Food-borne Illness-Listeriosis; Epidemiology, Zoonotic Transmission and Control Strategies

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Abstract

Listeriosis is a fatal food borne illness of birds, fish, animals, and humans. The causative agent of this zoonotic food borne disease is *Listeria monocytogenes*. *Listeria monocytogenes* is a unique intracellular bacterium which has the potential to move from one cell to another making it possible for this pathogen to cross the blood brain barrier, intestinal barrier, and placental barrier. Due to the presence of different characteristic features, listeria is able to evade the host immune response. The disease occurs sporadically worldwide and causes serious damage during an outbreak. The clinical manifestation of listeriosis includes septicaemia, encephalitis, abortion, stillbirth, and gastroenteritis. The isolation of *L. monocytogenes* has been done all around the world from a number of different kinds of samples such as humans, animals, poultry, soil, plants, milk, meat, seafood, and vegetables. The main transmission route of bacteria is through ingesting food with the contamination of listeria in both animals and humans. The chapter describes the zoonotic transmission of bacteria, epidemiology and pathogenesis of bacteria, diagnosis and treatment of bacteria, and how to control and prevent this disease.

Keywords: Listeriosis, Zoonosis, Foodborne Diseases, *L. monocytogenes*, Ingestion, Diagnosis, Antibiotics, and Contamination.

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Introduction

In people of all age groups and genders foodborne diseases are a major cause of morbidity and mortality. Foodborne diseases are linked to cause over 600 million illnesses and over 420,000 deaths annually worldwide. Multiple causes of foodborne disease have been reported in both developing and developed countries (Pal, 2005; Pal et al., 2022). Listeriosis is a significant emerging foodborne disease that mainly causes problems in pregnant, new-borns elderly and in immunocompromised individuals. Healthy individuals exposed to listeriosis remain asymptomatic or may only experience mild digestive issues (Pal et al., 2017). Listeriosis is a bacterial disease caused by various Listeria species, with *L. monocytogenes* being the most pathogenic species of ruminants and humans (CDC, 2009). *L. monocytogenes* is a Gram-positive, rod-shaped, and motile bacterium. It belongs to the *Listeriaceae* family, which includes six species within its classification. Since 1929, *L. monocytogenes* has been recognized as a human pathogen; however, its transmission route was first reported in the 1980s when multiple food-related outbreaks were identified (Kundul & Ame, 2022). In 1997, the consumption of contaminated corn salad resulted in a major outbreak of Listeria gastroenteritis in Italy, causing 1,566 cases. Due to their ability to survive in extreme conditions, Listeria species are commonly found in diverse environments. Even after regular cleaning and disinfection, this bacterium has been found in soil, plants, silage, and water, particularly in food processing environments and refrigerated units (Danion et al., 2017). The major cause of sporadic cases and outbreaks of listeriosis is food, particularly ready-to-eat foodstuffs, including meat, fish, milk, dairy products, fruits, and vegetables (Buchanan et al., 2017). *L. monocytogenes* is commonly found in food processing environments and can survive for long periods in foods and households, particularly under cold and frozen storage conditions. Environmental monitoring programs evaluate the efficacy of cleaning and sanitation as well as examine hard-to-clean areas within the facility (Abdollahzadeh et al., 2016). Listeriosis is an emerging infection with major public health concerns due to associated food-borne outbreaks and high risk of morbidity and mortality. "Common signs of listeriosis include meningitis, septicemia, and other infections of the central nervous system. In pregnant women, listeriosis may cause spontaneous abortion, stillbirth, or fetal death. Common signs suggestive of listeriosis include clinical symptoms, confirmation through pathogen isolation from specimens, and abortion associated with silage feeding. Listeriosis is a major emerging foodborne and zoonotic infectious disease affecting humans and animals (Quinn et al., 2011).

Transmission

L. monocytogenes is a gram-positive bacterium. Its natural reservoirs are soil and the gastrointestinal tracts of mammals, fish, avians, and crabs. These animals show no clinical signs even when they are infected. If infected animals are lactating, it can spread through milk; if pregnant, it can spread through reproductive fluids. It can also be spread through animals' feces, urine, and respiratory secretions (Figure 1) (Chen et al., 2023). In the case of abortion or miscarriage, it can also be present in the aborted fetus, fluid, or the fetal membranes. This bacterium is also present in straw, which is a plant material used for animal bedding. It comes into straw due to contamination from animal feces or soil. If an animal or a person touches fomites, it can also be transmitted. The air particles may also have this bacteria, so it can also be transmitted through breathing. It can also be transmitted through coitus. It enters into ruminants' gastrointestinal tract through poorly made silage. It can also be entered into the human body if the food is not properly cooked. It can contaminate ice creams, cheese, or deli cold cuts during or post processing due to mishandling of processing pieces of equipment (Wang et al., 2023). The amount or number of bacteria that can cause infection is not still known, but it is considered that the severity of infection depends upon the host's immune status and the specific strain of bacteria that are entering into the digestive system. There are more chances of contamination of this bacteria in processed food or food that are bought from other than primary sources due to cross contamination of fomites. It can grow and multiply even at refrigeration temperatures, such as 4°C. However, many bacteria stop growing at this temperature. There have been a lot of listeria outbreaks in food items. It has become a significant public health concern (Wu et al., 2023). Listeriosis may be asymptomatic to fatal. It is suggested that the infectious dose for this bacteria in immunocompromised is 10 to 100 microorganisms, while it shows no symptoms in healthy animals or persons (Zahid et al., 2023). It can cross placental barriers and enter into the newborn, which is the main route for this organism. It is an occupational disease, meaning it is transmitted to those who work with animals, such as veterinarians, farmers, and butchers. The zoonotic transmission of this organism is also reported apparently from birds (Kaptchouang Tchatchouang et al., 2020).

