



Listeria monocytogenes:

SEAFOOD PROCESSING SERIES

A bacterium of increasing concern

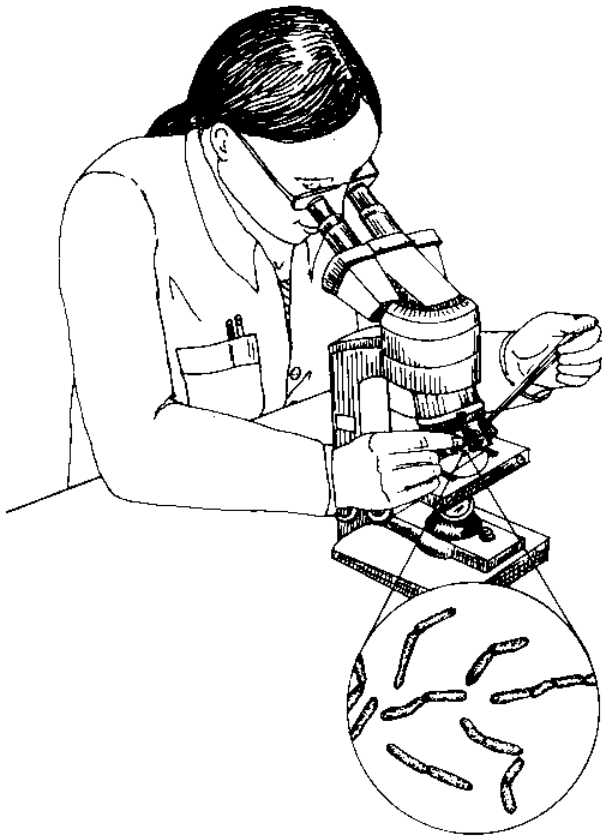
John B. Peters

The Problem

Contamination of ready-to-eat food products by the bacterium *Listeria monocytogenes* can be a serious threat to public health. This bacterium causes a food-borne disease called listeriosis in susceptible individuals. While healthy people may only suffer flu-like symptoms, pregnant women, newborn infants, recent mothers and immuno-compromised individuals are exposed to a very high fatality risk. Fatality rates in outbreaks of listeriosis usually range from 20 to 40 percent but have gone as high as 45 percent.

Surveys conducted by the Centers for Disease Control indicate that listeriosis is far more common than previously realized. The most recent survey estimates that the incidence among the general population is approximately 7 per 1 million population per year, whereas among pregnant women it is approximately 210, and among AIDS patients it is approximately 2,100 cases per million population per year. In the last decade, listeriosis has been reported with increasing frequency. Because it is often believed to be misdiagnosed, listeriosis may actually be more common than reported.

Listeria monocytogenes is not a newly discovered organism. It has been recognized as a problem in animals since 1911 and in man since 1929. It has come into the spotlight recently, partly because of the very serious epidemic attributed to Jalisco cheese in California in 1985 and an earlier outbreak in Boston in 1983, and also as a result of improved detection methods.



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The organism is widely distributed in nature and is most commonly found in soil, in marine sediments, and in water. It has also been found in a wide range of hosts, including mammals, birds, fish, and crustaceans. It grows at refrigeration temperatures in a variety of ready-to-eat products. It is a microorganism of increasing concern, considering the number of ready-to-eat food products with extended periods of shelf-life that are now being marketed.

Epidemic outbreaks of listeriosis have been associated with raw vegetables and dairy products, including pasteurized milk and soft cheeses. The *Listeria* organism has been identified in meat and poultry products as well as in several fishery products. There have been no reported cases of listeriosis attributable to either meat or poultry products. However, in 1980 there was an outbreak in New Zealand related to the consumption of raw fish and shellfish that resulted in twenty-two perinatal cases and five fatalities.

The U.S. Food and Drug Administration is the federal agency responsible for preserving the public health against exposure to pathogenic bacteria. Its position must, by definition, be conservative. The FDA has specified a zero tolerance level for *Listeria monocytogenes* in ready-to-eat foods. Therefore any ready-to-eat foods that test positive for this organism will be restrained or recalled from the marketplace.

Solutions

Potential risks to seafood processors resulting from problems related to *Listeria monocytogenes* can be minimized by an awareness of the problem and by maintaining a high performance level in sanitation and process control. It is recommended that processors use as their foundation program the "Good Manufacturing Practices" as outlined by the U.S. Food and Drug

Administration in CFR, Title 21, Part 110. It may be necessary to institute more intensive control measures in order to avoid contamination.

