Listeria monocytogenes in Retail Delis: Year 2

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Abstract

Listeria monocytogenes (LM) is a foodborne pathogen with a low rate of infection but high mortality rate (19%) (BBB 2009). Disease occurs mainly in pregnant women, the immunocompromised, and the elderly. LM is commonly found in the natural environment (e.g. soil, water) and has the ability to grow at low temperatures and high salt concentrations, consequently it can contaminate foods such as ready-to-eat meat (e.g. deli meats). LM prevalence in deli environments is concerning for the risk that it may contaminate food and infect humans. Last year, 30 retail delis were tested for prevalence and persistence of LM. Based on these data, changes to daily sanitation practices were implemented to target trouble areas: floor drains and squeegee, for example. The main goal of this project was to test the efficacy of the proposed interventions to reduce LM prevalence.

After stores implemented the interventions for 3 months, environmental samples were taken in the retail delis monthly for 6 months. Biochemical testing of these samples identified LM. These samples were then confirmed by Polymerase Chain Reaction (PCR) and Pulsed Field Gel Electrophoresis (PFGE). The new post-intervention data was compared to the historical data to assess efficacy of the interventions.

After comparing the new data with pre-intervention data the total amount of positive LM samples throughout all 30 stores increased slightly by 0.52 %. Seven stores went from having low rate of LM positive (the most being 7.75%) to having 0.00% after the added interventions. Half of the stores (15) decreased in LM prevalence and one store remained constant (0.00%). The other 14 stores increased in number of LM positives. Stores with low LM contamination benefited from the added interventions. Stores which increased in LM positives had started out with a high percentage of positive samples 20% or more. It is possible those stores which worsened were already lacking in sanitation systems and may not have carried out our interventions correctly. We also hypothesize that the daily interventions weren't aggressive enough to completely obliterate the LM biofilm in stores with high contamination rates; instead interventions may have broken and dispersed the biofilm throughout the store. Overall, the interventions were effective in reducing LM prevalence in low risk stores. Further work with more aggressive interventions needs to be done to address stores with high LM prevalence.

Introduction

Listeria monocytogenes (LM) is a foodborne pathogen that transfers through food. Vulnerable people eating LM contaminated food (pregnant women, the immunocompromised, the elderly) causes 1,600 illnesses (listeriosis) and 225 deaths in the United States each year (Scallan et.al, 2011). The illnesses/deaths are cause by LM targeting the immune systems of those infected. It is difficult to keep LM out of food because its natural environment is soil and water in both urban and rural areas. It also has the special ability to grow in low temperatures, like the refrigerators in which meat is stored. LM is very heat sensitive so cooking these meats to 165° will kill any present LM. For this reason, raw and ready-to-eat foods have a greater risk of causing listeriosis.

According to the 2003 Food and Drug Administration-United States Department of Agriculture Food Safety and Inspection Service (FDA-USDA FSIS) Risk Assessment, deli meats have greater risk of listeriosis per serving than any other food. Deli meats are high risk due to handling practices—like high product volumes on limited equipment, storage at refrigeration temperature, and eating without heating. The risk assessment identified that 83% of listeriosis cases caused by deli meats is from meat cross contaminated in retail delis. Regulatory agencies, as well as retail grocers and researchers, want to find ways to decrease LM contamination in retail delis to reduce the public health risk of listeriosis. In collaboration with the USDA and retail grocers, a previous study by our lab tested for LM in 30 retail delis over 6 months to quantify the amount of contamination and trace individual strains showing persistence. This study builds on those results to test the effectiveness of changes to current cleaning and sanitation practices in reducing the amount of LM positives in each deli.