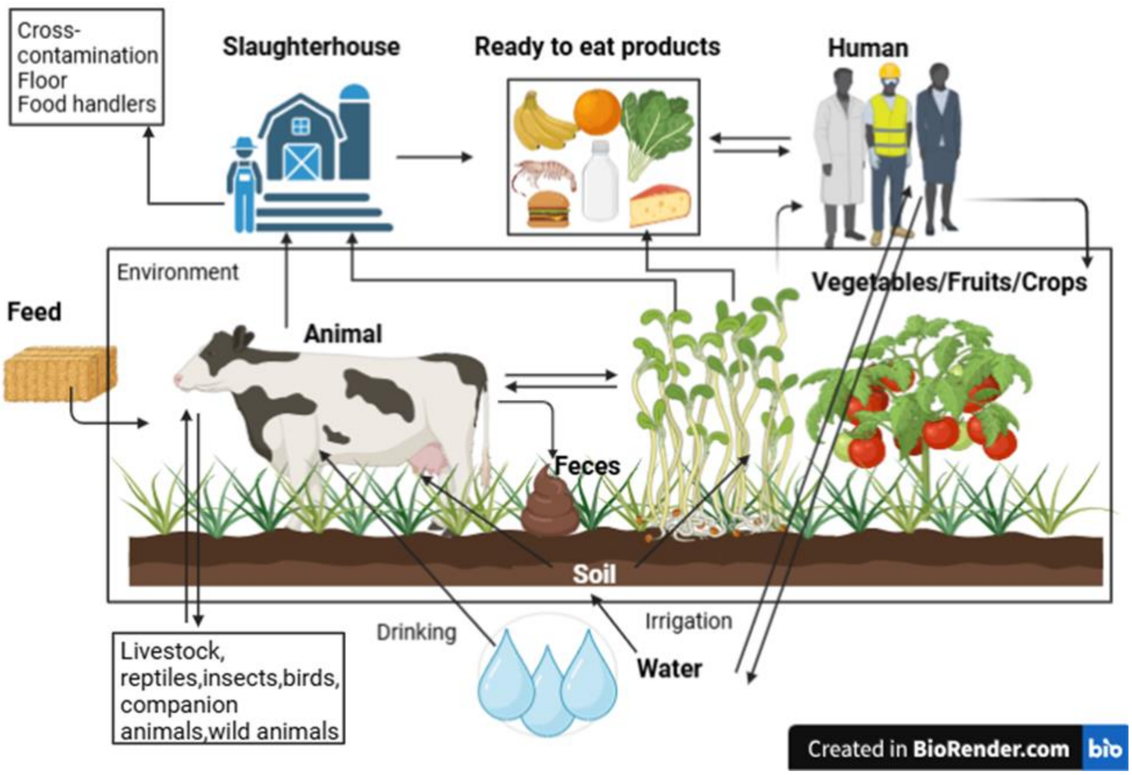

Fig. 1: Transmission of *L. monocytogenes* between water, soil, environment, animals, vegetables, fruits, food products and humans.

Epidemiological Distribution of Listeriosis

The worldwide distribution of Listeria has significant importance as it affects a large number of species of animals especially sheep, goat, cattle, buffalo, camel, horse, dogs, rodents, and birds. It is a zoonotic foodborne disease affecting a larger population of humans also. Sheeps are at high risk of getting this disease (Afonso et al., 2012). Sample has been collected from different sources including meat of cattle, sheep, goat, pig, chicken, ostrich, buffalo, milk, and cheese. All these samples were positive for contamination of listeria and listeria has been isolated from all these samples (Rahimi et al., 2012; Derra et al., 2013; Pal & Awel, 2014; Seyoum et al., 2015). Other ready to eat products, seafoods, vegetables, fish, mushroom, and ice cream also have significant amounts of listeria present in them (Ahmed et al., 2013; Viswanath et al., 2013). Individuals acquired the infection of listeria (different species) mainly by ingestion but other less important routes are also present for instance inhalation, inoculation into skin due to compromised integrity of skin, and through eye. With or without clinical signs, the shedding of virus by humans and animals is done through milk and vaginal secretions. Individuals with the infection of listeria excrete the bacteria in both their secretions and excretions especially including urine and nasal discharge. In case of infected pregnant females, the fetus also gets an infection in the uterus. In another scenario, a newborn may get an infection at the time of birth through vagina. In case of human newborns, listeria has been transmitted between newborns in hospitals via direct contact or through fomites but the transmission of listeria from person to person is insignificant (Mateus et al., 2013).

Pathogenesis of Listeria Infection

The infection of listeria is basically the ingestion of contaminated food that is the reason it is categorized under food borne illnesses (Figure 2). The primary site of entry for the bacteria is the gastrointestinal tract of the host (Farber & Peterkin, 1991; Allerberger & Wagner, 2010; Bagatella et al., 2022). Other than gastrointestinal tract, the infection of listeria is due to other body surfaces including broken skin or eye and the genital tract (Schlech & Acheson, 2000; Vázquez-Boland et al., 2001).The estimation of infective dose of *L. monocytogenes* reveals that the value of infective dose is 104-107 cells (bacteria) for individuals which are immunocompromised and the higher than 107 cells in health individuals (Buchanan et al., 2009; Pouillot et al., 2016; Angelo et al., 2017). A study reveals that the value of an infective dose was less than 100 cells per gram of ice cream during an outbreak in the United States (Drolia & Bhunia, 2019). In comparison to other food borne illnesses, Listeriosis is considered less pathogenic (Lecuit, 2007; Hoelzer et al., 2012).

