Global Prevalence of Listeriosis

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ABSTRACT

Listeria monocytogenes, a Gram-positive bacterium, is the causative agent of listeriosis, a severe foodborne infection affecting both animals and humans. Despite being initially recognized as a rare disorder, recent outbreaks in various regions have brought attention to its significant impact on public health. This zoonotic pathogen, categorized as a rare condition by ORPHANET, has become the sixth most prevalent zoonotic disease in Europe, with high mortality rates. Listeriosis cases have been on the rise in Europe since 2008, posing a substantial threat to vulnerable populations. The adaptability of L. monocytogenes to diverse environmental conditions, including food processing and agricultural areas, highlights its ability to persist and spread. Virulence factors, bacterial strain characteristics, and host susceptibility contribute to the severity of listeriosis. Insufficient epidemiological evidence hampers the estimation of contamination severity in most outbreaks. Government regulatory agencies enforce strict guidelines and programs in the food industry to control L. monocytogenes spread. Listeriosis primarily spreads through contaminated food, with infective dosages varying based on health conditions. High-risk groups, such as the elderly and immunocompromised individuals, are advised to avoid consuming high-concentration L. monocytogenes foods. The disease's protracted incubation period, propensity for severe clinical signs, and challenges in controlling its spread contribute to its severity. Global prevalence, outbreaks, and risk factors underscore the need for effective control measures. L. monocytogenes can contaminate various food sources, emphasizing the importance of stringent food safety practices. Laboratory data, microbiological diagnosis, and health risks associated with listeriosis further contribute to understanding and managing this public health threat.

Key words: Listeria monocytogenes, Listeriosis, Foodborne infection, Virulence factors, Food safety

CITATION

Zahid R, Arbab Z, Tahir Z, Tehseen U, Ali S, Bukhsh SK, Javaid A, Rehman A and Khan A, 2023. Global prevalence of listeriosis. In: Altaf S, Khan A and Abbas RZ (eds), Zoonosis, Unique Scientific Publishers, Faisalabad, Pakistan, Vol 4: 319-328. https://doi.org/10.47278/book.zoon/2023.158

CHAPTER HISTORY Received: 23-Feb-2023 Revised: 15-June-2023 Accepted: 14-Nov-2023

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1. INTRODUCTION

Listeria monocytogenes is a common Gram-positive bacterium that can be found in different environmental conditions and is the cause of listeriosis in humans. In the 1980s, this zoonotic illness was initially recognised as a foodborne infection. Due to being considered a relatively rare disorder, listeriosis frequently does not receive the acknowledgement it needs (Chowdhury and Anand 2023). It is categorised as a rare condition and is listed with the reference ORPHA533 in ORPHANET, a European Consortium concentrating on Rare Diseases and Orphan Drugs. The 28 member states of the European Union registered 2,480 identified cases of human detrimental listeriosis in 2017. This illness is the sixth most prevalent zoonotic disease in Europe; because of its high death rate, it stands out as the most severe in terms of clinical indicators (Finn et al. 2023). Because it primarily affects vulnerable populations, this is very alarming. The disease has garnered attention again in the medical community and media due to recent outbreaks in South Africa, the United States, and Andalusia in 2019, which have impacted hundreds of individuals (Lepe 2020).

Listeriosis is caused by the bacteria *L. monocytogenes*, a rare but severe illness that affects both animals and humans. It is one of the most serious foodborne illnesses due to its uncommonly high hospitalization and case fatality rates. There are twenty-one known species of tiny, Gram-positive, rod-shaped, common bacteria in the genus Listeria. Only *L. monocytogenes* and *Listeria ivanovii* are among these that are dangerous to mammals. In the later part of the 20th century, pathogenic strains of Listeria became a major foodborne pathogen in Western countries. Listeria outbreaks in humans and animals have had a substantial economic effect on humankind and the food sector. Interestingly, listeriosis cases have increased in Europe since 2008 (Tuytschaever et al. 2023).

Originally a saprophytic bacterium, certain members of the Listeria genus have effectively adapted to a variety of environmental conditions attributed to human activities. These ecosystems include food processing and agricultural areas, where there is a presence of animal and bird waste (Feng et al. 2023). Their remarkable ability to detect and adapt to environmental stressors facilitates this flexibility. Additionally, because of their ability to withstand adversity, Listeria can more easily enter the digestive systems of mammals by way of contaminated food (Quereda et al. 2021).

