What's the Hysteria about Listeria?

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Abstract:

Packaged salad products from a Dole processing facility in Springfield, Ohio have been linked to outbreaks of listeriosis in both the United States and Canada, resulting in at least one death and 19 hospitalizations. Listeriosis (from the bacteria *Listeria monocytogenes*) can be a serious, life-threatening illness, especially for pregnant women, individuals over 65 and those with compromised immune systems.

Main Article:

L. monocytogenes has been implicated in many outbreaks worldwide. Ready-to-eat meat products, cantaloupes, cheese, coleslaw, and seafood are some of the products that have been involved in a Listeriosis outbreak. The latest Listeriosis outbreak has resulted in 19 hospitalizations in 6 states and 5 Canadian provinces. In addition, it has claimed the life of one person in the United States and possibly another in Canada. This outbreak of *Listeria monocytogenes* has been linked to Dole packaged salad products that were produced in a Springfield, Ohio production facility with a product code beginning with the letter 'A.' Laboratory tests conducted on the *L. monocytogenes* isolates from the 12 infected people in the US showed that the isolates were genetically similar. In addition, testing on a Dole brand Field Greens packaged salad that was produced at the Springfield, Ohio facility showed that the *Listeria* isolate was highly related genetically to the isolates from the hospitalized people.

L. monocytogenes can survive high salt conditions (10% NaCl), various temperatures (1-50^{o}C), and various pHs (4.5-9.0), which allows it to thrive in various environments including soil, water, sewage, decaying vegetation, and fecal matter of mammals. The infective dose of *L. monocytogenes* is approximately 10^4–10^6 cells per gram of ingested product, but this amount can be much less for immunocompromised individuals. However, consumption of a contaminated product is not the only way *L. monocytogenes* can infect a host. Direct contact with an infected person, mother-to-fetus transmission via the placenta, and animal-to-human transmission are others ways to be infected.

Infection Begins ~20 Hours After Ingesting Contaminated Food

The course of infection begins ~20 hours after ingesting contaminated food with a median incubation time of about 3 weeks. To prevent activation of the immune system, *L. monocytogenes* enters the host's cells where it replicates and

spreads intracellularly. The genome of *L. monocytogenes* contains a '*Listeria* pathogenicity island' which is required for the pathogen to spread intracellularly within a host. The 6 genes in the pathogenicity island are *prfA, plcA, hly, mpl, actA,* and *plcB.* PrfA regulates the expression the virulence genes located on the pathogenicity island as well as the expression of internalins. The internalins binds to the host's receptors which results in a rearrangement of the cytoskeleton to internalize *L. monocytogenes.* Once inside the membrane-bound vacuole (phagosome), *L. monocytogenes* escapes intracellularly via upregulation of the genes in the pathogenicity island and is able to cross three biological obstacles: the blood-brain barrier, the maternal-fetal barrier, and the intestinal barrier.

Symptoms

The symptoms associated with a *L. monocytogenes* infection can be mild or severe, and are listed below:

Mild symptoms

- Headaches
- Nausea
- Flu-like symptoms
- Gastroenteritis
- Fever

Severe symptoms

- Meningitis
- Encephalitis
- Septicaemia

Since *L. monocytogenes* can cross the maternal-fetal barrier, it can infect a newborn or cause premature labour, miscarriages, and stillbirths in the 3rd trimester.

Treatments

Many individuals can clear an infection without requiring medical intervention. However, for those that require medical attention, there are very few effective antibiotics. Infected individuals are usually prescribed ampicillin or penicillin. For those allergic to penicillin, trimethoprim-sulpha-methoxazole or erythromycin (intravenously) is prescribed.

Prevention

It is difficult to tell if food products have been contaminated with *L. monocytogenes* because they may not look spoiled, nor taste or smell weird. Temperatures used to control pathogen growth on food (4-10^{o}C) are not effective at controlling *L. monocytogenes* growth because it can still grow at refrigerated temperature. However, there are many precautions and recommendations that should be taken to avoid an infection:

- Thoroughly cook raw meat and use a meat thermometer to check the temperature of cooked meat
- Separate raw meat from vegetables, cooked food, and ready-to-eat foods
- Avoid ready-to-eat products unless they are heated thoroughly
- Avoid unpasteurized milk products
- Wash vegetables and fruits thoroughly before consuming
- Ensure countertops, cutting boards, and knives are cleaned after use with uncooked meat

Related Articles:

Eat, Drink and Stay Healthy details some of the more common organisms that may cause foodborne illness.

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