References

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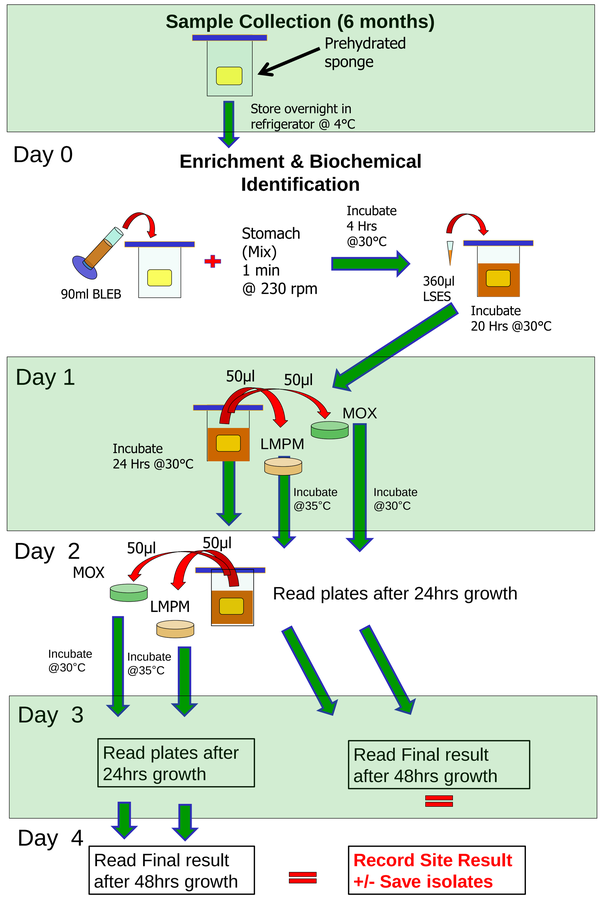
This project was supported by the United States Department of Agriculture, Food Safety and Inspection Service, Office of Public Health Science (USDA-FSIS contract no. AG-3A94-C-09-0027), as well as grants from the Food Marketers Institute Foundation and American Meat Institute Foundation. A big thank you to my mentors: Suzy Hammons, Haley Oliver, and Joe Ruhl. Thank you also to P. Cook, S. Chambers, and C. Wickware.

Methods

1. Collect preliminary data on persistence and prevalence of LM in retail delis (completed year one).
2. Identify and implement proposed good manufacturing practices.
3. Collect environmental samples in retail delis post added interventions.
4. Identify LM by biochemical testing.
5. Confirm identification by Polymerase Chain Reaction (PCR)-Pulsed Field Gel (PFGE).
6. Compare new post-intervention data with last year's historical data to assess efficacy of changes using statistical practices.

Interventions (3 months)

Target	Change
Slicer Delicase handle Coldroom door handle Slicer knobs Scale top and keypad Sinks	Clean every 4 hours when in use, as needed throughout the day, and at day's end.
Floors, floor-wall junctures, & drains	Clean daily and as needed. Drain cleaning remained the same.
Delicase Food Contact Surfaces	Clean daily at the end of the shift.
Delicase Down to the Coils	Clean once every four weeks or more frequently.
Squeegee	Replace sponge-style with sanitizable plastic
High Pressure Hoses	Replace with low pressure nozzles
Reactive Maintenance	Immediately repair equipment and eliminate presence of standing water.
Training	Re-train deli managers on existing and new SSOPs.