The virulence of the bacterial strain determines the effect of listeriosis on human health. Essential factors also include the number of bacteria consumed, the genetic variety within a population, the host's general health and immune system, and any food properties that may affect the microbial ecosystem and host state (Yang et al. 2024).

For most food-related listeriosis outbreaks, there is currently insufficient reliable epidemiological evidence to estimate the severity of contamination. However, the infective dosages of *L. monocytogenes* have been evaluated by researchers to be between 10^7 and 10^9 colony-forming units (CFUs) for individuals in good health and only between 10^5 and 10^7 CFUs for those who are more vulnerable. Recent events have shown that, even in cases when products contaminated with *L. monocytogenes* are widely available, most consumers are not impacted when the levels of contamination are low, and the circumstances necessary for the growth of bacteria are met. It is important to note that reports of *L. monocytogenes* in human faeces have not been linked to any apparent illness. These studies' results, along with the data currently available on epidemics in the United States and Italy. It demonstrates that even the less severe form of illness, which manifests as feverish gastroenteritis in healthy individuals, requires the consumption of substantial amounts of bacteria. On the other hand, even when consuming minimally contaminated products, persons with a high vulnerability may have severe clinical signs of listeriosis (Akram et al. 2021; Félix et al. 2023; Petrišič et al. 2023).

Government regulatory agencies have ordered the food industry to set up programs for analysing dangers at crucial control points in order to regulate the spread of *L. monocytogenes* through food. They have also enforced strict guidelines regarding the allowable thresholds of *L. monocytogenes*

contamination in food items (Sarghaleh et al. 2023). All strains of *L. monocytogenes* are currently treated in the same way from the perspective of regulation. It's crucial to remember that some strains, like those in the CC1, CC2, CC4, and CC6 groups, show increased virulence (Keane et al. 2023). These strains are known to afflict people with minimal or no immunosuppressive comorbidities, and they are often associated with clinical cases. Conversely, strains such as CC9 and CC121 exhibit lower virulence and are less usually linked to clinical infections. It is recommended that people in high-risk categories (such as the older, immunocompromised, and pregnant women), should refrain from consuming food that contains a significant concentration of *L. monocytogenes* due to the seriousness of the illness, the variability surrounding the minimum infectious dosage and the varying pathogenicity levels throughout Listeria strains. For the broader public, it is essential to deal with high-risk foods with care and store them at low temperatures for short periods (Quereda et al. 2021).

Due to the high death rate and seriousness of listeriosis, which can cause brain inflammation, blood poisoning, and abortion, it poses a severe threat to public health. Its protracted incubation time and propensity to afflict people with underlying medical issues, intensify this disease even further (Ding et al. 2023). The elderly, expectant mothers and their unborn children, and people with cancer, cirrhosis, diabetes, chronic kidney disease, rheumatoid arthritis, collagen-vascular disorders, and alcoholism are among those groups which are most susceptible to listeriosis. Remarkably, this microbe can survive at temperatures below those of cold storage. Furthermore, it has been found in the digestive tracts of animals as well as on the outside of living things. There have been separations from agricultural runoff and animal faeces. *L. monocytogenes* is a significant threat to the food business and challenging to control because of its capacity to persist and spread in environments associated with food (Bialvaei et al. 2018).

2. TRANSMISSION OF LISTERIOSIS

Sources of infection for *L. monocytogenes* include the soil and the digestive systems of asymptomatic animals such as fish, crabs, birds, and wild mammals. *L. monocytogenes* can be secreted by infected animals through their faeces, milk, and uterine fluids. The bacteria can also be found in the remains of miscarried babies and frequently in the urine and respiratory secretions of sick animals (Chen et al. 2023). The presence of Listeria monocytogenes in plants and straws is typically attributed to contamination from faecal matter or soil. Listeria infestation is most commonly contracted by consumption of contaminated food, though it can also be transmitted by direct physical contact and inhalation. Furthermore, sexual transmission could be a possible means of dispersal. Listeriosis usually develops in ruminant animals after they eat contaminated silage or other feed. Uncooked vegetables, unprocessed meat, seafood and unpasteurised dairy goods are examples of spoiled food sources for people. Additionally, contaminated post-processing goods, specifically Ice cream, sliced and grated cheese, soft cheddar cheese and deli cold cuts, have been linked to *L. monocytogenes* (Chen et al. 2023; Wang et al. 2023). Although the infectious dose for oral transmission is uncertain, the host sensitivity and the bacterial strain are assumed to play a role. Processed food is prone to contamination at every stage of production, from the unprocessed materials to the primary buyer. In response to the notable rise in contamination levels and the resulting danger of eating food contaminated with *L. monocytogenes*, food security and safety have become critical worldwide concerns (Wu et al. 2023). The pathogen's resistance to low temperatures is a significant challenge in the production chain, as it can cause a spike in infection rate and an increase in fatality rate. It is imperative to emphasise that listeriosis, which is caused by *L. monocytogenes*, is not exclusive to humans and can cause a variety of severe symptoms that can be fatal. In most cases, healthy people can eat items contaminated with Listeria without experiencing any symptoms. However, it is estimated that an infective dose of roughly

