

FSIS

Best Practices Guidance for Controlling *Listeria monocytogenes* (*Lm*) in Retail Delicatessens

June 2015

This guidance document provides specific actions that retailers can take in the delicatessen (deli) area to decrease the potential for *Listeria monocytogenes* (*Lm*) growth or cross-contamination. In particular, the guidance covers:

- Actions identified by the Interagency Retail *Lm* Risk Assessment (see page 3) that can decrease the predicted risk of listeriosis from deli products;
- Information from the U.S. Food and Drug Administration (FDA) Food Code, scientific literature, other guidance documents, and lessons learned from meat and poultry establishments that retailers can use to control *Lm*;
- Steps retailers can take to help ensure that deli products are maintained under sanitary conditions that do not allow *Lm* adulteration of the product; and
- A self-assessment tool that retailers can use to determine what practices they are currently using and what new practices to adopt to control *Lm*.

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Purpose

This guidance document provides specific recommendations for actions that retailers can take in the delicatessen (deli) area to control *Listeria monocytogenes* (*Lm*) contamination of ready-to-eat (RTE) meat and poultry products. These materials highlight recommendations that are based on an evaluation of retail conditions and practices in the [Interagency Risk Assessment-*Listeria monocytogenes* in Retail Delicatessens](#) (Interagency Retail *Lm* Risk Assessment). In addition, FSIS has included information from the Food and Drug Administration (FDA) Food Code, scientific literature, other guidance documents, and lessons learned from Food Safety and Inspection Service (FSIS) verification sampling and review of sanitation programs for *Lm* in meat and poultry processing establishments.

This version of the guidance document replaces the previous version of the document which was issued and announced in the *Federal Register* ([79 FR 22082](#); April 21, 2014). FSIS updated this guidance based on comments received during the public comment period, which closed on June 20, 2014. FSIS made the following changes in response to comments:

- Clarified that food processing equipment should be disassembled during cleaning and sanitizing.
- Added a recommendation that retailers scrub surfaces during cleaning to prevent biofilm formation.
- Clarified that retailers should rotate (change) sanitizers to help prevent *Lm* from establishing niches in the environment and forming biofilms.

Although comments will no longer be accepted through regulations.gov on this guidance document, FSIS will update this document as necessary, should new information become available.

Introduction

Lm is a bacterium that is found in moist environments, soil, and decaying vegetation and can persist along the food continuum. Transfer of the bacteria from the environment (e.g., deli cases, slicers, and utensils), employees, or raw food products is a particular hazard of concern in RTE foods, including meat and poultry products. Listeriosis is a serious infection usually caused by eating food contaminated with *Lm*. Controlling *Lm* has long been an objective of the public health community. The Centers for Disease Control and Prevention (CDC) estimates that infection with *Lm* causes about 1,600 illnesses, 1,500 hospitalizations, and 260 deaths in the United States each year. Listeriosis is rare, but its fatality rate is very high (about 16 percent, compared with 0.5 percent for either *Salmonella* or *E. coli* O157:H7) (Scallan et. al., 2011). It primarily affects older adults, pregnant women, newborns, and adults with weakened immune systems.

The CDC estimates that *Lm* causes a high level of deaths compared to other foodborne pathogens. Deli products have been shown to be a major contributor to these illnesses. Retailers can help decrease the risk of illness by controlling *Lm* contamination in the deli.

Lm can survive and grow at cool temperatures (as low as 34° F/1°C). Because of its growth and survival characteristics, *Lm* is usually persistent in the environment and is commonly referred to

as a harborage organism (i.e., it can form niches and grow to high numbers in the environment; niches provide an ideal place for *Lm* to establish and multiply). It can cross-contaminate food contact surfaces and foods. Improper sanitation, product handling, and employee practices can lead to the transfer of *Lm* to RTE meat and poultry products at retail causing them to become adulterated (see Regulation of Meat and Poultry Products at Retail below).

RTE meat and poultry products do not require cooking prior to being consumed and are often held at refrigerated temperatures. Once contaminated with *Lm*, RTE food products may provide an ideal environment for this harmful bacterium to grow. A variety of retail surveys of deli meats and a number of risk assessments of *Lm* in deli-sliced versus pre-packaged deli meats have analyzed the risk of listeriosis associated with deli prepared meat and poultry products. The [FSIS Comparative Risk Assessment for *Lm* in Ready-to-eat Meat and Poultry Deli Meats](#) (May 2010) estimated that of listeriosis illnesses attributed to deli meat, 83% are associated with deli meat sliced and packaged at retail (Endrikat et al. 2010).

Safe food handling practices, thorough cleaning and sanitation procedures, maintenance of the facility and equipment, and good employee practices are key components that may prevent or reduce the likelihood of RTE foods becoming contaminated in retail delis.

Regulation of Meat and Poultry Products at Retail

FSIS shares jurisdiction with FDA and with State, local, and tribal authorities for meat and poultry products at retail. FDA makes recommendations regarding retail practices through the FDA Food Code. The Food Code is used by the State and local agencies as a model to establish regulations, ordinances, and actionable policies that can be enforced in their jurisdictions. Operators of retail establishments are required to comply with the conditions of the permit or license under which they operate.

The Federal Meat Inspection Act (FMIA) and Poultry Products Inspection Act (PPIA) apply to meat and poultry products produced in federally inspected establishments and other entities producing or handling meat and poultry, including at retail. Although retail firms are generally exempt from FSIS inspection, retailers are required to maintain sanitary conditions and otherwise not produce adulterated or misbranded product ([21 U.S.C. 623\(d\)](#) and [464\(e\)](#); [9 CFR 303.1\(f\)](#) and [381.10\(d\)\(4\)](#)). The types of operations that are traditionally and usually conducted at retail stores can be found in [9 CFR 303.1\(d\)\(1\)](#) and [9 CFR 381.10\(d\)\(1\)](#).

