



Matvælatækní

Samantekt um *Listeria* fengin úr lokaritgerð Hákonar Jóhannessonar.

THE EFFECT OF REFRIGERATION ON GROWTH OF PATHOGENS AS A PREVENTIVE MEASURE
WITHIN THE HACCP SYSTEM DURING PROCESSING OF FINFISH

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Genus	<i>Listeria</i>
Family:	Not established
Various	Nonsporing, facultatively anaerobic, gram positive rods, flagellated and motile. <i>Listeria monocytogenes</i> can be divided into at least 13 serotypes (Fuch and Reilly, 1992).
Reservoirs	Is ubiquitous in the environment and has been isolated from sea and fresh water, silage, sewage sludge, soil and decaying vegetation. As it is widespread in nature, human exposure to the bacteria must be frequent. It has been isolated from faeces of asymptomatic humans with a rate of 1,2 % among hospitalised adults and 4,8 % of healthy slaughter house workers. (Adams and Moss, 1995). Studies of surface water in Netherlands, Germany and the U.K. have shown incidence rates of <i>Listeria</i> from 21 - 100% (Lovett, 1989). A survey indicated that 28% of imported frozen fish to USA contained the bacteria (Fuchs and Reilly, 1992). It has been isolated from the intestinal tract of a wide variety of animals including sheep, cattle, geese, gulls, ducks, rats. Also from insect larvae, arthropods and fish (Lovett, 1989). Has been found in Iceland in environmental samples and also been analyzed in fish products. Seagulls living close to the sewage area in Reykjavík have been found to be infected with <i>Listeria</i> (Magnússon, 1997).
Vehicles of infection	Foods of animal origin are an important reservoir of the bacteria. Foods found to contain the bacteria or responsible for outbreaks include raw milk, cheese, soft cheese, ice-cream, poultry carcasses, chopped beef, coleslaw, cook-chill chicken, pork sausage and fish including finfish, shrimp, lobster, (Lovett, 1989; Adams and Moss, 1995). Often found on cold smoked salmon (Embarek, 1994). In a local research a total of 128 samples of various seafood products on the Icelandic market were tested for the incidence of <i>Listeria monocytogenes</i> and other <i>Listeria</i> spp. In this research various fish and fish products included fresh, dried and smoked fish and also shrimps and shellfish. 91 samples of various fish and fish product were tested for the occurrence of <i>Listeria</i> spp. 8 (9%) of these tested positive for <i>Listeria monocytogenes</i> . The rest, 37 samples in this research included various fish salads. 6 (16%) of these tested positive for <i>Listeria monocytogenes</i> . The researchers conclude that there is a frequent occurrence of the organism in ready-to-eat fish and fish-salads (Hartemink and Georgsson, 1991).
Minimum Infective dose	Not known (Lovett, 1989; Huss, 1995). Has not yet been elucidated, neither possible role of co-factors (Rörvik and Yndestad, 1991). "Invasive infection will result only if a susceptible individual is exposed to a sufficiently high dose of a virulent strain" (Adams and Moss, 1995).



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Minimum temperature	-0,4°C (FDA Office of seafood (b), 1998).
Optimum temperature	2,5°C (Lovett, 1989).
Maximum temperature	30-37°C (FDA Office of seafood (c), 1998).
D-value	45°C ((FDA Office of seafood (c), 1998).
	34,48 min. at 50°C; 9,18 min. at 55°C and 1,31 min. at 60°C in crabmeat (National Seafood HACCP Alliance for Training and Education, 1997(a)).
Other temperature info	
Maximum cumulative exposure time	-0,4 - 10°C (2 days); 11-20°C (12 hr.); >21°C (3 hr.) (FDA Office of seafood (c), 1998).
Growth rate (generation time)	0,65-0,69 hr. (35°C), 5,0-7,2 hr. (13°C), 27,8 -39,8 hr. (4°C) in various milk products (Lovett, 1989). 62-131 hr. at 0-1°C and 13-25 hr. at 4-5°C (Adams and Moss, 1995; Walker et al., 1990).
Diseases caused by the bacteria	Is one of the most studied food borne bacteria during the last decade. Recalls of seafood products are still common in USA and in Europe (Embarek, 1994). The true rate of food borne infection from the bacteria is not known, but it is estimated that there are 1.600 annual cases in the United States. <i>Listeria monocytogenes</i> contains both pathogenic and non-pathogenic strains. Incubation period is from one day to a few weeks (Lovett, 1989). The pathogenesis of listeriosis is not clear. <i>Listeria monocytogenes</i> is a facultative intracellular pathogen that can survive and multiply in the cells of the monocyte-macrophage system. It attaches to intestinal cells and induces its endocytosis. (Adams M.R. and Moss M.O. 1995, p. 189). There are no known cases in Iceland of <i>Listeria</i> causing food borne illness (Pálmadóttir et al., 1997). The symptoms are flu-like that may include malaise, diarrhoea and mild fever. Virulent strains can multiply in macrophages, disrupting these cells and producing septicaemia. From there on the bacteria has access to other body areas. The central nervous system, the eyes, the heart are affected this way and the bacteria may even invade the foetus in pregnant women, leading to abortion, stillbirth or neonatal sepsis depending on the stage of pregnancy (Lovett, 1989). Mortality rate has been around 30% and the bacteria is considered to be serious. (Fuchs and Reilly, 1992). Individuals with a compromised immune system may get seriously ill with a high mortality rate (Walker et al., 1990).
Control measures	FDA requires producers to have foods that will be eaten with minimal or no cooking, to be without the bacteria / 25 g (Fuchs and Reilly, 1992). Other countries: Denmark, Germany, UK, Australia and Canada use a group risk - based approach to control <i>Listeria</i> (Embarek, 1994). <i>Listeria monocytogenes</i> is a tough pathogen, it can grow at a wide range of temperature including refrigeration temperature and it survives freezing and drying. It is furthermore able to grow and survive in a broad range of pH. Finally it can tolerate relatively low a_w and is relatively heat resistant compared to other vegetative cells, but is though destroyed during regular pasteurisation. It must be controlled in the food processing environment. Procedures to prevent the organism to enter the plant in the first place are very important. Also to avoid cross-



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contamination of the product by proper layout of premises and work schedule; to prevent animals, birds, insects and dust from entering the processing area and follow a sound cleaning and disinfecting plan including proper maintenance and cleaning of the air-conditioning system. Control of personnel hygiene is also essential.(Lovett, 1989).