10 to 100 organisms is required to initiate the infection in those who are susceptible. The most common form of disease in both ruminants and newborn humans is vertical transmission. The placenta or an infected birth canal are the main routes by which these illnesses are spread. In addition, proximity with diseased livestock during birth, lambing, or post-mortem investigations might result in human infection. There have been isolated cases documented after coming into contact with infectious birds or the corpses of chickens that don't appear to be sick (Kaptchouang Tchatchouang et al. 2020).

3. PATHOPHYSIOLOGY

Although contaminated food is the primary cause of the spread of infection with *L. monocytogenes*, the main route for the bacteria to enter the body is through the gastrointestinal tract. Consequently, the pathophysiology of listeriosis has been thoroughly understood. In the early hours following infection, the bacteria settle inside phagocytes and antigen-presenting cells in the lamina propria, having first invaded the enterocytes that line the absorptive epithelium of microvilli (Shen et al. 2023). The liver and spleen are the main organs of concern that are eventually targeted by a spread through the lymphatic and circulatory systems. The majority of the bacteria is located in the parenchyma of the liver, where it causes pyogranulomas. Within the first twenty-four hours after infection, this series of events takes place. Then, in healthy people, the pyogranulomas go away entirely a week after the infection first appears; in patients on immunosuppressive treatment, however, the infection may worsen and become an invasive illness. This procedure proceeds somewhat quickly and is not the same as the disease's protracted incubation period, which by definition includes a subclinical stage of infection. When it comes to treating disorders in immunocompromised people, the subclinical stage is crucial because lipophilic medicines, like rifampin or quinolones, may be able to reach granulomas more easily than ampicillin and completely eradicate the bacterium (Koopmans et al. 2023).

L. monocytogenes is recognised as a model cytosolic microorganism at the cellular level. Whereas the bacteria actively mediate entry into phagocytic cells through the cell, the formation of internalin (InlA and InlB) on their surface starts the process of penetrating non-phagocytic cells. These internalin interact with cellular receptors, including Met (the hepatocyte growth factor receptor) and E-cadherin, which causes the bacterium to internalise and form a vacuole that stays affixed to the cell membrane. After that, the bacteria use two phospholipases, PlcA and PlcB, and a pore-forming toxin called listeriolysin O (LLO) to help them to exit the internalisation vacuole (Adhikari et al. 2023). These enzymes cause the vacuolar membrane's structure to change, which makes it easier for *L. monocytogenes* to move into the cytoplasm of the cell. In the pathogenesis at the cellular level, this stage is crucial. The bacterium initiates a variety of metabolic pathways in this intracellular milieu to aid in its development and multiplication. The bacteria use several strategies to avoid the innate cytoplasmic immune responses. Among these is the induction of actin polymerisation via the bacterial surface protein ActA, which allows *L. monocytogenes* to spread to nearby cells. Recent studies have suggested that the bacteria can become persistent inside the vacuoles. The prolonged phase of incubation of the illness and the restricted efficacy of antimicrobials in treating it may be explained by this latent infection. Moreover, these enduring vacuolar forms may make regular microbiological identification of the bacteria more challenging (Lepe 2020).

4. INCIDENCE

According to reports, there are between 0.1 and 1 percent cases of listeriosis per 100,000 people per year. *L. monocytogenes* is responsible for 17 and 19 per cent of the recognised reasons for foodborne disease-related mortality in the United States of America and France as well, despite listeriosis being

more uncommon than other foodborne infections. Listeriosis may not be diagnosed as often as it should since it was not considered an infectious disease in the United States until 2000. The number of cases of listeriosis recorded each year has gone up in a number of European countries in recent years. This increase may be the result of a rise in the population of people over age 60 or those under 60 who have a predisposing immunocompromised state. There were 782 instances of listeriosis recorded in a report from 20 countries in 1991. It revealed that 43% of the infections were associated with pregnancy, 29% with septicemia, 24% with infections of the central nervous system (CNS), and 4% with unusual types of illnesses (Hernandez-Milian and Payeras-Cifre 2014).

