



Listeriosis: A Life Threatening Bacterial Zoonosis of Global Importance

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There are many bacterial zoonotic diseases, such as anthrax, brucellosis, campylobacteriosis, erysipelo-thricosis, leptospirosis, listeriosis, Lyme disease, melioidosis, salmonellosis, staphylococcosis, streptococcosis, tetanus, tuberculosis, tularaemia, and yersiniosis, which have significant impact on human and animal health [1]. Among these, listeriosis is an infectious, life threatening bacterial zoonosis of global public importance [1]. Disease is reported from many countries of the world including India [1-8]. It occurs in sporadic or epidemic form in humans and animals including birds. During the recent years, the organism has emerged as an important food borne pathogen responsible for many outbreaks in human beings in several countries including Australia, Canada, France, Switzerland, and USA [1,9,10]. Murray is credited to describe the disease in 1926 for the first time in rabbit and guinea pig [1]. Later, Nyfeldt in humans and Gill in domestic animals recorded the infection for the first time in 1929 and 1937, respectively. The name *Listeria monocytogenes* was proposed by Pirie in 1940 in the honour of the Lord Joseph Lister, the surgeon and the pioneer in antiseptic and for its effect on monocytes [11]. In USA, about 1700 cases of sporadic listeriosis with 550 deaths are reported each year [12].

There are eight documented species in the genus *Listeria*, which includes *L. monocytogenes*, *L. ivanovii*, *L. innocua*, *L. welshimeri*, *L. seeligeri*, *L. grayi*, *L. marthii* and *L. rocourtiae* [13]. Among these, *L. monocytogenes* is mainly implicated in the etiology of human (98%) and animal (85%) disease [14]. *Listeria monocytogenes* is a Gram positive, 0.5 - 2.0 µm in length, aerobic or facultative anaerobic, non-capsulated, non-spore forming, motile at 20 - 25°C, pleomorphic or rod shaped organism [1]. It can survive in wide range of temperature (-1.5°C to 45°C). Based on antigenic structures, 13 serovars of *L. monocytogenes* have been identified, and about 95% of human infections are caused by serotypes 1/2a, 1/2b, 1/2c, and

4b [8]. The pathogen has been reported in humans, and a wide variety of animals, such as cattle, sheep, goat, horse, pig, buffalo, dog, chinchilla, mink, rabbit, gerbil, mice, ferret, guinea pig, turkey, canary, duck, and fowl [1]. The bacterium is ubiquitous in distribution inhabiting the soil, silage, litter, sewage, decaying vegetable matter, manure, water, animal feed, fresh and frozen poultry, processed meat, raw milk, cheese, sea foods, and in faecal matter of healthy humans and animals [1,7,15]. The organism can survive and grow over a wide range of environmental conditions, such as refrigeration temperatures, low pH, and high salt concentration [10].

The principal mode of transmission is by ingestion of contaminated feed/food in animals and human, respectively. However, infection can also be acquired through direct contact with infected material, especially in veterinarians, animal handlers, farmers, and abattoir workers [16,17]. Transmission by sexual contact is also described as the organism is excreted in the semen. Neonatal infection in new born children and nosocomial infection in hospital and institution is also reported [1]. The virulence factors like internalin, listeriolysin O and actA are mainly involved in the pathogenesis of the disease. T-cell mediated immunity plays a vital role in the host defense [18].

The incubation period of listeriosis in humans is 4 to 21 days [1]. It is mentioned that new born infants and persons above 50 years of age are most susceptible [10]. Clinical spectrum of disease in humans include mild flu-like illness, fever, headache, abdominal pain, diarrhoea, conjunctivitis, pneumonia, urethritis, abortion or still birth or neonatal death, and papular exanthema on the arms besides septicemia, meningitis, encephalitis, and endocarditis [1]. The mortality from listeric meningitis may be as high as 70%. [10]. In animals, clinical symptoms, such as circling movement, incoordination, listlessness, anorexia, fever, marked salivation, drooping

of ear, dysphagia, paralysis of facial and throat muscles, meningoencephalitis, mastitis, and abortion are observed [1].

Listeriosis is an opportunistic and nosocomial zoonosis of global significance, and often causes fatal disease in those with weak immune system like infants or elderly persons, pregnant women, persons with chronic disease or long term therapy, HIV and cancer patients. A number of food borne outbreaks and sporadic cases have been reported in different parts of world involving consumption of contaminated food mostly of animal origin [4,10]. Sporadic and epidemic cases are reported in different species of animals [19]. The occurrence of the pathogen in the different types of food like raw milk, pasteurized milk, soft cheese, ice cream, red meat, poultry meat, egg, fish, sea-foods, fruits, vegetable, and their processing plant have been reported by several investigators [7-9,14]. These foods serve as important sources of *L. monocytogenes* [10].

The diagnosis of disease can be done by computed tomography/magnetic resonance imaging (MRI) in case of meningitis, gross and histopathology besides direct microscopy. However, unequivocal diagnosis is established by cultural isolation of the pathogen on selective media like Oxford agar, PALCAM agar, and its identification by performing biochemical tests. In addition, serological methods (complement fixation, ELISA) and molecular techniques like PCR can be performed on clinical samples of humans and animals as well as on various types of food [1,8]. Listeriosis should be differentiated from tuberculous and cryptococcal meningitis in humans and rabies, brucellosis, toxoplasmosis and bovine spongiform encephalopathy (BSE) in animals [18]. Recently, Pal and co-workers (2016) published a review on current molecular techniques for the diagnosis of listeriosis.

A number of antibacterial antibiotics, such as ampicillin, chloramphenicol, enrofloxacin, kanamycin, pefloxacin and tetracycline have been tried in humans as well as in animals [10]. Ampicillin is the drug of choice for the treatment of maternal foetal listeriosis. It is advised that tetracycline should not be given in children less than 7 year of age [1]. Prevention and control measures include avoiding consumption of contaminated foods, careful handling of the infected material, ingestion of cooked meat, and pasteurized milk, restraining of pregnant women to handle diseased animals, using protective clothing including gloves while removing retained placenta in animals, disinfection of premises where an animal aborted, immunization of sheep, avoiding cross contamination,

use of bacteriocins in food and application of HACCP principles in food processing plant [1,5]. Hitherto, no effective vaccine is available to immunize the humans. Therefore, it is highly imperative that correct early diagnosis and prompt treatment along with effective epidemiological investigation can minimize the incidence of listeriosis.

Further studies on the improvement in the surveillance system, molecular typing of the pathogenic strains of *L. monocytogenes* in various foods, and determining its ecological niche are recommended.

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