Processors should develop rigid programs to assure effective sanitation and elimination of cross-contamination. Both of these areas fall into the hazard analysis-critical control point (HACCP) program concept. Both are but two of the several critical areas that must be considered as necessary prerequisites to the production and marketing of safe and wholesome food products. Any efforts made to prevent contamination by *Listeria* will also help reduce other pathogenic and nonpathogenic organisms and thus help to extend the shelf-life of the product.

Unlike most food-borne pathogens, *Listeria* will grow at refrigerated temperatures as low as 37°F and as high as 113°F. It will survive freezing, and it will grow in the damp environments found in most seafood processing plants. It will grow between pH levels of 5.0 and 9.6. *Listeria* also tolerates high salt concentration and has been found in brine freezers. It can even grow in some cooked products after packaging.

In food plants, typical sources of *Listeria* contamination are: food contact surfaces, floors, floor drains, entrances, hoses, brooms, mops, sponges, and in wash areas. It has been found on exhaust hoods also. *Listeria* may be transported on aerosols such as water or steam to other locations in the plant, by drafts.

Listeria can be destroyed by chlorine, iodine, and quaternary ammonium compounds when used as recommended. Regulations permit the application of up to 25 ppm of iodine and 200 ppm of either chlorine or quaternary ammonium compounds without a following potable water rinse. Processing or pasteurization at temperatures of 145°F or higher will

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kill *Listeria*. Hot water above 180°F is reported to be effective, but the minimum contact time has not been established.

Some of the critical control points for managers to consider in evaluating their plants in order to limit *Listeria* contamination are discussed below.

Sanitation

- Ensure that the plant water supply is adequate and of good sanitary quality.
- Ensure that liquid and solid sewage disposal systems are adequate and capable of removing all waste materials from the plant.
- Provide adequate floor drainage.
- Provide adequate hand-washing and outerwear sanitizing facilities for plant personnel.
- Eliminate contamination by flies, birds, and animals and those conditions that attract them in and around the plant. Effectively screen all doors and windows or keep them closed.
- Ensure that all food product storage boxes, totes, rooms, and work areas are properly maintained, cleaned, and sanitized.
- Make sure that all equipment, tools, utensils, and food contact surfaces are properly designed and suitable for food use.
- Thoroughly clean and sanitize the plant, equipment, tools, utensils, and all food product contact surfaces at least once a day.

The following is the generally accepted procedure for plant cleanup:

- Use "dry" cleanup procedures whenever possible to remove soils by sweeping.
- Rinse with a low pressure-high volume rinse of potable warm water (140°F) to mobilize fats and oils and remove product residues. Minimize splashing.
- Apply FDA approved detergents and/or soaps. Scrub with appropriate brooms and brushes.
- Rinse with potable warm or hot (180°) water. Surfaces should be visibly clean.
- Apply approved sanitizers and rinse as required.
- Dry areas as much as possible. Do not blow materials from the floor onto equipment.

Cross-Contamination

- Eliminate all cross-connections and potential back-syphon situations.
- Consider all floors as contaminated and eliminate the possibility of floor water contaminating the product.
- Reduce or eliminate water on floors by adequate catchments, drainage, squeegees, and reduction of water usage.
- Effectively separate raw product areas from cooked product areas.
- Do not allow personnel to enter any area where unprotected finished products are exposed, without first sanitizing their hands, gloves, and outerwear.

- Eliminate any delays in the processing cycle that would allow the product to remain at or above room temperature for any period of time.
- Try to achieve a "continuous" type of process flow, where all product moves progressively in one direction, to eliminate the possibility of raw product contaminating cooked product.
- Consider using metal or plastic containers for ice and for cooked product. (Wood totes and boxes are virtually impossible to maintain in a sanitary condition.)
- Eliminate all possibilities of condensate or other materials from falling onto finished products.
- Use exhaust fans and hoods in appropriate areas to remove steam.
- Screen and filter all air coming into the plant, when necessary.

Following the practices described in this bulletin will help assure freedom from contamination by *Listeria monocytogenes*.

About the author:

John B. Peters is the seafood processing and marketing specialist with Washington Sea Grant Marine Advisory Services. He is a fisheries technologist and has more than 30 years' experience in the food processing industry. He regularly gives classes in seafood processing and quality control and has traveled worldwide on problem-solving assignments.

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