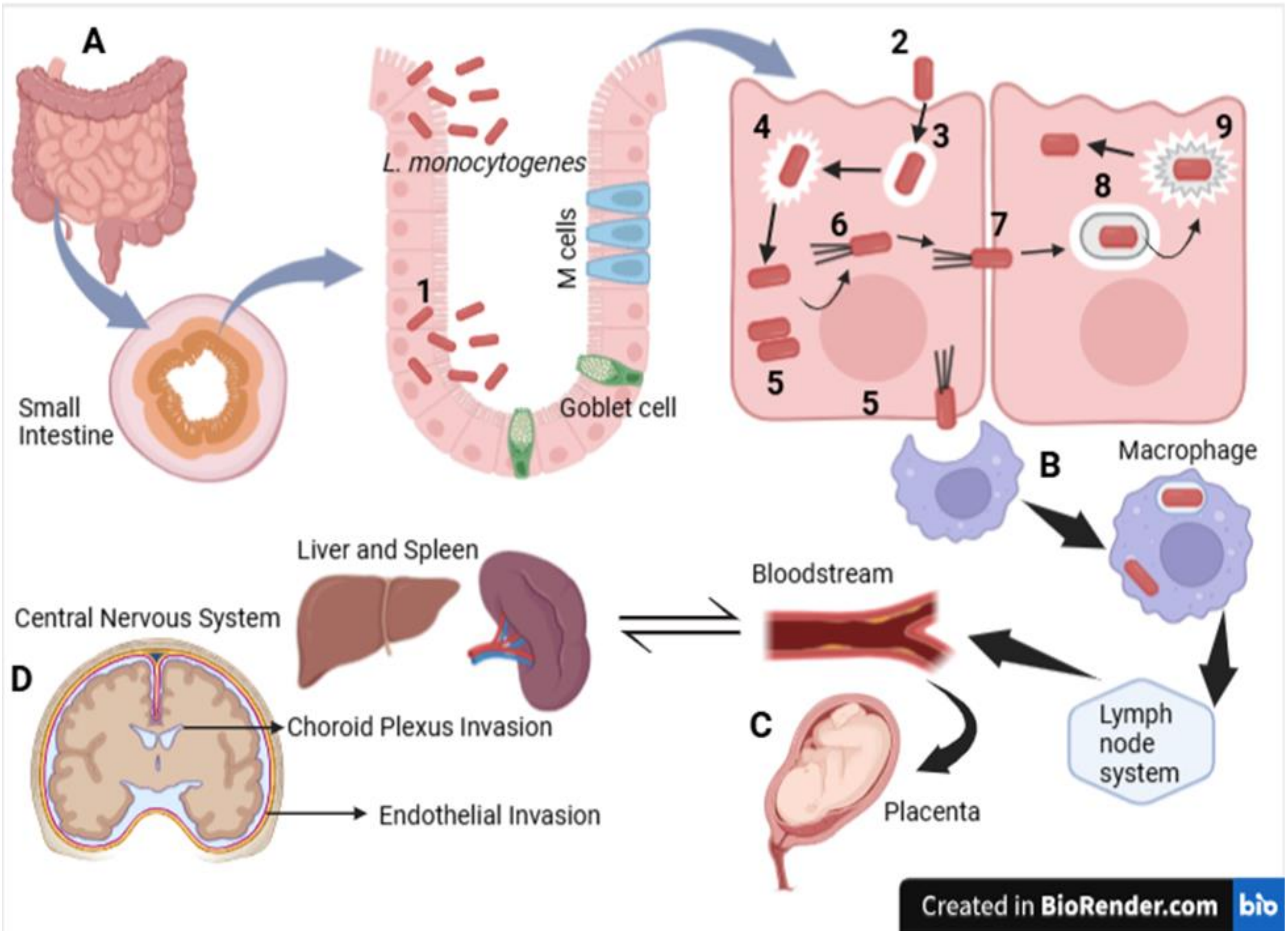

Fig. 2: Pathogenesis of *L. monocytogenes* in humans. (1) *L. monocytogenes* attached to the receptors (2) Invasion into the intestinal cells (3) Vacuole formation (4) Escape from the vacuole (5) Multiplication (6) Formation of actin Tail which helps in movement (7) Cell-cell invasion (8) Double membrane vacuole formation (9) Lysis of double membrane vacuole. *L. monocytogenes* causes gastroenteritis (A), passing the intestinal barrier (B) and spreading through blood to other body organs including liver, spleen, placenta (C), and brain (D).

