



PURDUE UNIVERSITY

Food Safety Issues

Listeria monocytogenes: Survival of the Fittest

Richard H. Linton, Ph.D. –
Food Safety Extension Specialist

Arun Bhunia, Ph.D. –
Molecular Food Microbiologist

Knowledge to Go
Purdue Extension

1-888-EXT-INFO

Situation:

Within the past few months, there have been several product recalls and illnesses associated with foods contaminated with a disease-causing bacteria called *Listeria monocytogenes*. To date, 16 deaths have been implicated in consumption of luncheon meats and hot dogs. Recent recalls of pasteurized milk and chicken burritos have also been initiated. For foods that are processed and considered "ready-to-eat", such as processed meats and pasteurized dairy products, a "zero tolerance" for the presence of *Listeria monocytogenes* has been in place for the past several years. Under refrigerated storage, *Listeria monocytogenes* can survive and grow to a dangerous level, and can cause disease if consumed.

What we know:

Listeria monocytogenes was considered the "hot microbe" of the 1980's, much like *E. coli* O157:H7 is today. *Listeria monocytogenes* is important for several reasons. Most importantly, *Listeria monocytogenes* can be found virtually everywhere in the environment and can, therefore, contaminate many different types of foods from the farm through processing to the retail market. While prevention of contamination is important in all areas of food production, special precautions must be taken after foods have been processed and before packaging. Many foods that are contaminated with *Listeria monocytogenes* are contaminated by post-processing handling. This means that the food has been processed to assure safety and then becomes contaminated just prior to being placed in the food package.

Control and destruction of this organism during food processing have been challenging. Compared to many other bacterial pathogens in foods, *Listeria monocytogenes* has an unusually high resistance to the environment and food processing conditions. Most notably, *Listeria monocytogenes* is resistant to high heat, low pH, high salt, and can grow at refrigerated temperatures. There was considerable debate in the 1980's, proposing that *Listeria monocytogenes* may have a high enough heat

resistance to survive pasteurization of milk. Several thermal bacteriology studies were done to show that, while the heat resistance is quite high, *Listeria monocytogenes* can be completely destroyed during the pasteurization process. Unlike nearly all other foodborne pathogens, *Listeria monocytogenes* can grow as low as 34°F or just above freezing temperatures. It can survive at a pH range of 4.1-9.6, and up to a 10% salt level. These characteristics provide a competitive edge for *Listeria monocytogenes* in refrigerated ready-to-eat foods. The food industry relies on thermal processing and good sanitation to control this microorganism from being present in ready-to-eat foods. For food products that are ready-to-eat but can also be cooked prior to consumption, such as hot dogs, cooking is still recommended to completely assure safety. Foods should be cooked to an internal temperature of 165°F.

Listeriosis, the disease caused by this organism, has been associated with consumption of several foods most notably fluid dairy products, cheese, coleslaw, and processed meats. The illness caused by *Listeria monocytogenes* can be severe. While the healthy human host may have flu-like symptoms or diarrhea, an immuno-compromised host may manifest more severe symptoms such as septicemia, encephalitis, and meningitis. *Listeria monocytogenes* is particularly dangerous for immuno-compromised populations including pregnant women, fetuses, young children, cancer patients, AIDS patients, and the elderly. Death rates for immuno-compromised populations can be quite high.

What we don't know:

The zero tolerance requirement for *Listeria monocytogenes* in processed ready-to-eat foods has been highly debated in recent years. While many research scientists and health practitioners believe that a dosage level of 100-1000 cells may lead to illness in some hosts, the true infective dose is still unknown. Other raw commodities that are consumed without cooking, like raw vegetables, have been shown to contain *Listeria monocytogenes*. However, no outbreaks have been associated with raw unprocessed whole vegetable products. Still, a zero tolerance is in effect for processed food products, probably because *Listeria monocytogenes* can grow well in these types of food products.

The most formidable challenge is to develop ways to keep this organism out of food processing plants. Some processing plants have programs in place to help prevent post processing contamination in food packaging areas. Some facilities do this by packaging products in a room with positive air pressure and hepa filters. While these methods are highly effective, environmental pathogens such as *Listeria monocytogenes* are still difficult to completely eliminate.

It is the policy of the Purdue University Cooperative Extension Service, David C. Petritz, Director, that all persons shall have equal opportunity and access to its programs and facilities without regard to race, color, sex, religion, national origin, age, or disability. Purdue University is an Affirmative Action employer.

This material may be available in alternative formats.

1-888-EXT-INFO

<http://www.agcom.purdue.edu/AgCom/Pubs/menu.htm>