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PREVALENCE OF LISTERIA MONOCYTOGENES AS A PUBLIC HEALTH PROBLEM

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SUMMARY
Listeria monocytogenes is a bacterium widespread across the world and presents one of the most common foodborne pathogens. Listeriosis is a serious infection caused by eating food contaminated with the bacterium *L. Monocytogenes.* Among foodborne zoonoses, listeriosis emerges as an illness most frequently resulting in death. This disease most commonly affects children, pregnant women and people with a weakened immune system. The infection is most commonly transferred by contaminated food, insufficiently pasteurized milk, soft cheeses, fermented sausages, raw vegetables and rarely directly from infected animals. Considering all the above-mentioned, *Listeria monocytogenes* is of great importance for public health since it can seriously affect human health. Diseases caused by contaminated food are a significant public health problem. The greatest risk for food contamination is a bad hygiene practice when handling food during food production as well as a possibility for pathogens to grow to the cooling temperature. Once *L. monocytogenes* is brought into a production facility, it can survive and live for a long time under adverse conditions.

KEYWORDS: Listeria monocytogenes; Food; Health; Persistence.

INTRODUCTION

Foodborne microorganisms are a constant threat to human health all over the world. *Listeria monocytogenes* is one of the most common foodborne pathogens and poultry meat and products are major carriers of *L. Monocytogenes* pathogen types. Listeriosis is a disease caused by eating food contaminated with *L. Monocytogenes* and it is very important for public health, considering the fact that it can seriously affect human health.[1] Among foodborne zoonoses, listeriosis emerges as an illness most frequently resulting in death. This disease most commonly affects children, pregnant women and people with a weakened immune system. The infection is most commonly transferred by contaminated food, insufficiently pasteurized milk, soft cheeses, fermented sausages, raw vegetables and rarely directly from infected animals.[2] There are two main types of listeriosis, which differ in intensity, symptoms and incubation period and we differentiate several clinical syndromes. The symptoms of the illness differ and most commonly they include mild symptoms similar to cold or flu accompanied by sore muscles, fever, diarrhea and vomiting. Very often, due to unrecognized, but also nonspecific symptoms, meningitis, encephalitis, septicemia and miscarriage in pregnant women can occur. A successful treatment of listeriosis depends on how fast it is accurately diagnosed as well as the beginning of the proper treatment itself.[3]

Listeriosis can cause mild illnesses, but serious ones as well, considering that *L. monocytogenes* can have mortality rate up to 30%, which is very dangerous especially for the high-risk groups. As the demand for ready-made food increases, the danger of *L. monocytogenes* for public health and food industry increases as well. Besides the fact that it represents a threat to public health, *L. monocytogenes* also represents a high economic burden for food industry in terms of analysis expenses and a potential product recall.[4]

L. monocytogenes is widespread in the environment and it is considered as one of the most resistant sporogenic bacteria. It grows in a wide temperature range from 4°C to 45 °C and it is resistant to different adverse growth and development conditions.[5] The greatest risk for food contamination is a bad hygiene practice when handling food during food production as well as a possibility for pathogens to grow to the cooling temperature. Once *L. monocytogenes* is brought into a production facility, it can survive and live for a long time under adverse conditions (1). In food industry, *L. monocytogenes* can create a biofilm which can act as a potential source of contamination.[6] Identifying the pathogenic potential of

L. monocytogenes is very important for food safety and public health.[7]

Prevalence of *Listeria monocytogenes* in food

Illnesses caused by contaminated food today represent an important public health problem, thus, it is important to determine the prevalence of *Listeria monocytogenes* in different food products. By exploring the significance of *L. monocytogenes* as a foodborne pathogen in different food samples in Egypt in 2016, Reda, et al. concluded that the isolation rate of *L. monocytogenes* in a beef burger was 8%, minced meat 4%, raw milk 8%, while sausage samples were negative.[8] Kramarenko, et al. (Estonia, 2013) got similar results on the prevalence of this pathogen. They examined 21,574 food samples where the results showed that in total 554 (2.6%) samples were positive to *L. monocytogenes*. This research also states that the most commonly contaminated products were raw meat (18.7%), mixed salads (18.5%) and raw milk (18.1%), and smoked fish among ready-made food products.[9] Research conducted in 2010 in Malesia also showed the prevalence of this pathogen in examined vegetable samples, namely in Japanese parsley (31.3%) and Yardlong beans (27.2).[10]

