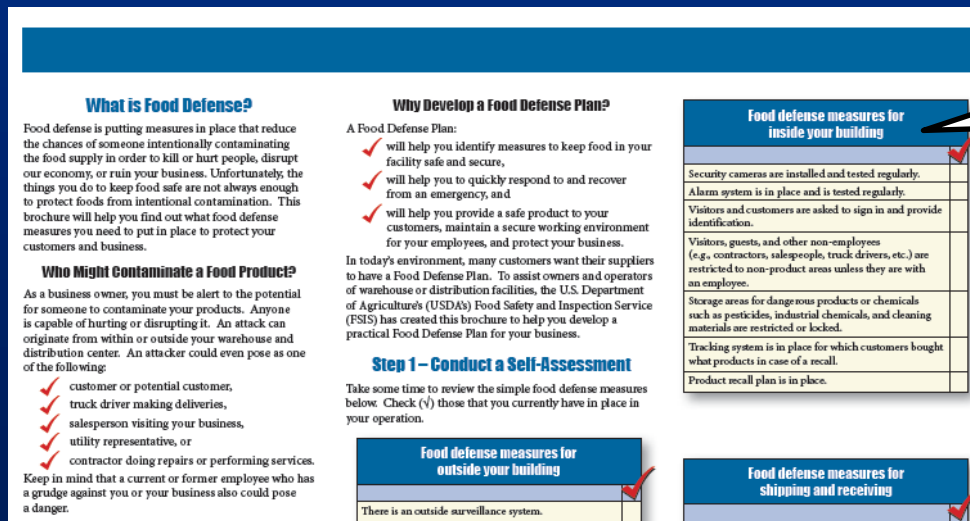
## Outreach to Address *Lm* at Retail

- FSIS is currently working with Conference of Food Protection (CFP) to develop a more detailed best practices guidelines (2 year process).
- Guidelines will contain information for:
  - slicers and other complex equipment
  - sources of *Lm* in the retail environment
  - detailed sampling procedures for *Lm*
- The guidelines would be referenced in the Food Code.



# Outreach

- A best practices guideline based on the Interagency Risk Assessment is being developed and will be posted online.
- Once the best practices guideline is finalized, a tri-fold brochure will be developed based on the guideline.
  - Distributed by FSIS Investigators to retailers and share with state and local agencies to distribute



Brochure will look similar to this Food Defense tri-fold

- This plan language brochure will give the retailers the opportunity to adopt the best practices identified in the Interagency Risk Assessment



## Continued Collaboration with Partners

- Interagency examination of next steps for applying the risk assessment findings.
- Evaluating options for outreach for State and locals (may include webinars).
- FSIS will continue its outreach to consumers for preventing listeriosis
- FSIS will conduct outreach to industry groups on guidelines once released
- EHS-Net deli study data will provide robust data to update the risk assessment model

# Thank you.