FSIS provides instructions to its personnel for surveillance activities at retail in [FSIS Directive 8010.1](#). The purpose of in-commerce surveillance is to ensure that FSIS-regulated meat and poultry products distributed in commerce are:

- Safe, wholesome, and not adulterated;
- Correctly marked, labeled, and packaged;
- Secure from intentional acts of contamination, and
- Legally imported and properly exported.

When performing in-commerce surveillance, FSIS verifies that:

1. Meat and poultry are wholesome and not adulterated;

2. Sanitary conditions are such that meat and poultry will not become contaminated with filth or rendered injurious to health;
3. Hazard controls are adequate to prevent meat and poultry from becoming adulterated;
4. Meat or poultry not intended for use as human food are properly denatured or otherwise made inedible as prescribed by Federal regulations; and
5. All records are kept and maintained in a manner that fully and correctly discloses all transactions involved in the business activity that is subject to the provisions of the FMIA and PPIA.

This guidance does not replace the FDA Food Code, State, tribal or local, or FSIS regulations. This document can be used along with the [2013 FDA Food Code](#) to help retailers ensure that meat and poultry products are not prepared or sliced under insanitary conditions in the retail deli area, which can lead to *Lm* contamination and outgrowth of the organism on the product.

The Interagency Retail *Lm* Risk Assessment Findings

The Interagency Retail *Lm* Risk Assessment was jointly developed by FSIS and FDA, and in consultation with the CDC, to help guide food safety efforts to minimize the public health burden of listeriosis in the U.S. The risk assessment was conducted to better understand how retail practices (e.g., temperature control, sanitation, worker behavior) influence the public health risk of listeriosis associated with eating deli products (e.g., meats, cheeses, and salads) sliced or prepared in retail. It also examines how effective various interventions are in limiting the survival, growth, or cross-contamination of *Lm*.

No single action or practice will control *Lm* contamination of retail foods. Instead there are many steps that retail deli operators and their suppliers can take to help reduce the risk of listeriosis.

The risk assessment is based on observations of:

- Deli employees' work routines;
- Concentrations of *Lm* on incoming products and in the deli environment;
- Studies on the ability of *Lm* to spread in retail delis, such as from a slicer to food; and
- An existing dose-response model.

The study was designed to apply to a range of deli establishments, from small independent operations to the deli departments in large supermarkets.

The risk assessment also reinforces the importance of FDA's Food Code recommendations to operators of retail delis. State, local, and tribal jurisdictions can do their part to reduce listeriosis by enforcing all relevant provisions of the 2013 FDA Food Code as part of their own food safety requirements.

The risk assessment found that certain practices are needed to effectively prevent cross-contamination and limit *Lm* growth in RTE foods handled or prepared in retail delicatessens, including:

- Proper storage,
- Adequate sanitation, and
- Effective employee practices.

NOTE: This guidance document includes key findings from the Interagency Retail *Lm* Risk Assessment and provides an overall summary of the data for typical retail deli settings. More detailed information regarding the findings is in the [Retail *Lm* Risk Assessment Report](#).

Key Findings

The following are key findings of the Interagency Retail *Lm* Risk Assessment for typical retail deli settings.

- **Storage Temperature.** If all refrigerated RTE foods are stored at 41°F (5°C) or below, as the 2013 FDA Food Code (3-501.16(A)(2)) recommends, approximately 9% of predicted listeriosis cases caused by contaminated deli products prepared or sliced in the retail deli could be prevented.
- **Growth Inhibitors.** If all deli products that support *Lm* growth were reformulated to include growth inhibitors, approximately 96% of predicted listeriosis illnesses caused by RTE products prepared or sliced in the retail deli could be prevented. While this finding is significant, the actual benefit may be smaller in part because the concentration of the growth inhibitor used may not be sufficient to be effective throughout the shelf life of a food or may not be used in high enough concentrations because the inhibitors can adversely affect the flavor of the product.
- **Control Cross-Contamination.** The predicted risk of listeriosis dramatically increases in retail delis as a result of cross-contamination. In particular, slicers are key sources of cross-contamination in retail delis. Eliminating all points of cross-contamination in the deli (including slicers) would decrease the predicted risk of illness from the consumption of RTE products prepared or sliced in the retail deli by approximately 34%. Cross-contamination is particularly difficult to control completely; however, the risk assessment shows that proper product handling, cleaning, sanitizing, and glove use help prevent cross-contamination.
- **Control Contamination at its Source.** Increased levels of *Lm* from incoming products and the environment (including potential niches), directly increases the predicted risk of illness. Therefore, elimination of environmental niches in the deli area will reduce the predicted risk of listeriosis from the consumption of RTE products prepared or sliced in the retail deli. Additionally, if levels of *Lm* on RTE foods (including foods that do not support the growth of *Lm*) that the retail deli receives from processing establishments were reduced by half, approximately 22% of the predicted listeriosis illnesses caused by contaminated deli products could be prevented. This finding suggests that continued efforts to prevent low levels of *Lm* contamination during processing, even on products that do not support growth of the pathogen, reduces the predicted risk from these products and other RTE foods that can be subsequently cross-contaminated in the retail delis.
- **Continue Sanitation.** Sanitation practices that eliminate *Lm* from deli food-contact surfaces reduce the predicted risk of illness. Cleaning and sanitizing food-contact surfaces reduces the predicted *Lm* levels in the deli area. Employees not wearing gloves while serving customers increases the predicted risk of listeriosis from the consumption of RTE products prepared or sliced in the retail deli by approximately 5%.

