

# Department of Food Science

## Food Safety

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### Listeria

Pat A. Curtis, Ph.D., John E. Rushing, Ph.D.

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*Listeria monocytogenes* can be found throughout the environment and in many foods. It is associated primarily with meat and animal products. It resists heat, salt, nitrite and acidity better than many organisms and can grow at temperatures as low as 34°F (1°C). Low storage temperatures slow, but do not stop growth. Commercial freezer temperatures of 0°F will stop *L. monocytogenes* from multiplying, but may not destroy it. Commercial pasteurization procedures for dairy products have been determined to be sufficient to destroy this organism. Proper cooking and reheating of foods will effectively control *Listeria*. The organism can colonize cracks, food-filled crevices, and inaccessible areas in food preparation and processing facilities and equipment. This presents a significant challenge to sanitation procedures.

Recent outbreaks of *L. monocytogenes* foodborne infections (listeriosis) have heightened concerns over its presence in foods. Its presence on a food does not change the taste or smell of the food. Foods implicated in outbreaks include soft (i.e. Latin-American white cheeses, Feta), and surface-ripened cheeses (i.e. Brie, Camembert--both domestic and imported), deli salads such as cole slaw, raw (unpasteurized) milk, turkey franks and other hot dogs, shrimp and (undercooked) chicken. Previously cooked, ready-to-eat

foods requiring no further cooking are also of concern.

#### Who is at risk?

Most healthy people will not become ill from foods contaminated with this organism. Persons at increased risk include pregnant women (or more correctly, their fetus), organ transplant recipients, the elderly and those with immunosuppressive conditions such as cancer, renal disease, diabetes, AIDS, and conditions caused by corticosteroid use.

#### What are the symptoms?

The disease symptoms are variable and depend on the individual's susceptibility. Symptoms may be limited to fever, fatigue, nausea, vomiting and diarrhea. Flu-like symptoms may occur 12 hours after eating *L. monocytogenes* contaminated food. Researchers are not sure how many *L. monocytogenes* organisms it takes to cause illness. Onset time probably depends on the health of the patient, the strain of *L. monocytogenes* and the amount of the bacteria ingested. However, these symptoms can precede a more serious illness.

The more serious cases of listeriosis may take one to six weeks to develop. These cases may result in meningitis (brain

infections) and septicemia (bacteria in the bloodstream). Pregnant women with flu-like symptoms due to listeriosis are particularly at risk and may develop complications which can result in miscarriage, stillbirth, or septicemia or meningitis in the newborn. In older children and adults, complications usually involve the central nervous system and blood stream, but may include pneumonia and endocarditis (inflammation of the heart lining and valves). Skin contact of *L. monocytogenes* with a wound can cause localized abscesses or skin lesions.

Listeriosis can be positively diagnosed by culturing the organisms from blood or cerebrospinal fluid. The disease can be treated with antibiotic drugs such as penicillin or ampicillin.

### **What is government doing?**

Neither the U.S. Department of Agriculture's Food Safety and Inspection Service (FSIS) nor the Food and Drug Administration (FDA) will accept **any** detectable *L. monocytogenes* in cooked or pasteurized, ready-to-eat food (zero tolerance). Both agencies have testing programs for this organism. The goal of these programs is to help government and industry identify the causes of contamination and to make permanent changes in processing plants that will reduce contamination, prevent problems and ensure a safe food supply. Both agencies can hold or detain products at the food processing plant, request a voluntary recall of the product, or seize products through court order, if necessary.

### **Prevention**

FSIS and FDA have identified the Hazard Analysis and Critical Control Points (HACCP) program as the most effective strategy for controlling the presence of *L.*

*monocytogenes* and other pathogenic bacteria on food products. In a HACCP program, points at which food safety risks are more likely to be introduced are identified. Control strategies are then developed to reduce the potential of product contamination. Government and food processors are working with retail establishments and institutions to identify critical control points and implement control strategies to reduce the food safety hazards.