Diagnostic Approaches for Listeriosis

The infection of listeria can be suspected clinically on the basis of signs and symptoms but the diagnosis of *L. monocytogenes* can only be done through microbiological studies. The isolation of *L. monocytogenes* shows invasive infection if the sample is taken from specific location such as blood, cerebrospinal fluid, or less specifically from pleural, pericardial, peritoneal, and articular fluid. The isolation of bacteria from samples like stools is not categorized under invasive infection but it is studied for epidemiological purposes (Lepe, 2020). The microbiological diagnosis is generally based on the conventional staining procedures and culture techniques. The sensitivity of Gram-staining while testing cerebrospinal fluid is low in case of neuro listeriosis (Pelegrín et al., 2014). The introduction of molecular techniques in diagnosis of *L. monocytogenes* which helps to decrease the time of detection of bacteria and enhance the sensitivity of the process (Cailleaux et al., 2020). In case of pregnant women and newborns, due the antibiotic treatment during peripartum period,the cultures are usually sterile (Verani et al., 2010; Sailer et al., 2018). For serological diagnosis, different tests are employed such as serum agglutination test, haemagglutination (HA), complement fixation test (CFT), haemagglutination inhibition (HI), and enzyme linked immunosorbent assay (ELISA) (Capita et al., 2001; Benett et al., 2013; Dhama et al., 2013).

Table 1: Different types of antibiotics, available and used to treat listeriosis.

Bacteriostatic Antibiotic	Bactericidal Antibiotics	Activity (Intracellular)	Cross placental barrier	Cross blood-brain barrier	References
Gentamicin		Limited	Limited	No	(Pacifici, 2006)
Ampicillin		Yes	Yes	Yes	(Sa del Fiol et al., 2005)
Amoxicillin	Amoxicillin	Yes	Yes	Yes	(Hof, 2004)
	Cotrimoxazole	Yes	Yes	Yes	(Hansen et al., 2016)
Chloramphenicol		Yes	Yes	Yes	(Sa del Fiol et al., 2005; Nau et al., 2010)
	Vancomycin	No	Limited	No	(Hof, 2004; Pacifici, 2006)
	Imipenem	Yes	Yes	Yes	(Hof, 2004)
Linezolid		Yes	Yes	Yes	(Pascual et al., 2002; Sa del Fiol et al., 2005; Myrianthefs et al., 2006)
	Fosfomycin	Yes	Yes	Yes	(Pacifici, 2006; Scortti et al., 2006; Lepe et al., 2014)
Erythromicin		Yes	Limited	Limited	(Heikkinen et al., 2000; Hof, 2004)
	Meropenem	Yes	Limited	Yes	(Carryn et al., 2002; Carryn et al., 2003; Tunkel et al., 2004; Hnat & Bawdon, 2005; Van de Beek et al., 2016)
Penicillin		Limited	Yes	Limited	(Sa del Fiol et al., 2005; Nau et al., 2010)
Rifampicin		Yes		Yes	(Hof, 2004)
Tetracyclines		Limited	Yes	Yes	(Sa del Fiol et al., 2005; Nau et al., 2010)
	Moxifloxacin	Limited	Yes	Yes	(Carryn et al., 2002; Hof, 2004; Grayo et al., 2008b)

Table 2: Human Listeriosis Outbreaks (2012-2022) (Koopmans et al., 2023)

Period	Country	Cases	Perinatal cases	Death	Suspect vehicle	Serotype
2012	Multistate, USA	22	4	1	6 from ricotta salad from pasteurized sheep milk (from Italy) and others from crosscontamination of cheese cut with the same equipment	1/2a
2012	Finland	20	0	2	Ready sliced meat jelly	unknown
2013	Multistate, USA	6	1	1	Cheese	4b
2014	Illinois and Michigan, USA	5	2	0	Mung bean sprouts	4b
2014	California and Maryland, USA	8	NA	0	Dairy products	1/2b
2014	Multistate, USA	5	1	1	Quesito casero cheese	*d
2014	Germany	39	0	3	Meat products (sold in healthcare facilities)	1/2a
2014	Multistate, USA	35	NA	7	Prepackaged caramel apples	4b, 4bV
2014	Denmark, Estonia, Finland, France, Sweden	22	NA	5	Ready-to-eat fish	1/2a
2015	Italy	24	NA	4	Pork ready-to-eat products 1/2a	1/2a
2015	Multicountry, Europe	47	0	9	Frozen sweet corn	4b
2015	Multistate, USA	10	NA	3	Ice cream/frozen yogurt/frozen snacks	*
2015	Multistate, USA	30	NA	3	Soft cheeses from a dairy company	*
2015	Ontario, Canada	34	1	4	Pasteurized chocolate milk	Unknown
2015	Denmark, Germany, France	12	NA	4	Marinated salmon	1/2a
2016	Multistate, USA	19	NA	1	Package salads	4bV
2016	USA and Canada	33	0	1	Package salads	4b
2016	Multistate, USA	9	NA	3	Frozen vegetables	*
2016	Multistate, USA	8	NA	0	Hummus	*
2017	Multistate, USA	8	NA	2	Soft raw milk cheese	*
2017	South Africa	1024	410	200	Polony	4b
2018	Austria	13	0	0	Liver pate	4bV
2018	Germany	112	0	1	Blood sausage	4b
2018	Switzerland	34	1	10	Brie	4b
2019	Michigan, USA	8	NA	1	Sliced meat at a deli	*
2019	Georgia, USA	8	NA	1	Hard boiled eggs	*
2019	Multistate, USA	13	4	1	Queso fresco (pasteurized)	*
2019	Spain	222	NA	3	Chilled pork roast	4b
2019	The Netherlands and Belgium	21	1	3	Ready to eat products	4b
2019	United Kingdom	9	NA	6	Sandwich and salad supplier	Unknown
2020	Multistate, USA	12	NA	1	Deli meats	*
2020	Multistate, USA	36	6	4	Enoki mushrooms	*
2021	Multistate, USA	13	NA	1	Queso fresco	*
2022	Multistate, USA	18	NA	3	Packaged salads	*
2022	Multistate, USA	10	NA	1	Packaged salads	*
2022	Multistate, USA	25	NA	1	Ice cream	*