A research conducted by Lambertz, et al. (Sweden, 2010) also showed presence of *L. monocytogenes* in food, such as cheese (0.4% out of 525 samples), meat products (1.2% out of 507 samples) and fish (12% out of 558 samples), and the percentage of smoked fish positive to *L. monocytogenes* was 8%.[11] A great prevalence of this pathogen in meat and meat products was confirmed by a research conducted in China in 2019, where 362 (29.9%) samples out of 1212 samples of meat and meat products were positive.[12]

Awareness on the occurrence and prevalence of *L. monocytogenes* and other types of *Listerias* is very limited in both veterinarian and public health sectors in Ethiopia, so Simon, et al. in 2011 explored the prevalence of *L. monocytogenes* and other types of *Listerias* in animal source foods, such as fresh cheese, raw beef, raw milk and eggs. In this case the research showed a great prevalence of *L. monocytogenes* in animal source foods in Ethiopia, where *L. monocytogenes* was identified in 5.4% out of the analyzed samples, including raw milk (13%), eggs (4.3%), then raw beef (2.6%) and fresh cheese (1%).[13] A study by Elmali, et al. in 2015 in Turkey aimed at isolating *L. monocytogenes* in chicken meat samples. The results showed the presence of *Listeria spp*. in 57 (47.5%) out of 120 samples and *L. monocytogenes* was identified in 54 samples. Great prevalence of *L. monocytogenes* in poultry meat samples can represent a risk to human health.[14] A similar research was conducted in Malesia in 2012, where the results also showed the presence of *L. monocytogenes* in 20% out of chicken meat samples.[15] A research conducted in Jordan in 2011 proved the prevalence of *L. monocytogenes* in ready-made chicken products.[16]

The Significance of *Listeria Monocytogenes* for Public Health

Listeria monocytogenes is considered one of the most significant foodborne pathogens. It is easily found on surfaces, especially as a biofilm and in such a state it can survive longer in food production facilities because they become resistant to cleaning processes and can cause food contamination during production, and thus represent a threat to public health. Autrori Bonsaglia, et al in 2014 showed that *L. monocytogenes* can form a biofilm on different surfaces regardless of temperature, but the surface composition can be an important factor for a faster development of the biofilm.[17]

Research from Australia and the USA showed that age groups above 60 are more often susceptible to listeriosis. Animal source food, including milk, meat and meat products are major sources of infection. In the USA, it is estimated that the annual expenses due to *L. monocytogenes* are 2.3-22 billion dollars and the annual benefit from food safety measures is 0.01-2.4 billion dollars.[18]

Dhama, et al. in a research on the significance of listeriosis for public health from 2015 state that unhygienic practice when handling food, contaminated water, insects and contaminated food materials are very significant in spreading listeriosis. Furthermore, they concluded that adequate thermal treatment of food is of great importance in preventing infection.[19]

The authors state that most of the listeriosis cases are caused by eating ready-made products contaminated with high concentrations of *L. monocytogenes*. Although strategies for preventing growth of *L. monocytogenes* in ready-made products are crucial for reducing incidences of listeriosis, contamination control of the environment in ready-made meat products and processed meat products is an important component of a comprehensive control program. A complete elimination of *L. monocytogenes* is a challenge because this pathogen is common in different surroundings outside of food processing facilities and can survive for years in food processing facilities.[20]

Many studies have shown that meat products sliced in retail stores often have a higher level of bacterial contamination compared to products prepared in meat delicacies plants. Lack of appropriate equipment and inadequate hygienic practice can cause a greater resistance of *L. monocytogenes* and cross-contamination to other food products.[21] The authors state that despite the low incidence, listeriosis remains a great public health problem due to high mortality rate. Several studies have shown that ready-made food is actually one of the biggest sources of infection. In order to ensure safety of such products, a special attention should be paid to many factors in different phases of the production chain.[22]

CONCLUSION

Based on review of scientific publications, we can conclude that due to its widespread presence and resistance to different adverse growth and development conditions, the bacterium *L. monocytogenes* has been representing a public health problem for many years and it is especially concerning for high-risk population groups. *Listeria monocytogenes* is most commonly present in meat and meat products, milk and dairy products. High prevalence rate of *L. monocytogenes* in the said samples represents a great public health risk. The presence of *L. monocytogenes* in food is contributed to unclean working environment and improper food handling. Due to the above mentioned, it is necessary to improve control over *L. monocytogenes* and conduct good hygiene and production practices.

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