How to Use this Guidance

This guidance provides practical recommendations that retailers can use to control *Lm* contamination and outgrowth in the deli area based on the findings of the Interagency Retail *Lm* Risk Assessment, available scientific knowledge, the 2013 FDA Food Code, as well as lessons learned from controlling *Lm* in meat and poultry processing establishments. Retailers can use this best-practices guidance to help ensure that RTE meat and poultry products in the deli area are handled under sanitary conditions and are not adulterated as defined in the FMIA and PPIA. While these practices are designed to control *Lm* specifically, they also may help control other food borne pathogens that may be introduced into the retail deli environment and other facilities where consumers take possession of food.

The best practices are divided into four sections: (1) product and product handling, (2) cleaning and sanitizing, (3) facility and equipment controls, and (4) employee practices. Practices identified by the risk assessment that can significantly decrease the predicted risk of foodborne illness are highlighted in each section. The other practices that are based on scientific knowledge or lessons learned also will help retailers increase *Listeria* control in the deli area. For example, although floors and drains were not considered as a source of cross-contamination according to the Interagency Retail *Lm* Risk Assessment, FSIS data has shown that floors, drains, and items like floor mats tend to be harborage points in FSIS establishments. Providing this information can assist retailers in controlling *Lm* in the deli area. A self-assessment tool, starting on page 12 of this guidance, is provided for deli operators to help them identify the best practices they are using and to assess whether they need to adopt others. By following the best practices in the guidance and the 2013 FDA Food Code, retailers can help ensure that RTE products are not adulterated with *Lm*, and that the potential for listeriosis is decreased.

NOTE: Retailers should be aware that the recommendations in this guidance, especially those based on the 2013 Food Code may be requirements in State, local, or tribal regulations. Questions on this guidance may be submitted through [AskFSIS](#).

Product Handling

The Interagency Retail *Lm* Risk Assessment found that using practices that prevent bacterial growth in the product substantially reduced the predicted risk of listeriosis. In addition, while the risk assessment showed that the risk from incoming *Lm*-contaminated products that do not support growth is low, it also showed that these products can cross-contaminate RTE products that support growth, and when they do, the risk increases substantially. The formulation of RTE products with antimicrobial agents prevents growth of *Lm* in RTE foods both at retail and during consumer home storage, leading to an overall reduction in the predicted risk of listeriosis. The 2013 FDA Food Code ([3-501.16\(A\)\(2\)](#)) recommends keeping RTE products at or below 41°F (5°C), which slows the growth of *Lm* in the deli and decreases the predicted risk for listeriosis. Other scientific studies also have shown that preventing product contamination reduces the risk of foodborne illness.

Therefore, it is important for retailers to adopt practices that protect RTE product from contamination with *Lm* and to use strategies to prevent or limit the growth of *Lm* in deli products. Below are a few such strategies.

- Use products formulated with antimicrobial agents (e.g., acetic acid, sodium diacetate, lactic acid, citric acid) when possible, to eliminate or prevent the growth of *Lm* in RTE products. In some cases, the addition of antimicrobial agents may not be possible because of the adverse effect on the flavor of the products. Retailers can read the ingredients statements on the labels to see whether the products in the deli have antimicrobial agents and can contact their suppliers to determine whether products formulated with antimicrobial agents are available.

NOTE: As stated previously, the Interagency Retail *Lm* Risk Assessment estimated that if antimicrobial agents are used in all products in the deli, the predicted risk of listeriosis from the consumption of RTE products sliced or prepared in retail departments could be decreased by approximately 96%.

Things to Consider at Retail

- ✓ Are the deli products being sold formulated with antimicrobial agents?
- ✓ Is RTE product properly identified and labeled?
- ✓ Are RTE products identified with the date the package is opened?
- ✓ Is RTE product discarded if it is past the recommended discard date?
- ✓ Is there a process to routinely remove RTE products that are not suitable for sale from the retail case?
- ✓ Are RTE meat and poultry products promptly refrigerated after use?
- ✓ Are RTE products prepared and stored adjacent to raw product?
- ✓ Is the retail deli case maintained at 41°F (5°C) or below to prevent pathogen growth?
- ✓ Is RTE product covered, wrapped, or otherwise protected after opening?
- ✓ Are RTE products placed on the same contact surfaces as other RTE product, e.g., cheese, vegetables, seafood?

- Use products that have been treated to reduce pathogens (e.g., through high pressure processing (HPP)). This information can be determined from certificates of analysis (COA), letters of guarantee (LOG), or other information from suppliers. Separate products that support growth from products that do not support growth (when possible) to help prevent cross contamination.

NOTE: As stated previously, the Interagency Retail *Lm* Risk Assessment found that if current levels of *Lm* in RTE foods (e.g., meats, cheeses, and salads) received by the retail deli were reduced by half, the predicted risk of listeriosis from the consumption of RTE products sliced or prepared in retail deli departments could be decreased by approximately 22%.

- Monitor the shelf life of an RTE product that is opened, prepared, and held in a retail setting for more than 24 hours. To monitor shelf life of the opened product, retailers should date-mark the product (e.g., clearly mark it with the date of opening and the discard date) as recommended by the 2013 FDA Food Code (3-501.17). Products also should be properly identified and labeled. RTE products that are past their shelf life should be discarded.
- Do not pre-slice products in the morning, after cleaning. Retailers should slice the product at the time it is requested by consumers.

NOTE: The Interagency Retail *Lm* Risk Assessment found that pre-slicing the product increases the predicted risk of listeriosis from the consumption of RTE products sliced or prepared in retail deli departments by approximately 6%.