5. OVERVIEW OF LISTERIOSIS PREVALENCE WORLDWIDE

According to estimates from the World Health Organization (WHO), 600 million individuals acquire foodborne illnesses each year. Foodborne diseases have a negative impact on the nation's economy, trade, and tourism, as well as the healthcare system and socioeconomic development. Globally, foodborne gastroenteritis cases are frequently linked to certain foodborne organisms, including Vibrio spp., Listeria spp., and Salmonella spp. Listeriosis is recognised to be caused by *L. monocytogenes*, and particular dietary sources are rarely found in its infrequent instances. A cluster is created when there are three or more cases of listeriosis with the same pullover strain during a given time frame. When a source strain produces larger-than-expected groups of patients at a particular time and location, it's referred to as an epidemic. Due to the prolonged and variable incubation period of listeriosis (3 to 70 days), which can cause recall bias and make it difficult to determine an appropriate exposure period for food histories, it is difficult to investigate the cause of an outbreak. Additionally, it will be difficult to identify foods that are rapidly spreading and not usually known to be an origin of human contamination (Letchumanan et al. 2018).

Foods that have not been cooked can have the contamination of Listeria. Under normal circumstances, listeria infections result in diarrhoea and other digestive issues; in 20% of cases, they are fatal. Listeria contamination in this study was notably lower than that of other pathogens under investigation. Previous reports have indicated comparable results (de Silva et al. 2013). Nonetheless, a number of studies have revealed a greater frequency in samples of fresh food items such as cheese sprouts (Samad et al. 2018). The first case of listeriosis in humans was documented in Pakistan, where the incidence rate was 1.66%. In Pakistan, the percentage of cow's milk containing *L. monocytogenes* ranged from 2.25 to 6%. Previous research in the South Asian region has revealed that tainted milk serves as a conduit for the spread of *L. monocytogenes*. Globally, the occurrence of *L. monocytogenes* in cow's milk samples was stated 5.3%, 4%, 1.66%, and 7.5% (Yakubu et al. 2012; Nayak et al. 2015; Dalzini et al. 2016); (Obaidat and Stringer 2019). The majority of cow's milk consumers in Pakistan are susceptible to *L. monocytogenes*. Pakistan and especially Punjab, has inadequate information about the risks of cow's milk. According to this study, 3.43% of cow's milk contains *L. monocytogenes* (Munir et al. 2022).

Over the years, there have been several listeriosis outbreaks reported globally. In 2018, South Africa experienced the world's worst epidemic of *L. monocytogenes*, with 937 reported cases and 193 fatalities caused by mortadella intake (Thomas et al. 2020). A total of 59 patients were examined in 2020 after outbreaks of listeriosis were documented in the United States. Soft cheese (11 illnesses, one fatality), meats including Prosciutto, mortadella and salami (12 illnesses, one fatality), and enoki mushrooms (36 infections, four deaths) have been associated with these outbreaks. Every product connected to the epidemic was withdrawn (CDC 2021). There is no official evidence of *L. monocytogenes* contamination in foodborne illness cases in Brazil. However, specific investigations have found the microbe in various Brazilian foods (Barancelli et al. 2011; Camargo et al. 2017; Maistro et al. 2012; Oliveira et al. 2018).

6. RISK FACTORS OF LISTERIOSIS

Listeriosis is a dangerous condition that can be treated and prevented. Those who are elderly, pregnant, or have damaged immune systems, such as those with HIV, cancer, kidney transplants, or steroid therapy, are more likely to develop severe listeriosis and are advised to stay clear of high-risk foods. Soft cheeses, cold-smoked fishery products, deli meat, and ready-to-eat meat products such as fermented meats and sausages are examples of high-risk foods. In nature, *L. monocytogenes* is found in enormous amounts. They can contaminate food and are present in soil, water, plants, and some animal excrement. The bacteria *L. monocytogenes* is the source of the infectious disease listeriosis. One of the most dangerous and severe foodborne illnesses is foodborne listeriosis. *L. monocytogenes* is the bacterium that causes it. With 0.1 to 10 percent cases per 1 million individuals annually, based on the countries and areas of the world, it is a relatively rare illness. Despite the low number of occurrences, listeriosis is a serious public health concern due to the high fatality rate linked to this condition.

