Listeria monocytogenes: An Overview

*Listeria monocytogenes* is persistent in the food processing environment. Unlike other bacteria, *Listeria* can survive and grow at refrigeration temperatures. Ready-to-eat foods that support the growth of *L. monocytogenes* due to its storage at refrigerated temperatures have been found to be a consistent source of *Listeria* contamination and foodborne illness.

*Salmonella* or *E. coli* O157 are better known for causing gastrointestinal and foodborne illness as they cause disease in higher numbers. *Listeria monocytogenes* infects fewer people but when it causes disease, the effects are far often more severe. The fatality rate of listeriosis exceeds that of *Salmonella* and can be deadly for up to 30% of infected consumers.

The control and monitoring of *L. monocytogenes* in the food processing environment is vital to ensuring consumer safety by reacting on possible risks before it contaminates food products.

People at Risk

Food contaminated with *Listeria monocytogenes* can cause serious illness and even death due to listeriosis, an invasive infection of the blood and central nervous system.

Although listeriosis can occur in otherwise healthy adults and children, certain populations, pregnant women, children, the elderly (> 60 years of age) and individuals with weakened immune systems, are at higher risk of developing listeriosis after eating contaminated food.

Food contaminated with *L. monocytogenes* shows no sign of spoilage and may be within the best before date for consumption.
Symptoms and Treatment

The genus *Listeria* includes six different species, but only *L. monocytogenes* is consistently associated with human illness. *L. monocytogenes* is also one of few bacteria that can cross the placental barrier and the blood-brain barrier to cause serious infections.

In pregnant women, the infection can cause miscarriages, stillbirths, premature delivery or life-threatening infection of the newborn.

In other infected individuals symptoms include flu-like symptoms, high fever, severe headache, muscle aches and stiffness, nausea, abdominal pain, sometimes preceded by diarrhoea and gastrointestinal symptoms. The blood infection can spread to the central nervous system or brain and lead to meningitis or encephalitis.

Most patients begin feeling symptoms anywhere from 7 to 21 days after ingestion of food contaminated with *L. monocytogenes*.

The illness can be treated with specific antibiotics when correctly diagnosed. When left untreated, the overall fatality rate of the illness is 30% in individuals and higher in vulnerable individuals like the elderly and foetuses.

*Listeria* in the Environment

*Listeria* is naturally widespread in the environment and can persist in food environments as a post-process contaminant.

Because of its persistence, the organism is constantly re-introduced into the food processing environment. Efforts to control *L. monocytogenes* can reduce the amount and level of contamination, but total elimination of *Listeria* from the processing environment is unrealistic. However, because of the serious nature of listeriosis in susceptible populations, it is vitally important that food industries take stringent measures to control the potential for contamination of prepared foods.

Other *Listeria* species can be found in the environment and are associated with food and the processing environment in the same way as *L. monocytogenes*. Therefore finding any *Listeria* species in the processing environment or food indicates that there is the potential for *L. monocytogenes* to be present as well.

Detection of *L. monocytogenes* and other *Listeria* species should be viewed in a very serious light.
Outbreaks, Recalls and Incidence

A recent UK study found that the prevalence of *L. monocytogenes* in ready-to-eat products such as sliced meats, hard cheeses, sandwiches, butter, spreadable cheese, confectionery products containing ice cream and probiotic drinks ranged from 0 to 7.0%. A large US study found that the prevalence of *L. monocytogenes* in ready-to-eat products such as smoked seafood, deli meats, various salads and soft cheeses ranged from 0.17 to 4.7%.

In the United Kingdom (UK) and the United States of America (USA) ready-to-eat food products are recalled if contamination with *L. monocytogenes* is suspected. Product recalls in the UK and USA for 2014 include coleslaw, smoked salmon, sandwiches, whole peaches, sunflower seeds, and chicken salad.

In 2014 a *Listeria* outbreak in Denmark was linked to 12 deaths, with pork sausages being the food vehicle. The death rate was especially high as a number of elderly persons had consumed the product. A *Listeria* outbreak in Australia in 2013 caused the death of 2 people and resulted in 1 miscarriage as a result of infection with *L. monocytogenes* isolated from soft cheeses.