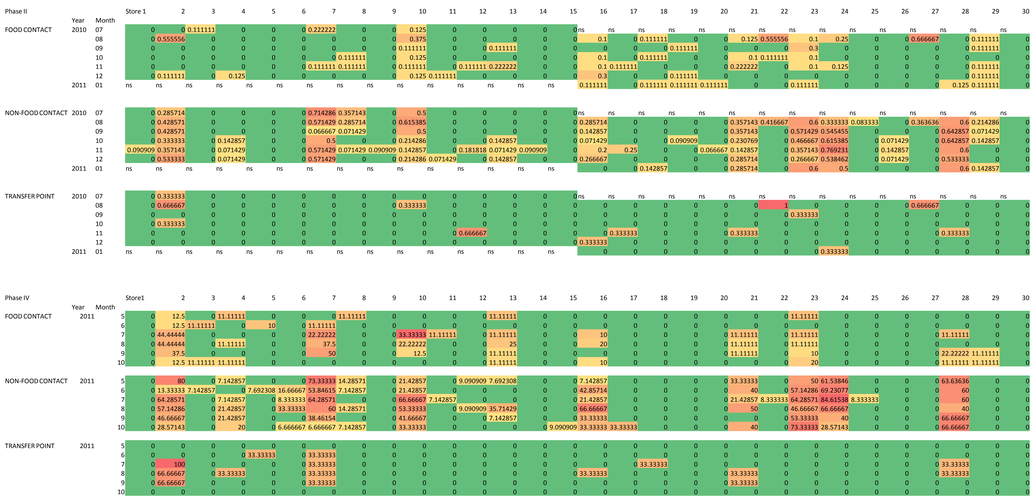
Results

Store	% POS Phase 2	% POS Phase 4
Store 1	0.71	0.00
Store 2	27.37	40.65
Store 3	0.57	1.92
Store 4	3.45	9.55
Store 5	0.00	1.92
Store 6	0.62	5.76
Store 7	27.51	36.13
Store 8	8.47	4.52
Store 9	0.65	0.00
Store 10	23.12	25.97
Store 11	1.69	1.28
Store 12	3.21	1.45
Store 13	5.08	7.05
Store 14	0.62	0.00
Store 15	0.00	0.72
Store 16	13.41	21.47
Store 17	3.45	2.78
Store 18	3.13	0.64
Store 19	2.90	0.00
Store 20	1.27	0.00
Store 21	19.08	20.00
Store 22	9.09	0.70
Store 23	29.76	34.57
Store 24	31.69	31.51
Store 25	0.68	0.69
Store 26	2.55	0.00
Store 27	7.75	0.00
Store 28	33.74	36.31
Store 29	8.39	1.28
Store 30	0.00	0.00
Overall	**9.40**	**9.92**
Minus (8) Poorest Stores	**2.89**	**1.88**

Site	% POS Phase 2	% POS Phase 4
Food Contact	**4.50**	**3.95**
Slicer Blade	2.80	3.33
Delicase	2.20	4.44
Case by Raw Meat	6.10	10.53
Delicase tray	2.20	3.33
3-Basin Interior	7.80	5.08
1-Basin Interior	18.30	9.82
Cold Storage Rm Racks	2.20	3.33
Cutting Board	2.60	1.91
Re-wrap table	0.60	0.56
Non-Food Contact	**14.00**	**15.76**
3-Basin Exterior	3.30	1.11
3-Basin FTW	13.30	15.00
1-Basin-Exterior	4.30	2.45
1-Basin FTW	27.90	22.94
Drain, deli area	20.00	25.14
Floor Adj Deli Drain	25.60	23.46
Floor Deli Area	12.80	19.44
Cold Storage Rm Floor	20.10	19.44
Cold Storage Rm Wall	2.20	5.00
Cold Storage Rm Drain	33.60	27.12
Standing water	17.80	28.42
Squeegee	27.30	26.43
Wheeled carts	7.80	12.78
Hoses	4.50	14.41
Trash Can Deli Area	5.00	6.70
Transfer Point	**3.30**	**3.30**
Slicer Knob	1.70	2.78
Delicase handle	4.40	5.00
Scale	3.90	2.22
Counter	2.80	3.35
Overall	**9.40**	**10.08**

- Overall positive LM rate increased from Phase II (443/4827) to Phase IV (448/4495), a total of 0.52%
- Excluding the eight most prevalent stores, overall positive LM rate decreased 1.01%
- Positive LM rate on Food Contact Surfaces decreased from Phase II (4.50%) to Phase IV (3.95%), a total of 0.55%
- Positive LM rate on Non-Food Contact Surfaces increased from Phase II (14.00%) to Phase IV (15.76), a total of 1.76%
- Positive LM rate on Transfer Points stayed the same from Phase II to Phase IV at 3.30%

Heat map comparison of the total percent of LM positive samples in each store from Phase II to post-intervention Phase IV:



Next Steps

Phase V: Test more aggressive cleaning practices. Implement a "deep clean" where the delis are disassembled, non-food contact surfaces are scrubbed, sanitized, and reassembled by a professional cleaning service. Sampling for LM in the delis will be conducted immediately before and after the deep clean event to test the instant impact of the deep clean. Monthly samples taken post intervention will test to see whether the delis maintain good sanitation overtime or if high LM positive rate returns.