In contrast to numerous other prevalent bacteria that cause foodborne illnesses*, L. monocytogenes* can endure and proliferate at low temperatures, often seen in refrigerators. The primary mode of infection is eating contaminated food that contains a high concentration of *L. monocytogenes*. Human-to-human condition is also possible, most notably from pregnant women to unborn children.

In the natural world, *L. monocytogenes* can be originated in soil, water, and the digestive tracts of animals. When manure is used as fertiliser or in the ground, vegetables might become polluted. Additionally, during preparation, germs can infect ready-to-eat food, and during distribution and storage, those bacteria can grow to deadly proportions.

Foods that are most frequently linked to listeriosis include:

- Foods that keep well under refrigeration (If given adequate time and refrigerated temperatures, *L. monocytogenes* can multiply in food) and have a long shelf life.
- Foods that are eaten raw, without being cooked or subjected to other treatments that would destroy *L. monocytogenes.*

Meat products that are ready to consume, such as smoked salmon, meat spread, frankfurters, and fermented raw meat sausages, were among the foods linked to previous outbreaks. There were also prepared salads like bean sprouts and coleslaw, fresh fruits and vegetables, and dairy goods like soft cheeses, unpasteurized milk, and ice cream (WHO 2018).

7. LABORATORY DATA

Public health researchers used the Pulse Net system to determine which illnesses were linked to this outbreak. CDC Pulse Net maintains a nationwide database of the DNA fingerprints of the microbes that cause food-borne diseases. In bacteria, whole genome sequencing (WGS) is used to achieve DNA fingerprinting. WGS demonstrated the tight genetic relatedness of bacteria found in samples from sick individuals. This implies that the same food may have caused the outbreak's sufferers' illnesses (CDC 2023).

8. HEALTH RISKS AND CHALLENGES

L. monocytogenes is the primary pathogen that causes disease in people, while *L. ivanovii* is a rare bacterium that causes disease in animals—both the genus Listeria and its subtypes cause infections in humans. The majority of the time, food contamination by microorganisms is the cause of listeria disease. The majority of the time, the illness that causes frequent, liquid-like bowel movements, fever, persistent headache discomfort, and muscle soreness are minor symptoms. In humans and animals, severe signs of listeriosis include blood poisoning, inflammation of the brain's membranes and surrounding cerebral

tissue and miscarriage. The most vulnerable are immunocompromised individuals, expectant mothers and newborns. Listeriosis has been associated with consuming a wide variety of foods such as meat and fish products and food that has already been cooked and doesn't require cooking (Zahra et al. 2020).
Because of its widespread distribution and capacity for adhesion, *L. monocytogenes* can endure in the food processing industry. Persistent strains of this bacterium, once adhered to, have the ability to form biofilms, contaminate food goods, and exhibit far more resistance to sanitising agents, including benzalkonium chloride, anionic acid and hypochlorite sanitiser than sporadic strains. Additionally, it has been reported that certain strains of *L. monocytogenes* are resistant to common antimicrobial agents like clindamycin, penicillin, and tetracycline. The presence of this resistance in food poses a threat to public health and results in significant financial losses because contaminated products must be removed from the market, and industry operations must be suspended until the contamination is resolved. The sale of implicated products is declining as a result of the erosion of consumer trust (Dos Santos et al. 2021).

9. MICROBIOLOGICAL DIAGNOSIS

The medical diagnosis of *L. monocytogenes* infection is able to be determined by microbiological investigations despite the fact that it can be clinically identified. When *L. monocytogenes* is isolated from a sample that should be sterile, such as blood, cerebrospinal fluid (CSF) or less commonly peritoneal, pericardial, pleural and articular fluid, etc, it indicates an invasive infection. Sample isolating from faeces is not recommended or regarded as an invasive illness criterion unless it is needed for epidemiological reasons. A microbiological diagnosis is mainly made using standard methods of staining and cultivating cultures. Some components of the diagnosis, meanwhile, are still up for debate. In instances with suspected neurolisteriosis, a recent study found that the susceptibility of Gram-staining in cerebrospinal fluid is low; in CSF, 83% of cases had positive results, whereas 64% of patients had positive results in blood culture. These issues can be avoided because *L. monocytogenes* is currently included in the molecular system for the syndromic examination of meningitis, which increases sensitivity and shortens the time required to identify bacteria. Diagnosing illness in expectant mothers and newborns is crucial as well since cultures in these cases may be unusable because of antibiotic use throughout the peripartum period. Additional samples, such as the amniotic fluid, newborn tracheal aspirate and placenta, may also need to be studied during the initial 48 hours following delivery, even though the clinical recommendation for the assessment of early-onset blood infection in newborn don't specifically address or recommend using these samples in comparable clinical scenarios (Lepe 2020).

