

Recently, it was found that fosfomycin is extremely effective in controlling listerial growth in a mouse model of infection.

How can you reduce your risk for listeriosis?

Currently no vaccine is available against listeric infections. Therefore the control and prevention of the infection depends on general hygiene and proper precautions during handling and cooking of foods.

General recommendations:

- Thoroughly cook raw food from animal sources, such as beef, pork, or poultry.
- Wash raw vegetables thoroughly before eating.
- Keep uncooked meats separate from vegetables and from cooked foods and ready-to-eat foods.
- Avoid unpasteurized (raw) milk or foods made from unpasteurized milk.
- Wash hands, knives, and cutting boards after handling uncooked foods.
- Consume perishable and ready-to-eat foods as soon as possible

Recommendations for persons at high risk:

- Do not eat luncheon meats, or deli meats, unless they are reheated until steaming hot.
- Do not eat soft cheeses such unless they have labels that clearly state they are made from pastuerized milk.
- Do not eat refrigerated meat spreads. Canned or shelf-stable pâtés and meat spreads may be eaten.
- Do not eat refrigerated smoked seafood, unless it is contained in a cooked dish. Canned or shelf-stable smoked seafood may be eaten.

For prevention of listeriosis care must be taken by following simple guidelines like

- Wash hands thoroughly with warm, soapy water before and after handling or preparing food. After cooking, use hot, soapy water to wash the utensils, cutting board and other food preparation surfaces must be keep cleaned.
- Clean raw vegetables thoroughly under plenty of running water.
- Cook food at appropriate temperature.
- Use precooked or ready-to-eat food as soon as you can. Do not store the product in the refrigerator beyond the use-by date

Additional precautions must be taken to those individuals who are at risk like avoiding of eating soft cheese, hot dogs and refrigerated smoked seafood.

It is one of the pathogen listed in Food Safety and Standards Regulations 2011 by Government of India. The microbiological requirements for *L. monocytogenes* in foods in India as per Food Safety and Standards (Regulations) 2011 are listed in Table 3.

Table 3. Microbiological requirements for *L. monocytogenes* in foods in India as per Food Safety and Standards (Regulations) 2011.

Food product	Requirement
Frozen mutton, goat, beef and buffalo meat, and cheese/processed cheese other than hard cheese	Absent in 25 g
Ice Cream/frozen Dessert/Milk Lolly/Ice candy /dried ice Cream mix	Absent in 1 g
Cheese/Processed	Cheese other than hard cheese: Absent in 25 g
Evaporated Milk	Absent in 1 g
Sweetened Condensed Milk	Absent in 1 g
Butter	Absent in 1 g
Butter Oil/Butter Fat and Ghee	Absent in 1 g
Yoghurt/Dahi	Absent in 1 g
Milk Powder/Cream powder	Absent in 1 g
Edible Casein products	Absent in 1 g
UHT Milk/UHT Flavoured milk	Absent in 1 g
Pasteurised milk	Absent in 1 g
Sterilised Milk/Sterilised flavoured milk	Absent in 1 g
Khoya/Channa/paneer	Absent in 1 g
Chakka/Srikhand	Absent in 1 g

The facilities for diagnosis of listeric infections are available at the following centres.

1. ICAR Research Complex for Goa, Ela, Old Goa 403 402.
2. Department of Microbiology and Animal Biotechnology, Nagpur Veterinary College, Seminary Hills, Nagpur - 440006, Maharashtra.
3. Division of Veterinary Public Health, Indian Veterinary Research Institute, Izatnagar, Bareilly - 243122, Uttar Pradesh.
4. Division of Animal Health, ICAR Research Complex for North East Hill Region, Umiam, Shillong - 793103, Meghalaya.