- Remove products that are filthy, putrid, decomposed, slimy, rancid, or in off-condition, which are considered adulterated, from the deli area as soon as possible. Thoroughly clean and sanitize areas that were contacted by the affected product to prevent any cross-contamination.
- Promptly return RTE products to refrigerated units, after slicing, to prevent pathogen growth. Maintain refrigeration units at or below 41°F (5°C) to slow the growth of *Lm*, as recommended by the 2013 FDA Food Code (3-501.16(A)(2)). RTE products should be covered, wrapped, or otherwise protected to prevent cross-contamination when not in use.

NOTE: The Interagency Retail *Lm* Risk Assessment found that storing the products at or below 41°F (5°C) decreases the predicted risk of listeriosis from the consumption of RTE products sliced or prepared in retail deli departments by approximately 9%.

- Store and handle RTE products in separate areas from raw products. RTE products that are prepared, held, or stored near raw products can become contaminated (e.g., because of aerosolization or dripping). The 2013 FDA Food Code (3-302.11(A)(1)) recommends that retailers separate RTE foods from raw foods. If storage space is limited, wrap the products and store RTE products above raw products. When wrapping, unwrapping, and slicing products, take care to prevent cross-contamination from the outer wrapper, other products, and unclean surfaces and utensils. Raw

products (e.g., chicken used for frying or rotisserie) prepared in the same area as RTE products can increase the potential for cross-contamination.

- Clean and sanitize surfaces between RTE items when using the same equipment to cut, slice, or otherwise reduce the size of large RTE products (e.g., ham, seafood, and vegetables).
- Ensure that grinders, dicers, or other equipment are maintained in sanitary condition when preparing deli salads.

Cleaning and Sanitizing

The Interagency Retail *Lm* Risk Assessment found that following the sanitation practices in the 2013 FDA Food Code aid in controlling *Lm* on deli area food contact surfaces and reduces the predicted risk of listeriosis. The 2013 FDA Food Code (4-602.11(C)) recommends cleaning equipment and utensils at least every 4 hours. Below are some key issues to consider when cleaning and sanitizing.

- Develop written sanitation procedures that describe how utensils and equipment (e.g., slicers) will be cleaned and sanitized prior to use. Ensure employees are familiar with and follow these procedures to reduce the risk of contaminating RTE products with *Lm*. Insanitary conditions (e.g., flies, rodent droppings, mold, or dirty surfaces) should not be present in retail areas. Retailers should **document** the actions they perform to ensure that sanitation procedures are performed on a regular basis.

NOTE: The Interagency Retail *Lm* Risk Assessment found that the predicted risk of listeriosis from the consumption of RTE products sliced or prepared in retail deli departments increases by approximately 41% if wiping, washing, and sanitizing activities are not performed.

- Clean and sanitize utensils and equipment used to handle, prepare, and store RTE products frequently (e.g., at least every 4 hours as recommended by the 2013 FDA Food Code (4-602.11 (C)) to maintain sanitary conditions throughout the day.

Things to Consider at Retail

- ✓ Are sanitation procedures documented?
- ✓ Are RTE product contact surfaces cleaned and sanitized prior to use?
- ✓ Are routine cleaning and sanitation procedures performed in areas where RTE products are handled, stored, and sold?
- ✓ Is RTE equipment disassembled before cleaning and sanitizing?
- ✓ Are surfaces scrubbed during cleaning to prevent biofilm formation?
- ✓ Are sanitizers used at the recommended concentrations?
- ✓ Are sanitizers rotated on a periodic basis?
- ✓ Are cleaning cloths rinsed or soaked in sanitizer between uses?
- ✓ Are only low-pressure water sources (hoses) used during cleaning to prevent splashing?

Clean and sanitize items that employees routinely handle, such as on/off switches, slicer handles, display cases, cooler handles, and similar surfaces.

NOTE: As stated previously, the Interagency Retail *Lm* Risk Assessment found that slicers are sources of *Lm* cross-contamination to RTE foods. Control of *Lm* cross-contamination at all points (including slicers) during retail preparation and handling of RTE foods will reduce the predicted risk of listeriosis from the consumption of RTE products sliced or prepared in retail deli departments by approximately 34%.

- Disassemble RTE food-processing equipment when cleaning and sanitizing equipment as recommended by the Food Code to ensure that hard to reach areas where *Lm* can hide are addressed. For more information, see the FDA poster: [Keep Commercial Deli Slicers Safe](#).
- Scrub surfaces during cleaning to prevent biofilms from occurring. Biofilms are thin layers of microorganisms that adhere to product contact surfaces. *Lm* and other bacteria can adapt to the environment over time and form biofilms. Biofilms are difficult to remove, and they may protect *Lm* from the effects of sanitizers.
- Follow the manufacturer's recommendations for sanitizer strength and application to ensure it is effective. Many sanitizers, when used as recommended, are effective against *Lm*, including those containing quaternary ammonia compounds, chlorine solutions, and organic acids. Generally, increasing the sanitizer strength above the recommended levels will not increase the efficacy of the sanitizer and may result in harmful levels of the sanitizer in foods.
- Rotate (change) sanitizers as needed to provide more effective bacterial control. Alternating sanitizers (e.g., quaternary ammonia and bleach) may help prevent *Lm* from establishing niches in the environment and forming biofilms. For example, retailers can use quaternary ammonia on the week days and bleach on the weekends when rotating sanitizers.
- Develop a procedure to sanitize cleaning aids or have single-use items that are discarded after use. Cleaning cloths, brushes, sponges, mops, and similar cleaning aids can become contaminated with bacteria and then can spread the bacteria to every surface they contact. Therefore, they should be cleaned of visible material and soaked in clean sanitizer between uses. Retailers should monitor sanitizer strength and change the sanitizer as needed so that food particles do not overwhelm the effectiveness of the sanitizer.
- Use low water pressure when cleaning in the deli areas. Splashing and overspray from high-pressure hoses can aerosolize microorganisms and distribute them into the air and onto nearby surfaces.
- Use separate sinks for hand washing and cleaning product or equipment (as recommended by the 2013 Food Code (2-301.15 and 4-501.16)). Hand washing can cause the sink to be contaminated with *Lm* and other pathogens, which can be spread to any other items cleaned in the sink.