10. CONTROL MEASURES AND TREATMENT

Because *L. monocytogenes* has been shown to remain along the cheese food chain, from the farm to the fork, its removal from cheese is crucial (Lahou and Uyttendaele 2017). This is why various tactics to regulate and lessen the pathogen's prevalence in food are presently being researched (Tumbarski et al. 2018). In Spain, conventional, outstanding quality soft-ripened cheeses made with unprocessed milk present a more severe and complex battle against the presence of this hazard due to the fact that they are manufactured under Protected Designations of Origin (PDO). One example of such a cheese is "Torta del Casar," a traditional cheese made in Extremadura, an area in the southwest of the country, in compliance with Regulation (CE) 1491/2003 of the European Commission. The inclusion of materials or microbes that are not part of the product itself is typically prohibited under P.D.O. laws.
The hazards related to the abundance of *L. monocytogenes* in traditional foods have been controlled and minimised through the widespread use of conventional preservation procedures such as salting, drying, severe heat treatments, chemical preservation and acidification (Amit et al. 2017; Jan et al. 2017). New

methods of conservation, such as pulsed electric fields, innovative packaging, high hydrostatic pressure and biopreservation, have begun to replace them gradually. The technique of bio-preservation has minimal impact on the organoleptic and sensory qualities of cheeses; it has been deemed an excellent alternative to other methods or procedures for enhancing the safety of food and increasing its shelf life.

Biopreservation is defined as the utilisation of harmless natural entities or controlled conditions, along with their metabolites. Consumers today avoid foods that contain chemical additives and instead seek better options created with natural or little refined ingredients. Therefore, bio-preservation could guarantee that customers' expectations are met.

Conversely, current research indicates that natural food safety additives could include antimicrobial peptides produced by employing gastrointestinal enzymes to hydrolyse milk proteins. The proliferation of both pathogenic bacteria and non-pathogenic bacteria has been demonstrated to be strongly controlled by these peptides or even inhibited (Martín et al. 2022).

However, the quantity of food-originating *L. monocytogenes* strains that are resistant to antibiotics has grown over time. According to some research, the widespread use of growth boosters in animal growth, human and veterinary medicine, and agriculture is to blame for the establishment of resistant strains (Sakaridis et al. 2011; Wang et al. 2013; Sugiri et al. 2014; Oliveira et al. 2018; Teixeira et al. 2020).

Antibiotic therapy is the mainstay of treatment for listeriosis because of its high death rate. For patients allergic to penicillin, tetracycline sulfamethoxazole-trimethoprim and gentamicin are used as second-choice or alternative therapy. The first line of treatment is the use of β-lactam antibiotics, such as penicillin G and ampicillin. The majority of medications used to treat Gram-positive bacteria, including erythromycin, gentamicin, and clindamycin, are effective against isolates of *L. monocytogenes* (Haubert et al. 2016; Rugna et al. 2021).

11. CONCLUSION

Listeria monocytogenes remains a significant public health threat, causing the severe illness of listeriosis. Despite its classification as a rare disorder, recent outbreaks and the escalating number of cases in Europe emphasize the urgency of addressing this pathogen. Listeriosis stands out as the sixth most prevalent zoonotic disease in Europe, marked by a high death rate and severe clinical indicators, particularly affecting vulnerable populations. The adaptability of *L. monocytogenes* to diverse environmental conditions, especially in food processing and agricultural areas, underscores its persistence and spread. Government regulatory efforts have been implemented to analyze dangers at critical control points in the food industry, yet challenges persist in determining minimum infectious dosages and addressing variability in virulence among different strains. The transmission of listeriosis involves contaminated soil, asymptomatic animals, and various food sources. The pathophysiology primarily targets the gastrointestinal tract, with subsequent organ involvement. Globally, the incidence of listeriosis varies, with an increasing trend possibly linked to demographic changes. Antibiotic therapy remains the mainstay of listeriosis treatment, though antibiotic-resistant strains pose a growing concern. The complex nature of *L. monocytogenes* necessitates ongoing research and comprehensive strategies in food safety, regulatory practices, and medical interventions to mitigate its impact on public health. As we mark the one-year anniversary of this exploration, continued vigilance and research are imperative to address the evolving challenges posed by *L. monocytogenes* and protect susceptible populations from the severe consequences of listeriosis.

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