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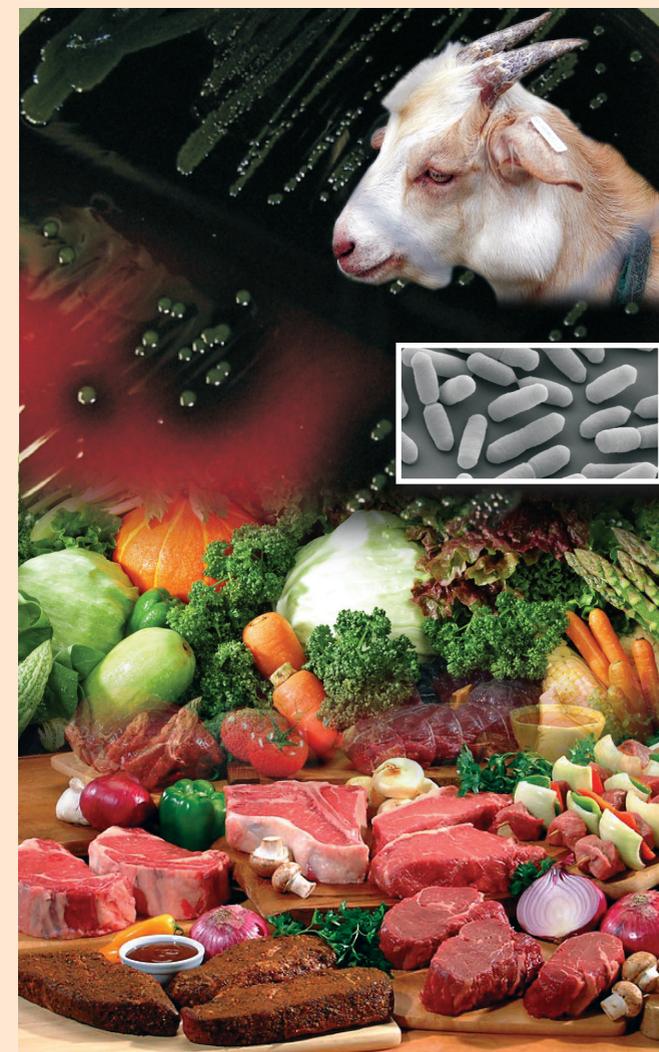
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Listeriosis

An Important Foodborne Infection



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What is Listeriosis..?

(Circling, Caprine bacterial encephalitis (in goats), Listerial abortion)

Listeria monocytogenes is a foodborne pathogen that can cause serious invasive illness, listeriosis, mainly in certain well-defined high-risk groups, including elderly and immunocompromised patients, pregnant women, newborns and infants.

Listeriosis is a symptomatic condition developed after infection of pathogenic species of genus *Listeria* (*Listeria monocytogenes*, *Listeria ivanovii*). Out of various listeriae, only *L. monocytogenes* is an opportunistic pathogen in human beings and various animal species whereas *L. ivanovii* affects only the animals, mainly the ruminants as a cause of abortion, and occasionally man also. The remaining species are non-pathogenic in their nature barring a rare human case report due to *L. seeligeri*.

The organism is ubiquitous in nature and natural habitat thought to be decaying matter. Generally listeriosis is food borne infection acquired by eating contaminated food with *Listeria monocytogenes*. Though rare, listeriosis is fatal as the mortality rate is about 30-40%, neonatal death rate 50% and highest hospitalization rate of 91%.

Healthy peoples are not susceptible for infection but unborn, neonates, pregnant woman and elder people may prone for infection and complication linked with listeriosis. About 5%-10% of all humans carry these organisms as part of the human bowel flora..

Ubiquitous nature of *Listeria monocytogenes* provides it to survive and establish infection in vast range of host such as animals, birds, fish etc. Food products procure from such carrier host for consumption will induce food borne illness in human. There is no occurrence of direct transfer of *Listeria* from human to human.

Distribution of disease: Worldwide, the causes of listeriosis have been reported from almost all species of domestic animals as well as from many species of poultry, fish, wild animals and rodents. Sheep is the most commonly affected species.

Host range and reservoirs. The host range of *L. monocytogenes* includes 40 mammals, 20 birds, crustaceans, ticks and fishes, and the pathogen has been reported to infect almost all domestic animals (bovines, equines, capro-ovines, porcines, canines) besides many species of rodents (guinea-pigs, mice, merions, ferrets, chinchillas, gerbils etc.), poultry (hens, ducks, geese, turkeys etc.) and, wild animals (lemmings, skunks, racoons etc.).

Who are susceptible..?

The majority of cases in adults and juveniles occur among the immuno-compressed i.e., patients receiving steroids or cytotoxic therapy or with malignant neoplasms. Other "at-Risk" include AIDS patients, diabetics, elderly people, kidney dialysis patients, individual with prosthetic heart valves or replacement joints and individual with alcoholism or alcoholic diseases.

Mode of transmission.

Listeria spp. are isolated from a diversity of environmental sources, including soil, water, effluents, a large variety of foods, and the feces of humans and animals. The natural habitat of these bacteria is thought to be decomposing plant matter, in which they live as saprophytes.

Infected mother can transfer infection to her fetus in uterus or via the birth canal. After birth occurrence of listeriosis is associated with ingestion of contaminated food with *Listeria monocytogenes*.