- Eliminate or remove unnecessary items (e.g., supplies and equipment) from the deli area. Organize supplies and equipment to facilitate thorough cleaning.

Facility and Equipment Controls

As stated on page 4, the Interagency Retail *Lm* Risk Assessment found that increasing the level of *Lm* and the potential of cross-contamination increases the predicted risk of listeriosis. The 2013 FDA Food Code (6-101.11(A)(1)) recommends that floors, walls, and ceilings be smooth, durable, and easily cleanable.

Facilities, equipment, and utensils should not contribute to product adulteration or contamination. Here are some areas to check and some insanitary issues to avoid.

- Do not allow conditions in the retail facility that could cause the product to become adulterated. These conditions could include condensation dripping on exposed product, construction dust on product or food contact surfaces, or broken equipment which could harbor *Lm*.
- Ensure that walls, floors, drains, and overhead structures in the RTE deli and cooler areas are smooth, durable, easily cleanable, and in good repair. Rubber floor mats and other items used on the floor may be harborage sites for *Lm*. Clean them as often as necessary to ensure that sanitary conditions are maintained.
- Do not perform construction (e.g., replacing floors, walls, or ceilings) when exposed RTE product is present in the deli. *Lm* can be harbored behind the walls and carried by dust. Therefore, the product and equipment should be protected during construction, and the deli area should be cleaned and sanitized after construction and before use.
- Maintain tables, slicers, and other food contact surfaces so that they are easily cleanable. Rough surfaces created by welds, cracks, and other defects can be difficult to clean and can create areas where bacteria can hide. Replace worn, missing, or degraded seals or gaskets because they may become contaminated with *Lm*.
- Clean overhead structures as often as necessary to keep them free of condensation and ensure that sanitary conditions are maintained. Overhead items (e.g., cracked light fixtures) can be *Lm* harborage points. Condensation on overhead structures can lead to contamination of food or food preparation surfaces.
- Keep water from pooling on the floor or other surfaces within the deli area. Doing so will reduce the likelihood that splashes could contaminate food products or food contact surfaces. Standing water can serve as a vehicle for *Lm* and other pathogens.

Things to Consider at Retail

- ✓ Is the facility structure in good repair to prevent contamination or adulteration of products in the deli area?
- ✓ Is the equipment nonporous and free of cracks, pits, and rough welds?
- ✓ Is the overhead structure in the deli area free of condensation?
- ✓ Is the deli area free of standing water on floors or product contact surfaces?

Employee Practices

As mentioned previously, the Interagency Retail *Lm* Risk Assessment found that wearing gloves while serving customers reduces the predicted risk of listeriosis. The 2013 FDA Food Code also recommends that employees wear gloves or use other suitable utensils to handle RTE foods and includes recommendations for training, hand washing, employee health and hygiene, and limiting public access in deli areas to prevent product contamination (references below). Good employee hygiene practices are critical to prevent cross-contamination and the spread of *Lm* and other pathogens. *Lm* can be present on, and spread by, equipment, materials, foods, and people. Here are a few employee practices retailers can use to minimize cross-contamination.

- Ensure that employees wear gloves or use suitable utensils when handling RTE products, as recommended by the 2013 FDA Food Code (3-301.11(B)). Provide disposable gloves so that employees wear and change gloves, as needed, to prevent the contamination of food.

NOTE: The Interagency Retail *Lm* Risk Assessment found that employees not wearing gloves increases the predicted risk of listeriosis from the consumption of RTE products sliced or prepared in the retail deli department by approximately 5%.

- Train employees in sanitation practices and safe food handling procedures. Ensure that the manager has knowledge of food safety practices and procedures, as recommended by the 2013 FDA Food Code (2-102.11), and that employees have been properly trained in hygienic practices.
- Provide adequate facilities, including soap and running water, for employees to wash their hands. As recommended by the 2013 FDA Food Code (2-301.14), employees should wash hands prior to gloving, when switching between handling raw and RTE foods, after engaging in other activities that may contaminate the hands (e.g., handling money or potentially dirty or contaminated surfaces), or using the restroom.
- Implement a policy to ensure that ill employees do not work with open food items, including RTE foods. For example, written procedures should include removing workers from the deli when they are ill with respiratory or diarrheal diseases, as recommended by the 2013 FDA Food Code (2-201.11).

Things to Consider at Retail

- ✓ Are there procedures to prevent ill employees from working in the food preparation area?
- ✓ Do employees wash hands prior to handling exposed RTE product?
- ✓ Do employees wear disposable gloves when handling exposed RTE product?
- ✓ If employees wear disposable gloves, do they change them, as necessary, to prevent cross-contamination (e.g., after handling raw product or money) when handling RTE product?
- ✓ Is foot traffic limited in RTE food product handling areas?

- Limit employee traffic in the deli area and develop traffic-flow plans for product, employees, and other items to prevent contamination by consumers and employees. The plans should minimize exposure of open RTE foods to raw foods, exterior packaging, and other possibly contaminated materials, such as boxes, trash, and chemicals. Designing facilities and controlling traffic in the deli area to restrict movement of people and material reduces the chance of cross-contamination. Non-deli workers should not handle exposed RTE products.
- Develop practices to prevent outer clothing from spreading contamination. Ensure that employees change their aprons or outer clothing, such as frocks or smocks, when the clothing is soiled with food or dirt particles that could transfer to food or food contact surfaces. Employees should not hold exposed RTE food products against their aprons or other clothing. Employees should not wear this outer clothing into restrooms, in break areas, or outside the deli area.