Treatment of Listeriosis

Treatment suggestions for listeriosis are often determined by the host's immunological condition as well as the kind, location, and severity of the illness. After eating food tainted with Listeria, patients who get gastroenteritis often experience a self-limiting course with symptoms going away in two days. Antibiotics (Table 1) are therefore seldom needed by immunocompetent individuals, while immunocompromised patients may be given oral ampicillin or trimethoprim-sulfamethoxazole (TMP-SMX) due to their increased risk of invasive listeriosis (Ooi & Lorber, 2005). Even with proper antibiotic therapy, death rates for patients with invasive Listeriosis, including meningitis, bacteremia, and endocarditis, are still high (Hof, 2004). It is challenging to determine the best antibiotic therapy for invasive infections since there are few prospective and randomized clinical trials on the most suitable antibiotic regimens due to the limited number of listeriosis patients (Grayo et al., 2008a; Janakiraman, 2008).Despite the fact that *L. monocytogenes* is sensitive to the majority of regularly used antibiotics in vitro, treatment failure has been documented in over 30% of instances (Hof, 2004), which can be attributed to a variety of causes. Because *L. monocytogenes* is an intracellular bacterium, it may avoid both the human immune response and the effects of drugs. Furthermore, for intracellular bacteria, standard in vitro susceptibility testing does not always equate to clinical effectiveness. While beta-lactams are often bacteriostatic, only a small number of antibiotics, including vancomycin, aminoglycosides, cotrimoxazole, and the more recent quinolones, exhibit bactericidal action against Listeria (Hof, 2004). Furthermore, because listeriosis mostly affects immunocompromised hosts, the body's immune system could not be strong enough to aid in the body's defense against the invasive virus.Ampicillin and penicillin are the main therapy choices for serious listeriosis . Due to Listeria's propensity for infections in the central nervous system and to achieve bactericidal concentration in the CNS (Loo et al., 2020), a high dosage of ampicillin is advised regardless of central nervous system (CNS) involvement. An aminoglycoside called gentamicin is frequently used in conjunction with ampicillin and penicillin to produce synergy. Cephalosporins, which are frequently employed as the first-line empirical treatment for meningitis, cannot treat Listeria meningitis due to the innate tolerance of *L. monocytogenes* to these medications, depriving patients of effective treatment. Consequently, empirical treatment for *L. monocytogenes* coverage should be administered to at-risk individuals. When treating meningitis, antibiotics should be given for at least 21 days; in instances of rhombencephalitis, brain abscess, and immunocompromised host, the duration of treatment should be extended to at least 8 weeks (Loo et al., 2020). Human listeriosis outbreaks (2012-2022) have been elaborated in Table 2.

Prevention and Control

Because the causative organism is so common, there is no easy way to detect Listeria contamination in the environment, and little is known about risk factors other than silage, controlling listeriosis is challenging (Dhama et al., 2015). Nonetheless, the following are a few of the control measures against listeriosis. Infected corpses, beddings and litters, and contaminated items should all be thoroughly disposed of by burning or incineration. Rotten veggies shouldn't be offered to animals. Animal farms should maintain proper cleanliness and hygiene. Animals should not be given silage in endemic regions. When there is a disease epidemic, take precautions by keeping tetracyclines in the diet of animals that are at risk. When handling diseased animals, aborted material, or removing a retained placenta, wear protective clothing. Animals shouldn't be given spoiled silage. Listeria infections are more likely to occur in immunocompromised hosts, thus prompt and adequate measures must be taken in these situations. To lower the annual number of cases, routine testing of raw milk or a raw milk testing program should be implemented (Latorre et al., 2011).

Conclusion

The infection caused by *L. monocytogenes*, listeriosis is an emerging food borne illness which gains importance due to its zoonotic transmission also makes it a serious concern for public health. The disease spread in both sporadic and epidemic form. Due to the ability of the Listeria to survive at refrigerator temperature, the bacteria is of great importance for food safety concerns. The major source of transmission of the *L. monocytogenes* is by the ingestion of contaminated food and other food products such as ready to eat products. The high risk group includes immunocompromised people, neonates, pregnant women, and elderly people. The one health approach is the best approach for the prevention and control of the disease. For future perspective the implementation of good hygiene practices (GHP), good manufacturing practices (GMP) as well as developing a food safety management system under the rules of Hazard Analysis and Critical Control Points (HACCP) on all the food chain sectors should be mandatory. There should be more research to find out the method of survival of bacteria, transmission vehicles, with great emphasis on finding out the molecular epidemiology of the different listeria species.

References

Abdollahzadeh, E., Ojagh, S. M., Hosseini, H., Ghaemi, E. A., Irajian, G., & Heidarlo, M. N. (2016). Antimicrobial resistance of Listeria monocytogenes isolated from seafood and humans in Iran. *Microbial Pathogenesis*, *100*, 70-74.

Afonso, C. L., Miller, P. J., Grund, C., Koch, G., Peeters, B., Selleck, P. W., & Srinivas, G. B. (2012). Manual of diagnostic tests and vaccines for terrestrial animals. *Paris: World Organization for Animal Health*.

