

## Listeria - Emerging Pathogens

### Background

*Listeria* is ubiquitous in nature. It is commonly found in the intestines of animals and humans without causing illness. It can survive for long periods of time in soil, leaf litter, sewage, silage dust, vegetation, and water. The organism has been found in many domestic and wild animals, fish, birds, insects and snails. It has been isolated from a variety of products, including raw milk, cheese made from unpasteurised milk, soft cheese, meat and poultry and their products cole slaw, and cabbage.

*L. monocytogenes* bacteria are found frequently in the food-processing environment and can form biofilms on solid surfaces commonly found in the food processing plants, including stainless steel and rubber under experimental conditions. *Listeria* can also survive adverse conditions on apparently smooth surfaces.

### Challenges

Over the past decade in particular, commercial considerations have driven food produce development to become increasingly innovative. The ready availability of food raw materials from anywhere in the world has led to the use of more "exotic" ingredients and the closure of the "season gap", which has made normally seasonal foods available all year round, thereby giving a free reign to innovative technology.

Developments in such raw materials availability and novel applications, combined with developments in processing technologies, packaging technology and storage and distribution systems, are all providing continuing challenges to food microbiologists and technologists to devise and maintain controls of food safety.

The market for chilled food product has grown significantly over the last decade, including savoury and ready meals (recipe dishes), dairy and desert products, sandwiches and other snack meals. Increasingly novel and complex combinations of raw materials are being manufactured in large-scale commercial systems using the wide variety of meats, poultry, game, fish and shellfish, milk and milk products, eggs, vegetables (root, leafy and salad), grains, nuts, herbs and spices available.

Alternative food processing technologies are in development and new applications of existing technologies are being explored for use in food production processes. Ohmic heating processes, irradiation, ultra-filtration, high pressure and high intensity light are examples of such technologies. The effects of these on the survival of microorganisms in respect of food safety and food spoilage have, in many instances, yet to be determined. Clearly, the list of already known bacterial pathogens, including *L. monocytogenes*, must be included in any consideration of the implications of new combinations of approaches to food product development, and the application of alternative technologies in food processing.

It is essential that HACCP- based considerations are applied at an early stage in all new food product and process developments to minimise the potential public health problems that could arise from the presence and outgrowth of *L.monocytogenes*.

### Impact and Targeting of Controls

With the exception of provisions for soft cheeses and pasteurised milk (absence in 25g) and for other dairy products (absence in 1g) current Community legislation does not provide for microbiological standards with regard to *Listeria*.

The lack of microbiological reference values has led to situations where food-products have been declared unfit for human consumption because of non-qualified demonstrations of contamination with *L. monocytogenes*. The absence of agreed reference values for this zoonotic agent has led to substantial controversy especially in cases of intra-Community trade.

### Points to be Considered

1. *L. monocytogenes* is ubiquitous, and can be present in all food types that have not been exposed to treatments during production, which are listericidal.
2. The introduction of cold storage to prolong the shelf life of a special food commodity has opened an ecological window for the growth of *L. monocytogenes*. Because of the ubiquitous nature of *L. monocytogenes* the physical handling of foods may lead to contamination of food products. Packaged, long shelf-life food, which is not heat-treated in the final package, represents the most critical food commodity group.
3. Several features support the likelihood of a high infectious dose for *L. monocytogenes* infection through food. However, the possibility of infection from low numbers of *L. monocytogenes*, especially among the most susceptible population groups (young, old, pregnant, immunocompromised) cannot be discounted.
4. According to outbreak data available it would seem that the presence of *L. monocytogenes* concentrate is below 100cfu/g. The implications of this statement do not relate to a dose but only to a concentration. The limit of 100cfu/g is not based upon formal dose-response formulas. Likewise it should be borne in mind that the consumption pattern for relevant foods are not directly available and have therefore not been considered.
5. *L. monocytogenes* levels above 100cfu/g may be reached after in-food growth. Therefore risk management efforts should be focused on those food commodity types where *L. monocytogenes* can multiply.
6. The potential for growth of *L. monocytogenes* can be minimised in food through pH, water activity, preservatives and the shelf life of the product combined with temperature and storage time. Predictive growth models are helpful when assessing this potential, but experimental confirmation is often lacking and is necessary.

7. There are indications that *L. monocytogenes* can establish itself within a food processing factory as an in house bacteria. It is also noteworthy that some production plants seem to be able to function without *L. monocytogenes* problems while comparable plants have continuing problems.
8. In addition to published *L. monocytogenes* prevalence and concentration data from food, it is essential for the exposure assessment to obtain frequency based intake data for relevant foods.
9. Three factors might result in an increased incidence of listeriosis in the future:
  - The increasing proportion of susceptible people, be it due to old age or immunosuppressive treatments and/or diseases;
  - The increased use of cold storage to prolong the shelf life of foods;
  - The possible emergence of non-classical listeriosis, such as *L. monocytogenes* food poisoning resulting in diarrhoea.

### Priorities for Action

1. The primary responsibility for safe food production rests with the food business operator.
2. Implementation of good hygiene practice and principles used to develop the system of HACCP (hazard analysis and critical control points) are important elements to ensure food safety.
3. Management options to control and or/lowe the risk of human listeriosis from food consumption must be implemented in view of the high case-fatality rate of this infection , despite the relatively low incidence of human disease.
4. An objective must be to keep the concentration of *L.monocytogenes* in food below 100cfu/g and to reduce, the fraction of foods with a concentration above 100cfu/g thereby reduing the fraction of foods with a concentration above 100 *L.monocytogenes* per gram significantly. This objective should be expressed as a Food Safety Objective. The effect of initiatives to this end must be evaluated through surveillance investigations of food, especially including quantitative investigations, as well as efficient monitoring of human listeriosis.
5. The potential for growth of *L.monocytogenes* must be the focus of attention when designing management options. In particular the following must be considered:
  - The grouping of foods according to *L.monocytogenes* growth potential
  - The presentation of production dates on all products
  - Appropriate temperature and storage time combinations
  - The potential pf shelf life limitations
  - Identification of relevant *L.monocytogenes* limits for the different food groups

6. Since some production plants operate without *L.monocytogenes* problems while comparable plants have recurrent problems underline the necessity of improvements in production hygiene. HACCP and GMP must be geared to reduce/eliminate *L.monocytogenes* colonisation of production environment. The potential for real time monitoring for *L.monocytogenes* at the production line must be considered. Further research must be initiated towards control of "house strains" in food production facilities.
7. Strategies for risk communication must be implemented. Apart from advice to the general public, special attention should be addressed to consumer groups at increased risk (i.e. young, old, pregnant, immunocompromised) which represent a considerable and growing section of the total population.
8. Technological changes in food production and food storage regimes must be evaluated with regard to *L.monocytogenes* prevalence and growth.
9. Experimental data on *L.monocytogenes* growth are lacking for a number of specific commodities. Research to acquire this information must be implemented to support predictive model estimations of growth potential.

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**Subject:** please add BSE Stakeholder Workshop 18 December central london - check with catherine clarke for details