The Public Health Agency in Sweden is investigating the increase in outbreaks of *L. monocytogenes* foodborne illnesses in 2014. Outbreaks of *L. monocytogenes* are difficult to investigate as there is an average of 3 weeks between consuming the product, and showing signs of illness. The suspected food vehicle is cold cut meats.

Control of *L. monocytogenes*

Cross-contamination of prepared foods can occur from transfer of *L. monocytogenes*:

- From the environment and equipment
- From contact with raw food products
- From incorrect employee practices

The greatest risk for product contamination occurs when a product contact surface is contaminated. This risk is highest between the point where a food is cooked or decontaminated and the point where the food is packaged. Control of *Listeria* must be directed toward preventing the establishment and growth of *Listeria* in the processing environment. A control program for *L. monocytogenes* should focus on the more common sources of direct product contamination. Effective control programmes start with environmental monitoring to prevent contamination of final products.

The aim of a *Listeria* monitoring and control programme is to:
● Prevent contamination of products with *L. monocytogenes*
● Prevent contamination of food contact surfaces
● Prevent the establishment and growth of the *L. monocytogenes* in niches in the processing environment

Corrective actions implemented after detection of *Listeria* in the environment must be monitored to confirm their effectiveness. It is important to continually strive for negative results by responding to each positive sample with appropriate corrective actions in a timely manner.

**Best Practice Internationally**

Control of the environment is essential to combat the contamination of foodstuffs with *L. monocytogenes*. Control and monitoring of *Listeria* in the food processing environment and on food contact surfaces allows risk areas to be targeted before contamination of foodstuffs can occur.

The number of *Listeria* organisms present in food product is determined with a count per gram of food. Food is considered unsafe for most consumers if *L. monocytogenes* is present at unacceptable levels, usually greater than 100 CFUs/g at the end of shelf-life. As *Listeria* grows at refrigeration temperatures, this number can easily be reached during extended storage periods of food if *Listeria* is present in the product. It should be remembered that for ready-to-eat foods where there is a *Listeria* control step like cooking, finding any *Listeria* species will indicate that there has been a control failure or recontamination of the product. This indicates that *L. monocytogenes* may be present.

International trends suggest that if food contact surface samples are found positive at two or more processing steps, end-product testing should be initiated to ensure that finished product is not contaminated with *L. monocytogenes*.

In high risk food products that may support the growth of *L. monocytogenes* the absence of the bacteria in 25 g is advised e.g. deli-meats, soft cheeses, hot dogs, pâté. In food products which have a limited potential for the growth of *L. monocytogenes* a limit of <100 CFUs/g is advised e.g. foods with a shelf-life of <5 days.

**Our Technology**

Microchem uses a rapid and sensitive chromogenic test method that is AFNOR certified and validated for the detection of *Listeria monocytogenes*, the pathogenic strain of the *Listeria* species.
*L. monocytogenes* is isolated using selective enrichment and a specific colorimetric enzyme reaction on chromogenic media. Further confirmatory tests are performed if any presumptive colonies are isolated. This method detects *L. monocytogenes* directly, is faster than traditional testing methods, while also being cost-sensitive.

Microchem offers alternative rapid detection methods which include:

- The Polymerase Chain Reaction (PCR): based on the detection of the bacterial DNA of *L. monocytogenes* from the food enrichment.
- VIDAS technology: based on the detection of the *L. monocytogenes* bacteria using recombinant phage protein technologies.

The rapid alternative methods provide a negative result one day faster than rapid chromogenic testing. The cost of these test methods higher due to the advanced technology used to generate the result faster. Confirmation of positive results requires the isolation of the bacterial culture using culture media.

**Other Services by Microchem**

Routine Food Microbiology Analyses  
Food-borne Pathogen Analyses  
Water Microbiological Analyses  
Product Shelf-Life Analyses  
Hygiene Inspections and Reports  
Microbiological Swabbing  
Foreign Object Inspections  
Food Chemistry  
Nutritional Analyses  
Trace Elemental and Heavy Metal Analyses  
Food Colourants (Azo Dyes)  
Vitamin Analyses  
Water Chemical Analyses  
Melamine Analyses

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