Ahmed, H. A., Hussein, M. A., & El-Ashram, A. M. (2013). Seafood a potential source of some zoonotic bacteria in Zagazig, Egypt, with the molecular detection of Listeria monocytogenes virulence genes. *Veterinaria Italiana, 49*(3), 299-308.

Allerberger, F., & Wagner, M. (2010). Listeriosis: a resurgent foodborne infection. *Clinical Microbiology and Infection*, *16*(1), 16-23.

Angelo, K. M., Conrad, A. R., Saupe, A., Dragoo, H., West, N., Sorenson, A., & Jackson, B. R. (2017). Multistate outbreak of Listeria monocytogenes infections linked to whole apples used in commercially produced, prepackaged caramel apples: United States, 2014–2015. *Epidemiology & Infection*, *145*(5), 848-856.

Bagatella, S., Tavares-Gomes, L., & Oevermann, A. (2022). Listeria monocytogenes at the interface between ruminants and humans: A comparative pathology and pathogenesis review. *Veterinary Pathology*, *59*(2), 186-210.

Benetti, T. M., Monteiro, C. L. B., Beux, M. R., & Abrahão, W. M. (2013). Enzyme-linked imunoassays for the detection of Listeria sp. and

Salmonella sp. in sausage: a comparison with conventional methods. *Brazilian Journal of Microbiology*, *44*, 791-794.

Buchanan, R. L., Gorris, L. G., Hayman, M. M., Jackson, T. C., & Whiting, R. C. (2017). A review of Listeria monocytogenes: An update on outbreaks, virulence, dose-response, ecology, and risk assessments. *Food Control*, *75*, 1-13.

Buchanan, R. L., Havelaar, A. H., Smith, M. A., Whiting, R. C., & Julien*, E. (2009). The key events dose-response framework: its potential for application to foodborne pathogenic microorganisms. *Critical Reviews in Food Science and Nutrition*, *49*(8), 718-728.

Cailleaux, M., Pilmis, B., Mizrahi, A., Lourtet-Hascoet, J., Nguyen Van, J. C., Alix, L., & Le Monnier, A. (2020). Impact of a multiplex PCR assay (FilmArray®) on the management of patients with suspected central nervous system infections. *European Journal of Clinical Microbiology & Infectious Diseases*, *39*, 293-297.

Capita, R., Alonso-Calleja, C., Moreno, B., & García-Fernández, M. C. (2001). Occurrence of Listeria species in retail poultry meat and comparison of a cultural/immunoassay for their detection. *International Journal of Food Microbiology*, *65*(1-2), 75-82.

Carryn, S., Van Bambeke, F., Mingeot-Leclercq, M. P., & Tulkens, P. M. (2002). Comparative intracellular (THP-1 macrophage) and extracellular activities of β-lactams, azithromycin, gentamicin, and fluoroquinolones against Listeria monocytogenes at clinically relevant concentrations. *Antimicrobial Agents and Chemotherapy*, *46*(7), 2095-2103.

Carryn, S., Van Bambeke, F., Mingeot-Leclercq, M. P., & Tulkens, P. M. (2003). Activity of β-lactams (ampicillin, meropenem), gentamicin, azithromycin and moxifloxacin against intracellular Listeria monocytogenes in a 24 h THP-1 human macrophage model. *Journal of Antimicrobial Chemotherapy*, *51*(4), 1051-1052.

Centers for Disease Control and Prevention (CDC). (2009). Preliminary FoodNet Data on the incidence of infection with pathogens transmitted commonly through food--10 States, 2008. *MMWR: Morbidity & Mortality Weekly Report*, *58*(13).

Chen, L., Leng, Y. K., Qiu, S., Liu, B., Liu, J., Wan, S. P., & Wu, Q. (2023). Ultrahigh-sensitivity label-free singlemode-tapered no core-singlemode fiber immunosensor for Listeria monocytogenes detection. *Sensors and Actuators B: Chemical*, *376*, 132930.

Danion, F., Maury, M. M., Leclercq, A., Moura, A., Perronne, V., Leotard, S., & Charlier, C. (2017). Listeria monocytogenes isolation from urine: a series of 15 cases and review. *Clinical Microbiology and Infection*, *23*(8), 583-585.

Derra, F. A., Karlsmose, S., Monga, D. P., Mache, A., Svendsen, C. A., Félix, B., & Hendriksen, R. S. (2013). Occurrence of Listeria spp. in retail meat and dairy products in the area of Addis Ababa, Ethiopia. *Foodborne Pathogens and Disease*, *10*(6), 577-579.

Dhama, K., Karthik, K., Tiwari, R., Shabbir, M. Z., Barbuddhe, S., Malik, S. V. S., & Singh, R. K. (2015). Listeriosis in animals, its public health significance (food-borne zoonosis) and advances in diagnosis and control: a comprehensive review. *Veterinary Quarterly*, *35*(4), 211-235.

Dhama, K., Verma, A. K., Rajagunalan, S., Kumar, A., Tiwari, R., Chakraborty, S., & Kumar, R. (2013). Listeria monocytogenes infection in poultry and its public health importance with special reference to food borne zoonoses. *Pakistan Journal of Biological Sciences: PJBS*, *16*(7), 301-308.

Drolia, R., & Bhunia, A. K. (2019). Crossing the intestinal barrier via Listeria adhesion protein and internalin A. *Trends in Microbiology*, *27*(5), 408-425.

