Control of *Listeria monocytogenes* at the Retail Level

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Overview

- Recent retail research findings
  - NFPA survey
  - Cornell survey
- Sources of LM
- Factors contributing to presence of LM
- Prevention and control of LM
- Verification programs
- Maintenance of a successful LM control program
NFPA Survey

- Samples collected 2000-2001
- Collected in Maryland and California
- Categories of foods:
  - Luncheon meats
  - Deli salads
  - Hispanic style cheese
  - Bagged salads
  - Blue-veined and soft mold ripened cheese
  - Smoked seafood
  - Seafood salads
NFPA Survey

- 31,705 samples tested
- 577 samples positive for LM
- Overall LM prevalence rate of 1.82%
- 402 samples had levels <0.3 MPN
- 21 samples had levels >2 \( \log_{10} \text{CFU/g} \) (up to 5 \( \log_{10} \text{CFU/g} \))
NFPA Survey

- Maryland samples positive for LM
  - 7.2% seafood salads
  - 3.4% smoked seafood
  - 2.4% deli salads
  - 1.2% luncheon meats
- California samples positive for LM
  - 5.2% smoked seafood
  - 2.6% blue veined cheeses
  - 2.3% deli salads
  - 2.2% seafood salads
  - 1.6% mold ripened cheeses
Other findings from survey
- Highest prevalence rate in:
  - Seafood salads (4.7%)
  - Smoked seafood (4.3%)
- Lowest prevalence rate in:
  - Soft cheese (0.17%)
  - Bagged salads (0.74%)
  - Deli salads (2.4%)
  - Sliced luncheon meats (0.89%)
- No seasonality for LM positive samples
NFPA Survey

- In-store packaged RTE products (deli salads, luncheon meats, seafood salads) had higher LM prevalence than manufacture-packaged RTE products.
- Reasons for higher LM prevalence:
  - Additional handling by employees
  - Refrigeration temperatures may have differed
- LM levels were higher in manufacture-packaged products.
Cornell Survey

- New York State
- Samples obtained from 1997-2002
- Food and environmental samples obtained from:
  - 7 food processing establishments
  - 47 retail establishments
- Human isolates also obtained from patients
Cornell Survey

- 125 retail foods were positive for LM
  - Smoked fish, fish salad, fish spread/dip
  - Deli-style meat (turkey, ham, beef bologna, chicken, pastrami, roast beef)
  - Cheese (Hispanic-style, American, Polish)
  - Hot dogs (beef, turkey, unknown)
  - Prepared pasta and salad
  - Hummus
  - Salad (mixed)

- 40 retail environmental isolates positive for LM
Cornell Survey

- 20 of the 47 establishments had foods that were positive for LM
- 5 establishments had foods with more than 1 LM isolate
- 9 of 15 establishments had similar LM isolates from foods taken on multiple dates (1 week to 12 months apart)
Cornell Survey

Other findings:
- LM persists over time in food processing and retail environments
- LM contributes to contamination of foods
- Measures are needed to improve control of environmental LM at retail
Potential Sources of LM

- Food products and ingredients; packaging
- Non-food contact surfaces (environment)
- Food-contact surfaces (equipment)
- Other
- Employees
- Customers & Vendors
Food Products and Ingredients

- **Raw foods:**
  - Poultry, meat, seafood

- **RTE foods:**
  - Luncheon meat
  - Fruits and vegetables

- **Ingredients**
  - Spices
  - Sauces

- **Packaging materials**
  - Cardboard, plastic, etc.
Non-Food Contact Surfaces

- Drains
- Grease traps
- Floors
- Pests (ie. rodents and insects)
Non-Food Contact Surfaces

- Standing water
- Walls with cracks & crevices
- Ceilings
- Machine panels
Non-Food Contact Surfaces

- Air filters
- Motor housings
- Cracked hoses
- Ice makers
Non-Food Contact Surfaces

- Wheels of carts
- Display cases
- Coolers
- Cooling fans in display cases
Non-Food Contact Surfaces

- Mops
- Cleaning buckets
- Floor scrubbers
- Maintenance tools
- Pallets and/or crates
Non-Food Contact Surfaces

- On/off switches
- Rubber seals around doors
- Open bearings within equipment
- Rivets
- Trash cans
Food-Contact Surfaces

- Equipment
  - Preparation tables or cutting boards
  - Slicers
  - Knives
  - Gloves and aprons
  - Bamboo mats
Food-Contact Surfaces

- Equipment
  - Racks for transporting food
  - Bins, tubs, baskets to hold food
  - Sponges, brushes for cleaning equipment
Other Sources of LM

- Meat mixer and grinder
- Sausage machine filler outlet
- Sausage stuffer in meat hopper
- Equipment wash sink

(Cornell Study, 2004)
Other Potential Sources of LM

- Packaging equipment
- Hollow table legs
- Hard to clean or tight areas
Other Potential Sources of LM

- Rusted/pitted areas
- Collection points for water/food
Potential Sources of LM

- Employees
- Customers
- Vendors
Conditions Leading to Product Contamination

- Cross-contamination
- Improper cleaning and sanitation
- Improper time and temperature control measures
Cross Contamination

- Contaminated RTE foods → food contact surfaces (i.e. slicing of ready-to-eat items)
- Raw product → RTE foods, equipment or food contact surfaces
- Employees who handle RTE foods but touch contaminated equipment, environment, or food contact surfaces
- Employees who do not change gloves or follow specified procedures before handling RTE product
Cross Contamination
Improper Sanitation