Deli Self-Assessment Tool

Retailers should use this tool to determine whether they have adopted the appropriate procedures to control *Lm*, or whether they should adopt new procedures. The preferred answer (based on the information in the guidance) is indicated with an asterisk. Having a “no” answer does not necessarily indicate lack of control. If retailers find that they are not meeting the recommendations in this guidance, they should consider changing practices to better control *Lm* in the deli area.

| Product/ Product Handling: RTE Deli Area | YES | NO | N/A |
|---|----------------------------|----------------------------|--------------------------|
| 1. Is any visibly adulterated product present in the area (e.g., filthy, putrid, decomposed, slimy, rancid, off-condition)? | <input type="checkbox"/> | <input type="checkbox"/> * | <input type="checkbox"/> |
| 2. Are RTE meat or poultry products refrigerated promptly after use? | <input type="checkbox"/> * | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. Is RTE product prepared, held, or stored near or adjacent to raw product in the deli case and elsewhere in the deli area? | <input type="checkbox"/> | <input type="checkbox"/> * | <input type="checkbox"/> |
| 4. Is the RTE product date-marked when opened? | <input type="checkbox"/> * | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. Is there any RTE product in the deli case that is outside of the date-marked period? | <input type="checkbox"/> | <input type="checkbox"/> * | <input type="checkbox"/> |
| 6. Are the deli cases and other refrigerated units maintained at or below 41°F (5°C)? | <input type="checkbox"/> * | <input type="checkbox"/> | <input type="checkbox"/> |
| 7. Is opened RTE product covered, wrapped, or otherwise protected to prevent cross-contamination when not in use in the deli case and elsewhere in the deli area? | <input type="checkbox"/> * | <input type="checkbox"/> | <input type="checkbox"/> |
| 8. Is RTE product stored in the deli case properly identified and labeled? | <input type="checkbox"/> * | <input type="checkbox"/> | <input type="checkbox"/> |
| 9. Do you use deli products formulated with antimicrobial agents? | <input type="checkbox"/> * | <input type="checkbox"/> | <input type="checkbox"/> |
| 10. Are RTE product contact surfaces cleaned and sanitized prior to using the surface for another product to avoid cross-contamination of products? | <input type="checkbox"/> * | <input type="checkbox"/> | <input type="checkbox"/> |
| 11. If you prepare deli salads, are there controls in place to ensure that grinders, dicers, or other equipment are maintained in sanitary condition? | <input type="checkbox"/> * | <input type="checkbox"/> | <input type="checkbox"/> |

| Cleaning/Sanitizing: RTE Deli Area | YES | NO | N/A |
|--|----------------------------|----------------------------|--------------------------|
| 12. Are insanitary conditions (e.g., flies, rodent droppings, mold, or dirty surfaces) present in areas where meat and poultry products are prepared, packed, or held? | <input type="checkbox"/> | <input type="checkbox"/> * | <input type="checkbox"/> |
| 13. Do you use sanitizers at the proper concentration? | <input type="checkbox"/> * | <input type="checkbox"/> | <input type="checkbox"/> |
| 14. Do you clean and sanitize the RTE equipment (including slicers) at least every 4 hours? | <input type="checkbox"/> * | <input type="checkbox"/> | <input type="checkbox"/> |
| 15. Do you disassemble RTE equipment (including slicers) during cleaning and sanitizing? | <input type="checkbox"/> * | <input type="checkbox"/> | <input type="checkbox"/> |
| 16. Do you scrub surfaces during cleaning to prevent biofilms? | <input type="checkbox"/> * | <input type="checkbox"/> | <input type="checkbox"/> |
| 17. Do you soak or rinse cleaning cloths in sanitizer between uses? | <input type="checkbox"/> * | <input type="checkbox"/> | <input type="checkbox"/> |

| | | | |
|--|----------------------------|----------------------------|--------------------------|
| 18. Are sanitizer types (e.g., quaternary ammonium, chlorine-based, or iodophores) rotated periodically? | <input type="checkbox"/> * | <input type="checkbox"/> | <input type="checkbox"/> |
| 19. Do you clean the RTE area with a high pressure hose (e.g., with enough pressure to cause splashing)? | <input type="checkbox"/> | <input type="checkbox"/> * | <input type="checkbox"/> |
| 20. Are there separate sinks for hand washing and other uses? | <input type="checkbox"/> * | <input type="checkbox"/> | <input type="checkbox"/> |
| 21. Do you have material (e.g., pallets, milk cartons, cardboard boxes, or push carts) in the deli area that makes cleaning difficult? | <input type="checkbox"/> | <input type="checkbox"/> * | <input type="checkbox"/> |

| Facility: RTE Deli Area | YES | NO | N/A |
|---|----------------------------|----------------------------|--------------------------|
| 22. Are there facility conditions (e.g., condensation dripping on exposed product, construction dust on product, or broken equipment) that could cause the product to become adulterated? | <input type="checkbox"/> | <input type="checkbox"/> * | <input type="checkbox"/> |
| 23. Is there condensation on overhead structures or over the RTE product? | <input type="checkbox"/> | <input type="checkbox"/> * | <input type="checkbox"/> |
| 24. Is there standing water on surfaces, including the floor? | <input type="checkbox"/> | <input type="checkbox"/> * | <input type="checkbox"/> |
| 25. Are product contact surfaces in good condition (e.g., non-porous surfaces, free from cracks, pits, and rough welds)? | <input type="checkbox"/> * | <input type="checkbox"/> | <input type="checkbox"/> |
| 26. Are slicers and mixers in good condition (e.g., free of cracks, broken, missing or unattached parts; seals and gaskets not worn, degraded, or missing)? | <input type="checkbox"/> * | <input type="checkbox"/> | <input type="checkbox"/> |
| 27. Are the walls, floors, and ceilings sanitary and in good repair? | <input type="checkbox"/> * | <input type="checkbox"/> | <input type="checkbox"/> |