Farber, J. M., & Peterkin, P. (1991). Listeria monocytogenes, a food-borne pathogen. *Microbiological Reviews*, *55*(3), 476-511.

Grayo, S., Join-Lambert, O., Desroches, M. C., & Le Monnier, A. (2008a). Comparison of the in vitro efficacies of moxifloxacin and amoxicillin against Listeria monocytogenes. *Antimicrobial Agents and Chemotherapy*, *52*(5), 1697-1702.

Grayo, S., Lott-Desroches, M. C., Dussurget, O., Respaud, R., Fontanet, A., Join-Lambert, O., & Le Monnier, A. (2008b). Rapid eradication of Listeria monocytogenes by moxifloxacin in a murine model of central nervous system listeriosis. *Antimicrobial Agents and Chemotherapy*, *52*(9), 3210-3215.

Hansen, C., Andrade, S. E., Freiman, H., Dublin, S., Haffenreffer, K., Cooper, W. O., & Davis, R. (2016). Trimethoprim–sulfonamide use during the first trimester of pregnancy and the risk of congenital anomalies. *Pharmacoepidemiology and Drug Safety*, *25*(2), 170-178.

Heikkinen, T., Laine, K., Neuvonen, P. J., & Ekblad, U. (2000). The transplacental transfer of the macrolide antibiotics erythromycin, roxithromycin and azithromycin. *BJOG: An International Journal of Obstetrics & Gynaecology*, *107*(6), 770-775.

Hnat, M., & Bawdon, R. E. (2005). Transfer of meropenem in the ex vivo human placenta perfusion model. *Infectious Diseases in Obstetrics and Gynecology*, *13*(4), 223-227.

Hoelzer, K., Pouillot, R., & Dennis, S. (2012). Animal models of listeriosis: a comparative review of the current state of the art and lessons learned. *Veterinary Research*, *43*, 1-27.

Hof, H. (2004). An update on the medical management of listeriosis. *Expert Opinion on Pharmacotherapy*, *5*(8), 1727-1735.

Janakiraman, V. (2008). Listeriosis in pregnancy: diagnosis, treatment, and prevention. *Reviews in Obstetrics and Gynecology*, *1*(4), 179.

Kaptchouang Tchatchouang, C. D., Fri, J., De Santi, M., Brandi, G., Schiavano, G. F., Amagliani, G., & Ateba, C. N. (2020). Listeriosis outbreak in South Africa: a comparative analysis with previously reported cases worldwide. *Microorganisms*, *8*(1), 135.

Koopmans, M. M., Brouwer, M. C., Vázquez-Boland, J. A., & van de Beek, D. (2023). Human listeriosis. *Clinical Microbiology Reviews, 36*(1), e00060-19.

Kundul, B. G., & Ame, M. M. (2022). Review on Listeriosis in small ruminants and public health significance in Ethiopia. *International Journal of Veterinary Science and Research*, *8*(3), 086-094.

Latorre, A. A., Pradhan, A. K., Van Kessel, J. A. S., Karns, J. S., Boor, K. J., Rice, D. H., & Schukken, Y. H. (2011). Quantitative risk assessment of listeriosis due to consumption of raw milk. *Journal of Food Protection*, *74*(8), 1268.

Lecuit, M. (2007). Human listeriosis and animal models. *Microbes and Infection*, *9*(10), 1216-1225.

Lepe, J. A., Torres, M. J., Smani, Y., Parra-Millán, R., Pachón, J., Vazquez-Barba, I., & Aznar, J. (2014). In vitro and intracellular activities of fosfomycin against clinical strains of Listeria monocytogenes. *International Journal of Antimicrobial Agents*, *43*(2), 135-139.

Lepe, J. A. (2020). Current aspects of listeriosis. *Medicina Clínica (English Edition)*, *154*(11), 453-458.

Loo, K. Y., Letchumanan, V., Dhanoa, A., Law, J. W. F., Pusparajah, P., Goh, B. H., & Lee, L. H. (2020). Exploring the pathogenesis, clinical