Table 1. List of items favouring and generally free of listeriae

Food items which may contain <i>L. monocytogenes</i>	Food items which in general free of listeriae
Sausages (salami, pate.)	All kinds of food immediately after heating
Raw meat, in particular turkey and chicken	Pasteurized milk, yoghurt (industrial products!)
Sandwiches	Hard cheese
Lettuce, raw mushrooms	Chocolate, marmalade, cookies
Raw milk and products made from Soft cheese	Raw carrots, Raw apples
Fresh cheese (ricotta, feta) Seafood (mussels, salmon)	Raw apples, Raw tomatoes

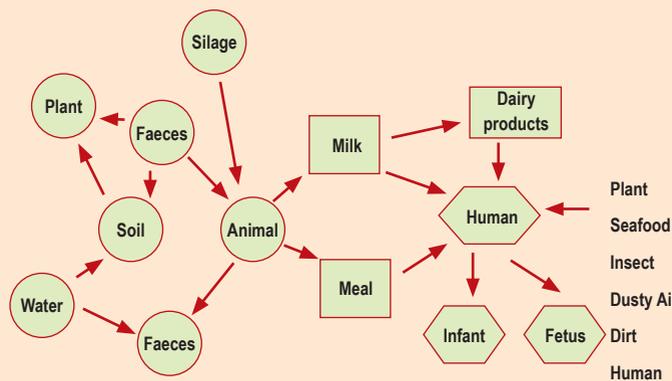


Table 2. Reported isolations of *Listeria monocytogenes* from foods in India.

Sample/product	Prevalence (%)
Milk and milk products	1-23
Meat (beef, chevon)	2-5
Poultry meat	8-14
Fresh water fish	13
Seafood	0-17

What are symptoms?

The clinical signs of *L. monocytogenes* infection are very similar in all susceptible hosts. Two basic forms of presentation can be distinguished: perinatal listeriosis and listeriosis in the adult patient. Listeriosis mainly occurs in immune-compromised individuals. The symptoms are common to other infections and unable to distinguish. Initially, mild flu like symptoms such as chills, fatigue, headache, muscular and joint pain etc. can be observed. Individual may feel vomiting and suffer by gastroenteritis. Untreated cases may develop into septicemia, meningitis, encephalitis, abortions and in some cases death. *L. monocytogenes* should be considered to be a possible etiology

in outbreaks of febrile gastroenteritis when routine cultures fail to yield a pathogen.

Pregnant women are much more likely than the rest of the population. Infected pregnant women may have only mild, flulike symptoms. However, infection in a pregnant woman can lead to early delivery, infection of the newborn, and also death of the baby.

High-risk persons other than pregnant women shows non specific flu like symptoms fever, muscle aches, nausea headache, stiff neck, confusion, loss of balance, and convulsions diarrhea is another but less common symptoms. Symptoms such as vomiting and conjunctivitis also have been listed. In animals some similar symptomatic conditions observed include mastitis, abortion, repeat breeding, infertility, encephalitis, and septicemia. Untreated cases may lead to death.

Animals contribute to amplification and dispersal of *L. monocytogenes* into the farm environment, and the farm ecosystem maintains a high prevalence of *L. monocytogenes*, including subtypes linked to human listeriosis cases and outbreaks. In India, cases of listeriosis have been reported from animal population as sporadic as well as outbreak forms. The clinical manifestations varied with the species affected. Spontaneous abortions, subclinical mastitis, meningoencephalitis and endometritis were the commonest forms reported.

How it Diagnose?

Listeriosis can be tentatively diagnosed on history and symptoms developed in patients. Primarily microscopic observation of sample is quick method for identification of listeriosis in suspected cases. For detection blood, cerebrospinal fluid, vomitus, food products, vaginal secretions, fecal matter will be collected. Along with microscopic methods there are number of methods which help to confirmed infection, include

- Isolation of infectious agent:**

Isolation of *Listeria monocytogenes* time consuming process it need 5 to 6 days. As it is fastidious organism it needs pre-enrichment and successive plating on selective media. For isolation two reference methods are widely use, FDA bacteriological and analytical method (BAM) and the International Organization of Standards (ISO) 11290 method.

- Immunological assay:**

Serodiagnostic methods ELISA based on virulence marker antigens are useful for detection of the antibodies.

How to treat cases of listeriosis?

Use of antibiotic help to cure the infection effectively. *Listeria monocytogenes* is sensitive to wide range of antibiotics such as ampicillin, amoxicillin, tetracyclines, chloramphenicol, -lactam antibiotics, together with an aminoglycoside, trimethoprim, and sulfamethoxazole, are recommended. However, ampicillin is the drug of choice in cases of encephalitis. Ampicillin along with gentamicin are recommended for prolonged treatment.