### **Recommendations for retail food stores and commercial and institutional food service operators:**

- Keep perishable foods requiring refrigeration in the refrigerator.
- Emphasize routine temperature checks for refrigeration cases to assure regulatory compliance. Lower temperatures are recommended to minimize the multiplication of *Listeria*.
- Survey refrigerated items for pull dates and remove out-of-date merchandise.
- Ensure food contact surfaces and utensils are adequately cleaned and sanitized.
- Require and strictly enforce the separation of raw from cooked food items.
- Cooking and hot holding should follow all state and local ordinances. The proposed U.S. Public Health Service Model Code requires cooking to at least an internal temperature of 145°F (63°C) for all animal foods except rare roast beef, which must be cooked to an internal temperature of 130°F (55°C) for 121 minutes. Poultry, stuffed meats and leftovers must be heated to 165°F (74°C). Foods held hot must be

maintained at a temperature at or above 140°F (60°C). Food in preparation must not be held between 40°F and 140°F for more than a total of four hours.

- Sometimes charitable organizations receive out-of-date perishable products. Thorough cooking (165°F or 74°C internal temperature) is advised for leftovers and out-of-date, ready-to-eat refrigerated foods before serving.

#### **Recommendations for delicatessens:**

- Keep perishable foods requiring refrigeration in refrigerators.
- Ready-to-eat food should be protected against cross contamination from raw food by physical separation. Special care should be taken when handling soft cheeses and cold cuts (luncheon meats and cheeses) to prevent contamination of other foods.
- Ready-to-eat foods should not be stored below raw foods on shelves.
- Every food utensil and the food contact surfaces of equipment should be sanitized after thorough cleaning and before reuse and:
- Each time there is a change in preparation between types of raw animal products such as beef, fish, lamb, pork and poultry
- Each time there is a change from raw to ready-to-eat foods
- At intervals not to exceed four hours throughout periods of operation.
- Poultry shall be either sold raw or after it has been fully cooked to a temperature of 165°F (74°C) or above,

and held hot or cooled then reheated to required serving temperatures.

- Product thermometers should be provided and used to ensure attainment and maintenance of proper internal food temperatures.
- Food contamination from employee's hands should be minimized during food preparation and service by frequent hand washing and by the proper use of deli paper, suitable utensils, or single service gloves.

#### **Recommendations for all individuals:**

- Thoroughly cook raw food from animal sources such as beef, pork, or poultry.
- Wash raw vegetables thoroughly before eating.
- Keep uncooked meats separate from vegetables and both separate from cooked foods and ready-to-eat foods.
- Avoid raw (unpasteurized) milk or foods made from raw milk.
- Wash hands, knives, and cutting boards after preparing uncooked foods.
- Keep hot foods hot above 140°F (60°C) and cold foods cold at or below 40°F (4.4°C). Do not keep them out for longer than two hours at room temperature before eating.
- Read and follow label instructions to "keep refrigerated" and "use by" a certain date.
- Divide leftovers into small, shallow covered containers before refrigerating, so that they can chill rapidly and evenly.

- Keep your refrigerator **clean** and keep the temperature at 34-40°F (1.1-4.4°C).

**Additional recommendations to high-risk individuals:**

- Avoid soft cheeses such as Mexican-style cheeses, Feta, Brie, Camembert, and blue-veined cheeses. There is no need to avoid hard cheeses, cream cheese, cottage cheese, or yogurt.
- "Left-over" foods or "ready-to-eat" foods such as hot dogs, should be reheated until steaming hot before eating. Avoid microwave preparation of these foods.
- Although the risk of listeriosis associated with foods from delicatessen counters is relatively low, high risk individuals such as pregnant women and immunosuppressed persons may choose to avoid these foods or to thoroughly reheat cold cuts before eating.

**Additional sources of information:**

**The following publications are available from:**

**FSIS Publications  
USDA  
Room 1165, South Bldg.  
Washington, DC 20250**

- "Is Someone You Know at Risk for Foodborne Illness?"
- "FSIS Facts: Bacteria that Cause Foodborne Illness"
- "A Quick Consumer Guide for Food Handling" (for consumers)
- "Preventing Foodborne Illness: A Guide to Safe Food Handling" (for extension Agents and health educators)

- "Preventing Foodborne Listeriosis"

**The following publications are available from: Food and Drug Administration**

**HFE-88  
5600 Fishers Lane  
Rockville, MD 20857**

- "Listeria, Battling Back Against One Tough Bug"
- "Listeriosis: A Deadly Danger"
- "Guarding Against Listeria at Home"
- Eating Defensively: Food Safety Advice for Persons with AIDS"

**For further information contact:**

**Department of Food Science, North Carolina State University, North Carolina Cooperative Extension Service, Box 7624, Raleigh, NC 27695-7624 (919/515-2956 or FAX 919/515-7124)**

**USDA's Meat and Poultry Hotline at 1-800-535-4555.**