characteristics and therapeutic regimens of Listeria monocytogenes. *Microbiology*, *3*(3), 1-13.
Mateus, T., Silva, J., Maia, R. L., & Teixeira, P. (2013). Listeriosis during pregnancy: a public health concern. *International Scholarly Research Notices*, *2013*(1), 851712.
Myrianthefs, P., Markantonis, S. L., Vlachos, K., Anagnostaki, M., Boutzouka, E., Panidis, D., & Baltopoulos, G. (2006). Serum and cerebrospinal fluid concentrations of linezolid in neurosurgical patients. *Antimicrobial Agents and Chemotherapy*, *50*(12), 3971-3976.
Nau, R., Sörgel, F., & Eiffert, H. (2010). Penetration of drugs through the blood-cerebrospinal fluid/blood-brain barrier for treatment of central nervous system infections. *Clinical Microbiology Reviews*, *23*(4), 858-883.
Ooi, S. T., & Lorber, B. (2005). Gastroenteritis due to Listeria monocytogenes. *Clinical Infectious Diseases*, *40*(9), 1327-1332.
Pacifici, G. M. (2006). Placental transfer of antibiotics administered to the mother: a review. *International Journal of Clinical Pharmacology & Therapeutics*, *44*(2).
Pal, M., & Awel, H. (2014). Public health significance of Listeria monocytogenes in milk and milk products: an overview. *Journal of Veterinary Public Health*, *12*(1), 1-5.
Pal, M., Mulu, S., Zenebe, N., Girmay, G., Savalia, C. V., & Gobu, B. (2017). Listeria monocytogenes as an emerging global food-borne zoonotic bacterial pathogen. *Beverage World Food*, 44, 29-32.
Pal, M., Shuramo, M. Y., Shiferawu, F., & Parmar, B. C. (2022). Listeriosis: an emerging foodborne disease of public health concern. *Journal of Advances in Microbiology Research*, 3(2), 29-33.
Pal, M. A. I. I. E. N. D. R. A. (2005). Importance of zoonoses in public health. *Indian Journal of Animal Sciences*, 75(5), 586-591.
Pascual, A., Ballesta, S., García, I., & Perea, E. J. (2002). Uptake and intracellular activity of linezolid in human phagocytes and nonphagocytic cells. *Antimicrobial Agents and Chemotherapy*, *46*(12), 4013-4015.
Pelegrín, I., Moragas, M., Suárez, C., Ribera, A., Verdaguer, R., Martínez-Yelamos, S., & Cabellos, C. (2014). Listeria monocytogenes meningoencephalitis in adults: analysis of factors related to unfavourable outcome. *Infection*, *42*, 817-827.
Pouillot, R., Klontz, K. C., Chen, Y., Burall, L. S., Macarisin, D., Doyle, M., & Van Doren, J. M. (2016). Infectious dose of Listeria monocytogenes in outbreak linked to ice cream, United States, 2015. *Emerging Infectious Diseases*, *22*(12), 2113.
Quinn, P. J., Markey, B. K., Leonard, F. C., Hartigan, P., Fanning, S., & Fitzpatrick, E. (2011). *Veterinary Microbiology and Microbial Disease*. John Wiley & Sons.
Rahimi, E., Yazdi, F., & Farzinezhadizadeh, H. (2012). Prevalence and antimicrobial resistance of Listeria species isolated from different types of raw meat in Iran. *Journal of Food Protection*, *75*(12), 2223-2227.
Sa del Fiol, F., Gerenutti, M., & Groppo, F. C. (2005). Antibiotics and pregnancy. *Die Pharmazie-An International Journal of Pharmaceutical Sciences*, *60*(7), 483-493.
Sailer, S., Badia, P. R. B., Vetter-Laracy, S. I. C., Benítez-Segura, I., & de Gopegui Bordes, E. R. (2018). Neonatal listeriosis and the importance of body surface cultures. *Klinische Pädiatrie*, *230*(05), 278-280.
Schlech III, W. F., & Acheson, D. (2000). Foodborne listeriosis. *Clinical Infectious Diseases*, *31*(3), 770-775.
Scortti, M., Lacharme-Lora, L., Wagner, M., Chico-Calero, I., Losito, P., & Vázquez-Boland, J. A. (2006). Coexpression of virulence and fosfomycin susceptibility in Listeria: molecular basis of an antimicrobial in vitro–in vivo paradox. *Nature Medicine*, *12*(5), 515-517.
Seyoum, E. T., Woldetsadik, D. A., Mekonen, T. K., Gezahegn, H. A., & Gebreyes, W. A. (2015). Prevalence of Listeria monocytogenes in raw bovine milk and milk products from central highlands of Ethiopia. *The Journal of Infection in Developing Countries*, *9*(11), 1204-1209.
Tunkel, A. R., Hartman, B. J., Kaplan, S. L., Kaufman, B. A., Roos, K. L., Scheld, W. M., & Whitley, R. J. (2004). Practice guidelines for the management of bacterial meningitis. *Clinical Infectious Diseases*, *39*(9), 1267-1284.
Van de Beek, D., Cabellos, C., Dzupova, O., Esposito, S., Klein, M., Kloek, A. T., & Brouwer, M. C. (2016). ESCMID guideline: diagnosis and treatment of acute bacterial meningitis. *Clinical Microbiology and Infection*, *22*, S37-S62.
Vázquez-Boland, J. A., Kuhn, M., Berche, P., Chakraborty, T., Domı́nguez-Bernal, G., Goebel, W., & Kreft, J. (2001). Listeria pathogenesis and molecular virulence determinants. *Clinical Microbiology Reviews*, *14*(3), 584-640.
Verani, J. R., McGee, L., & Schrag, S. J. (2010, November). *Prevention of perinatal group B streptococcal disease: revised guidelines from CDC, 2010*.
Viswanath, P., Murugesan, L., Knabel, S. J., Verghese, B., Chikthimmah, N., & LaBorde, L. F. (2013). Incidence of Listeria monocytogenes and Listeria spp. in a small-scale mushroom production facility. *Journal of Food Protection*, *76*(4), 608-615.
Wang, J., He, Z., Cui, M., Sun, J., Jiang, L., Zhuang, N., & Cheng, C. (2023). Hypoxia-induced HIF-1α promotes Listeria monocytogenes invasion into tilapia. *Microbiology Spectrum*, *11*(5), e01405-23.
Wu, J., McAuliffe, O., & O'Byrne, C. P. (2023). Trehalose transport occurs via TreB in Listeria monocytogenes and it influences biofilm development and acid resistance. *International Journal of Food Microbiology*, *394*, 110165.
Zahid, R., Arbab, Z., Tahir, Z., Tehseen, U., Ali, S., Bukhsh, S. K., & Khan, A. (2023). Global prevalence of listeriosis. *Zoonosis, Unique Scientific Publishers, Faisalabad, Pakistan*, *4*, 319-328.