| Employee Practices: RTE Deli Area | YES | NO | N/A |
|--|----------------------------|----------------------------|--------------------------|
| 28. Are visibly ill employees working in food preparation areas where product could become contaminated (e.g., by coughing or sneezing)? | <input type="checkbox"/> | <input type="checkbox"/> * | <input type="checkbox"/> |
| 29. Do employees work without washing hands prior to handling exposed RTE product? | <input type="checkbox"/> | <input type="checkbox"/> * | <input type="checkbox"/> |
| 30. Do employees wear disposable gloves when handling exposed RTE product that will not be cooked? | <input type="checkbox"/> * | <input type="checkbox"/> | <input type="checkbox"/> |
| 31. If employees wear gloves, do they changed them as necessary to avoid cross-contamination of RTE product? | <input type="checkbox"/> * | <input type="checkbox"/> | <input type="checkbox"/> |
| 32. Do employees change outer clothing (e.g., frocks, aprons, or smocks) as often as necessary to avoid contamination of RTE product? | <input type="checkbox"/> * | <input type="checkbox"/> | <input type="checkbox"/> |
| 33. Is foot traffic limited to necessary employees in areas where RTE product is handled? | <input type="checkbox"/> * | <input type="checkbox"/> | <input type="checkbox"/> |

*Preferred answer

References and Resources

Burnett SL, Mertz EL, Bennie B, Ford T, and Starobin A. Growth or survival of *Listeria monocytogenes* in ready-to-eat meat products and combination deli salads during refrigerated

storage. *Journal of Food Science*. Volume 70, Issue 6, pages m301–m304, August 2005. (Role of temperature in *Lm* control)

Centers for Disease Control and Prevention website, found at <http://www.cdc.gov/listeria/> (*Lm* and listeriosis overview)

Conference for Food Protection *Listeria monocytogenes* Intervention Committee. Voluntary Guidelines of Sanitation Practices Standard Operating Procedures and Good Retail Practices to Minimize Contamination and Growth of *Listeria monocytogenes* Within Food Establishments. (*Lm* niche and sanitation practices) Found at: <http://www.foodprotect.org/media/guide/2006CFPLmInterventionvoluntaryguidelines.pdf>

Endrikat S, Gallagher D, Pouillot R, Hicks Quesenberry H, LaBarre D, Schroeder CM, and Kause J. A comparative risk assessment for *Listeria monocytogenes* in prepackaged versus retail-sliced deli meat. *Journal of Food Protection*. Volume 73, Issue 4, pages 612-619, April 2010 (FSIS comparative *Lm* risk assessment)

FDA Food Code, 2013, found at: <http://www.fda.gov/Food/GuidanceRegulation/RetailFoodProtection/FoodCode/ucm374275.htm> (Model regulations, ordinances, and policies for food safety)

FDA, Guidance for Industry: Control of *Listeria monocytogenes* in Refrigerated or Frozen Ready-To-Eat Foods; Draft Guidance, February, 2008. Found at: <http://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/FoodProcessingHACCP/ucm073110.htm>

FDA/FSIS, Quantitative assessment of relative risk to public health from foodborne *Listeria monocytogenes* among selected categories of ready-to-eat foods, 2003. Food and Drug Administration, United States Department of Agriculture, Centers for Disease Control and Prevention. Found at: <http://www.fda.gov/Food/FoodScienceResearch/RiskSafetyAssessment/ucm183966.htm> (*Lm* risk assessment)

Folsom, JP and JF Frank. Chlorine resistance of *Listeria monocytogenes* biofilms and relationship to subtype, cell density, and planktonic cell chlorine resistance. *Journal of Food Protection*. Volume 69, number 6, pages 1292-1296, June 2006.

Food Marketing Institute (2006). Guidance for the Control of *Listeria monocytogenes* Risks in Retail Food Stores. (Guidance for *Lm* control)

Food Marketing Institute (2012). FMI *Listeria* Action Plan for Retail Delis. Found at: <http://www.fmi.org/docs/food-safety-best-practice-guides/listeria-action-plan-for-retail-delis.pdf?sfvrsn=9> (Guidance for *Lm* control)

Food Safety Authority of Ireland. The Control and Management of *Listeria monocytogenes* Contamination of Food. 2005. Found at: <https://www.fsai.ie/WorkArea/DownloadAsset.aspx?id=1234>

FSIS/FDA, Guidelines for Retail and Foodservice Establishments Affected by Natural or Other Disasters, found at:

http://www.fsis.usda.gov/wps/wcm/connect/1f4d9cef-3410-4d03-9dd6-08fe089e1317/Fsis_Fda_Retail_Reopening.pdf?MOD=AJPERES

(Guidance for retail food safety)

FSIS Compliance Guideline: Controlling *Listeria monocytogenes* in Post-lethality Exposed Ready-to-Eat Meat and Poultry Products, 2014, found at:

<http://www.fsis.usda.gov/wps/wcm/connect/d3373299-50e6-47d6-a577-e74a1e549fde/Controlling-Lm-RTE-Guideline.pdf?MOD=AJPERES>

(Guidance for FSIS regulated establishments)

Gibson KE, Koo OK, O'Bryan CA, Neal JA, Ricke SC, and Crandall PG. Observation and relative quantification of cross-contamination within a mock retail delicatessen environment. *Food Control*, Volume 31, Issue 1, pages 116-124, January 2013 (Bacterial cross-contamination in the deli)

Gombas DE, Chen Y, Clavero RS, Scott VN. Survey of *Listeria monocytogenes* in ready-to-eat foods. *Journal of Food Protection*. Volume 66, Issue 4, pages 559-669, April 2003 (Retail surveys of *Lm* contamination in RTE products)

Hoelzer, K, Pouillot, R, Dennis, S, Gallagher, D, and Kause, J. "Update on *Listeria monocytogenes*: reducing cross-contamination in food retail operations." In: *Advances in microbial food safety*, Volume 2. Sofos, J. (Ed). Woodhead Publishing, Cambridge, UK, December 2014.

