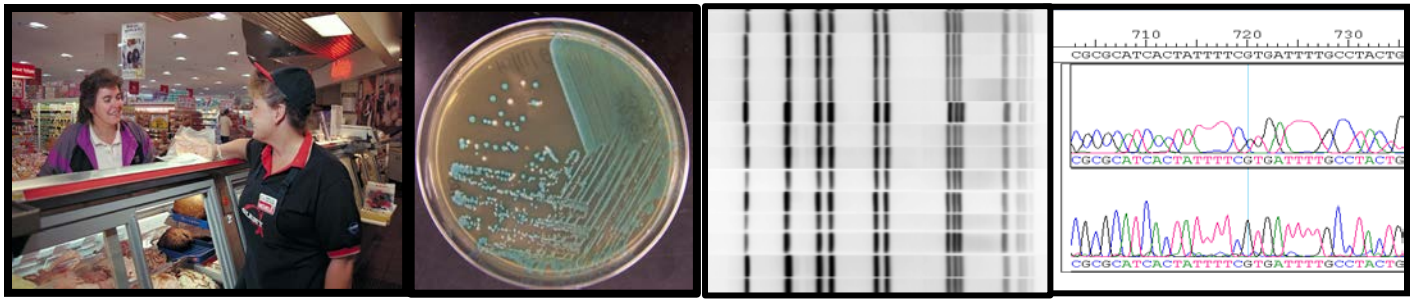
Regulatory Environmental Oversight of Delis: Focus on *Listeria monocytogenes*



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Listeria monocytogenes

- Considered ubiquitous in nature.

- *L. monocytogenes* can survive in stressful environments;
  - ✓ high acid (pH 2.5)
  - ✓ high salt (10 to 15%)
  - ✓ extreme temperatures (-0.4 to 50°C)

- Approximately 1-5% of ready-to-eat (RTE) foods contain *L. monocytogenes* (Gombas et al, 2003).

- Source: 99% of cases are foodborne.
  - ✓ Contamination is often linked to processing plants, but the overall role of contamination in retail establishments and in consumer homes is not precisely known.

L. monocytogenes Prevalence

Non-Food Processing Environments:

- Pristine environments: 1.3% (n=900) (Sauders, 2006)
- Urban environments: 7.3% (n=900) (Sauders, 2006)
- Ruminant farms (Nightingale, 2004)
  - Bovine farms with listeriosis cases: 24.35% (n=616)
  - Bovine farms without listeriosis cases: 20.06% (n=643)
  - Small ruminant farms with listeriosis: 32.92% (n=322)
  - Small ruminant farms without listeriosis: 5.89% (n=475)

Food/Food Processing Environments

- Raw foods
- Food processing environments: from <0.1% to 30% or more
- Ready-To-Eat foods: 0.17 – 4.7 % (Gombas et al., 2003)

Strain Differentiation (DNA subtyping/fingerprinting)

- Phenotypic strategies (e.g. serotyping) have been used for subtyping *L. monocytogenes*, but their utility is somewhat limited (i.e. >90% of all known *L. monocytogenes* isolates are among 3 of 13 serotypes).

- Genotypic or "DNA-based" subtyping methods (ribotyping, pulsed-field gel electrophoresis (PFGE), and DNA sequencing) are more highly discriminating (>100 different types)

- Genetic lineages described for *L. monocytogenes* have shown significant associations between subtypes and specific hosts or environments;
  - ✓ lineage I - associated with human disease (serotypes 1/2b, 3b, 3c, 4b)
  - ✓ lineage II - associated with foods and food environments (1/2a, 1/2c, 3a)
  - ✓ lineage III - associated with animal disease, occasional among foods, and rare from humans (4a, 4c)

Listeria Surveillance

- *Listeria monocytogenes* retail sampling since 1997
  - Scheduled/Investigations
- Enforcement
- Education
- Subtyping collaboration with NYSDOH and Cornell University
- Data collection since 2000
- Development of Lm sampling protocol

L. monocytogenes (Lm) Surveillance

Year	# of Food Samples Tested	# Positive	% Positive
2000	929	42	4.5
2001	648	15	2.3
2002	882	35	4.0
2003	889	26	2.9
2004	783	29	3.7
2005	1213	38	3.1
2006	562	16	2.8

Lm Surveillance

Type of Establishment	Number of Positives				
	2002	2003	2004	2005	2006
A = Store	20	8	10	23	7
B = Dairy Manufacturing Plant	0	2	2	0	0
C = Food Manufacturing	6	6	3	8	1
D = Food Warehouse	0	1	3	0	0
J = Multiple Operations	9	9	11	7	8
TOTALS	35	26	29	38	16

Implicated Products

- **Smoked Fish – 31**
- **Other Processed Fish – 20 (Trimmings, added handling)**
- **Fermented Sausage – 23 (Natural fermentation)**
- **Cold Cuts Deli Sliced – 36 (Includes Sandwiches)**
- **Processed Meats – 11**
- **Salads – 34**
- **Dairy - 7**

Collaborative *Listeria monocytogenes* Project with Cornell University

- Phase 1 – 60 Large chains and 60 large/medium independents (27, 000ft^2)
- Phase 2 – 60 Small independents (2, 200ft^2)
- Phase 3 – 60 establishments with poor sanitation history (5, 500ft^2) (3 consecutive – food equip./x contam.)