- Improper or infrequent cleaning and sanitation may allow LM to grow to high levels on equipment and the environment.
- If LM remains on equipment and the environment for long periods of time, the risk for contamination of ready-to-eat food increases.
Biofilms

Proper Sanitation
Improper Sanitation of Food Contact Surfaces

- Deli slicers
- Display cases and coolers
- Food bins
- Tables and cutting boards
- Knives, aprons, gloves
- Etc.
Improper Sanitation of Environment

- Ceilings
- Walls
- Floors
- Door handles
- Vents
- Drains
- Waste bins
- Failure to remove condensation
- Etc.
Improper Time and Temperature Controls

- Temperatures higher than 41°F allow LM to grow at a much faster rate.
- Federal guidelines recommend that open deli meats held at 41°F be discarded 7 days after opening.
- Check your state or local regulations for acceptable storage times of opened deli meats.
Improper Time and Temperature Controls
Control of LM in Retail

- Prevent cross-contamination
- Properly clean and sanitize
- Control time and temperature of product
Prevent Cross Contamination

- Work with reputable vendors who operate under HACCP systems and are inspected by federal, state, or local agencies
- Require vendors to provide letters of guarantee and/or certificates of analysis that indicate products have been tested for and are free of pathogens
Prevent Cross Contamination

- Design a proper flow of food (receiving -> storage -> processing -> sale)
- Minimize traffic between raw and ready-to-eat areas
- Separate raw and ready-to-eat preparation areas
- Physically separate raw and ready-to-eat products in display cases
Control Spread of LM at Retail

- Prepare ready-to-eat foods (i.e., salads) in a central kitchen and distribute packaged salads to each store
- Minimize the number of times food is handled and/or repackaged or reworked
- Breakdown and clean slicers and other frequently used equipment frequently (i.e., every 4 hours)
Control Spread of LM at Retail

- Use clean utensils for each task
- Don’t mix old product with new product
- Train employees on proper personal hygiene techniques, including proper handwashing
- Prepare raw meats or seafood away from areas where ready-to-eat food preparation or storage occurs
Properly Clean and Sanitize

- Use detergents and sanitizers at proper concentrations, proper temperature, and application time
- Clean first with a detergent specific for the type of equipment (such as stainless steel or plastic) or type of residue (such as fat or protein)
- Rinse surface thoroughly and check for residue
Properly Clean and Sanitize

- Sanitize only visibly clean surfaces
- Purchase equipment that is easily cleanable
- Implement cleaning and sanitizing schedules with adequate record keeping
- Train employees in proper sanitation and consider recordkeeping
Proper Sanitation

- Replace equipment that is scratched, rusted, or damaged
- Develop a sanitation schedule specific for the places LM can hide:
  - Drains
  - Inside of display cases
    - Fans, grates, dividers, etc.
  - Slicers
  - Utensils
  - Preparation surfaces
  - Packaging equipment
Control Time and Temperature of Product

- Receive foods at <41°F
- Use the “first in first out” (FIFO) rule
- Work with smaller volumes or chunks of ready-to-eat product (check with supplier)
- Maintain the internal temperature of products at <41°F (keep refrigerated cases at <39°F)
Control Time and Temperature of Product

- **Label all food items with a date that the product must be used by or discarded**
- **Make sure open product is not temperature-abused**
- **Do not stack product higher than indicated by manufacturer and display items at the proper temperature**
Control Time and Temperature of Product

- Do not stack product higher than indicated by manufacturer specifications
- Take and record accurate temperatures of foods
Verification Programs

- Record Keeping
- Examination of critical factors
- Conducting third party audits
- Conducting microbiological testing
- Evaluating employee performance
Record Keeping

- Developing a log book
  - **Receiving log** for recording of receiving temperatures
  - **Time and temperature logs** for product temperatures during hot or cold holding
  - **Sanitation logs** for days and times of sanitation jobs

- Training employees on completing logs
Examination of Critical Factors

- Review inspection reports to:
  - Identify positive areas or where food safety strategies may need improvement
  - Identify trends -> problems (malfunctioning equipment, infrequent sanitation, etc.)

- Visual inspection of:
  - Sanitation procedures
  - Temperature checks
  - Receiving documents
  - Flow of food
  - Check code dates
Conducting Third Party Audits

- Done to evaluate if a food safety program is working
- Outside auditor can give an unbiased opinion as to how the food safety program is working
- Continuous improvement
Conducting Microbiological Testing

- Consider collecting a preliminary set of tests for non-food contact surfaces and food contact surfaces; compare results after food safety systems are in place.
- Consider sampling for indicator organisms (i.e., total plate counts, *Listeria* spp.)
Conducting Microbiological Testing

- If decrease in indicator organisms, then food safety systems may be working; if an increase in total plate counts, or presence of generic Listeria, then test further to determine if LM is present.
- Concentrate efforts on problematic areas.
Evaluating Employee Performance

- Train, train, train!
- Conduct regular in-house audits
- Design control measures that can be incorporated easily into employee duties
- Verify that employees are maintaining records such as temperature charts, receiving records, or other important records
- Encourage and reward employees
Maintenance of a Successful LM Control Program

- Implement a record keeping system
- Conduct internal and third party audits
- Consider microbiological testing of environment
- Develop a recall or outbreak/illness plan
- Revise LM control programs if there are major structural, equipment, employee, or vendor changes
- Provide regular on-going training for employees
Questions???