Lin CM, Takeuchi K, Zhang L, Dohm CB, Meyer JD, Hall PA, and Doyle MP. Cross-contamination between processing equipment and deli meats by *Listeria monocytogenes*. *Journal of Food Protection*. Volume 69, Issue 1, pages 71-79, January 2006 (*Lm* cross-contamination from slicers)

Lloyd T, Alvarado CZ, McKee SR, and Berrang ME. Control of *Listeria monocytogenes* in ham deli loaves using organic acids. *Journal of Food Safety* Volume 30, Issue 4, pages: 793–803, November 2010 (growth inhibitors)

Maitland J, Boyer R, Gallagher D, Duncan S, Bauer N, Kause J, and Eifert J. Tracking cross-contamination transfer dynamics at a mock retail deli market using GloGerm™. *Journal of Food Protection*. Volume 76, Issue 2, pages 272-282, January 2013. (Bacterial cross-contamination in the deli)

Pan Y, Breidt Jr F, and Kathariou S. Resistance of *Listeria monocytogenes* biofilms to sanitizing agents in a simulated food processing environment. *Applied Environmental Microbiology*. Volume 72, Issue 12, pages 7711-7717, December 2006. (sanitation practices for *Lm* control)

Pennsylvania State University (Penn State), College of Agricultural Sciences, Agricultural Research and Cooperative Extension. Control of *Listeria monocytogenes* in Retail Establishments, 2006.

<http://pubs.cas.psu.edu/freepubs/pdfs/uk137.pdf>

(Guidance for *Lm* control)

Pennsylvania State University (Penn State), College of Agricultural Sciences, Agricultural Research and Cooperative Extension. Control of *Listeria monocytogenes* in Small Meat and Poultry Establishments, 2003.
<http://extension.psu.edu/food/safety/other-topics/controlling-listeria/Cotrolling-Listeria-2.pdf/view>
(Sampling for *Lm*, rotating sanitizers).

Pouillot, R, Gallagher, D, Tang, J, Hoelzer, K, and Kause, J. *Listeria monocytogenes* in retail delicatessens: an interagency risk assessment – model and baseline results. Journal of Food Protection, Volume 78, Issue 1, pages 134-145, January 2015.

Pradhan AK, Ivanek R, Gröhn YT, Bukowski R, Wiedmann M. Comparison of public health impact of *Listeria monocytogenes* product-to-product and environment-to-product contamination of deli meats at retail. Journal of Food Protection, Volume 74, Issue 11, pages 1860-1868, November 2011 (Bacterial cross-contamination in the deli)

Pradhan AK, Ivanek R, Gröhn YT, Bukowski R, Sofos JN, and Wiedmann M. Quantitative risk assessment of listeriosis-associated deaths due to *Listeria monocytogenes* contamination of deli meats originating from manufacture and retail. Journal of Food Protection, Volume 73, Issue 4, pages 620-630, April 2010 (Cornell University comparative *Lm* risk assessment)

Ryser T and Marth EH (eds). 1999. *Listeria*, Listeriosis, and Food Safety. Second Edition (*Lm* and listeriosis overview)

Scallan E, Hoekstra RM, Angulo FJ, Tauxe RV, Widdowson MA, Roy SL, Jones JL, and Griffin PM. Foodborne illness acquired in the United States—major pathogens. Emerging Infectious Diseases, Volume 17, Number 1, pages 7-15, January 2011. (Estimates of foodborne illness in the U.S.)

Simmons, C, Stasiewicz, MJ, Wright, E, Warchocki, S, Roof, S, Kause, JR, Bauer, N, Ibrahim, S, Wiedmann, M, and Oliver, HF. *Listeria monocytogenes* and *Listeria* spp. contamination patterns in retail delicatessen establishments in three U.S. states. Journal of Food Protection, Volume 77, Issue 11, pages 1929-1239, November 2014.

Tompkin, RB. Control of *Listeria monocytogenes* in the food-processing environment. Journal of Food Protection, Volume 65, Issue 4, pages 709-725, April 2002. (*Lm* niche and sanitation practices)

Tompkin RB, Scott VN, Bernard DT, Sveum WH, and Gombas KS. 1999. Guidelines to prevent post-processing contamination from *Listeria monocytogenes*. Dairy, Food and Environmental Sanitation 19 (8): 551-562.

USDA/FDA, Interagency Risk Assessment: *Listeria monocytogenes* in Retail Delicatessens, 2013. United States Department of Agriculture, Food Safety and Inspection Service and U.S. Food and Drug Administration, Center for Food Safety and Applied Nutrition.
<http://www.fsis.usda.gov/wps/wcm/connect/c0c6dfbc-ad83-47c1-bcb8-8db6583f762b/Lm-Retail-Technical-Report.pdf?MOD=AJPERES>
(*Lm* risk assessment)

Vorst K L, Todd EC, and Ryser ET. Transfer of *Listeria monocytogenes* during mechanical slicing of turkey breast, bologna, and salami. Journal of Food Protection, Volume 69, Issue 3, pages 619–626, March 2006 (*Lm* cross-contamination from slicers)

Walker SJ, Archer P, and Banks JG. Growth of *Listeria monocytogenes* at refrigeration temperatures. Journal of Applied Bacteriology. Volume 68, Issue 2, pages157–162, February 1990. (Temperature and general background information)