Lm Project
(Summary)

Environmental Samples	Phase 1	Phase 2	Phase 3
Stores Sampled	121	60	60
Store positive for Lm	73 (60%)	33 (55%)	39 (65%)
Multiple Positive sites	44 (36%)	19 (32%)	24 (40%)
Prevalent Ribotypes	27 (22%)	11 (18%)	16 (27%)
Multiple Prevalent Ribotypes	0	1 (2%)	5 (8%)

Lm Project - Phase 3 Report
(Environment)

Sponge Description	# Tested	# Present	% Present	Phase 2	Phase 1
Slicer/Utensils	131	6	4.6%	3.6%	2.6%
Deli Case	63	5	7.9%	8.5%	3.3%
Deli Sink	60	10	16.7%	11.7%	12.2%
Deli Floor Drain	11	3	27.3%	0%	19.7%
Deli Floor	13	1	7.7%	14.3%	
Dairy Case	53	8	15.1%	18.5%	10.9%
Raw Meat Floor Drain	15	10	66.7%	61.5%	34.9%
Dry Aisle	55	4	7.3%	10%	7.3%
Walk-in Cooler Floor	50	16	32%	27.1%	
Entrance floor mat	60	8	13.3%	15.8%	

Lm Project
(Summary)

Sponge Description	Phase 1	Phase 2	Phase 3
Slicer/Utensils	2.6%	3.6%	4.6%
Deli Case	3.3%	8.5%	7.9%
Deli Sink	12.2%	11.7%	16.7%
Deli Floor Drain	19.7%	0% *	27.3% **
Dairy Case	10.9%	18.5%	15.1%
Raw Meat Floor Drain	34.9%	61.5%	66.7%
Dry Aisle	7.3%	10%	7.3%

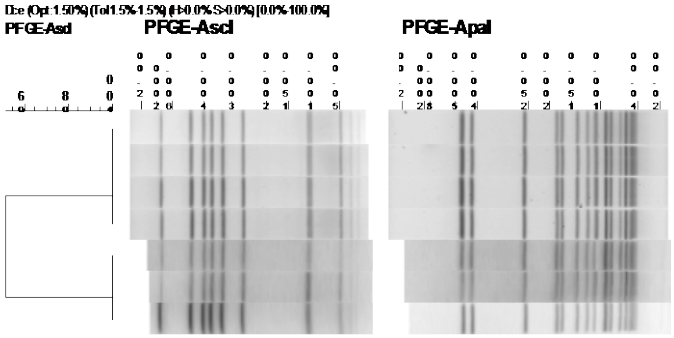
* 8 Samples, ** 11 samples

Lm Project Summary

- Lm is commonly found in retail operations in wide variety of areas
- Poor sanitation history shows increased risk for Lm contamination
  - Large establishment size?
  - Establishment location (NYC)?
- Strains in retail also overlap with those found among human illness cases
- Follow-up sampling shows persistence (>1 year)
- Lm can be controlled

PFGE patterns of *Listeria monocytogenes* isolated from salads produced by Food Processing Company A (2005-2011)

(7 entries)



Key	LabID	SourceCo	SourceS	SourceCounty	SourceCity	SourceSite	SourceTyp	TypeDetails	PPatIsolatDate
11B02457A-1	NYAG	USA	NY	Albany	Slingerlands	Salad	Food	salad-potato	2011-03-23
11B02457A-2	NYAG	USA	NY	Albany	Slingerlands	Salad	Food	salad-potato	2011-03-23
11B02457A-6	NYAG	USA	NY	Albany	Slingerlands	Salad	Food	salad-potato	2011-03-23
11B02457A-7	NYAG	USA	NY	Albany	Slingerlands	Salad	Food	salad-potato	2011-03-23
05B07990A-1	NYAG	USA	NY	Oneida	New Hartford	Salad	Food	salad-tuna	2005-09-19
05B07991A-1	NYAG	USA	NY	Oneida	New Hartford	Salad	Food	salad-tuna	2005-09-19
05B08708A-1	NYAG	USA	NY	Oneida	New Hartford	Salad	Food	salad-tuna	2005-10-03

Lm Sampling Protocol

- Protocol in place to close and require establishments with Lm contaminated deli foods to conduct environmental testing using qualified expert

- Class I Recalls initiated as appropriate
  - Widely distributed product
  - Product still in distribution/storage in consumer homes

- Swabbing done to represent entire deli operation

- Deli may reopen after cleaning and disinfection completed and swabbing results are Lm negative; or if qualified expert verifies in writing the process was sufficient to eliminate Lm

Summary

- Retail operations under our jurisdiction have benefitted from our large scale surveillance project as efforts have shown the obvious impact of sanitation training

- However, Lm contamination of retail environments continues to be a potential source of food contamination in deli or retail operations.

- Although PFGE and other methods have been useful for tracking Listeria, higher resolution genetic methods such as whole genome sequencing are on the horizon for routine public health implementation

Contact Information

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