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Listeriosis, an Emerging Food-Borne Disease in India

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Opinion

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Listeriosis is a food-borne disease, caused by *Listeria monocytogenes*. Like many organism *L. monocytogenes* is seen in soil, water, sewage, animal & human feces, and even manures. Human body gets inflicted with the pathogen via consumption of food, contaminated by *L. monocytogenes*. In the genus, Listeria, there are about 10 species, where in *L. monocytogenes*, *L. ivanovii* & *L. grayii* alone are pathogenic; of them *L. monocytogenes* is highly pathogenic to human [1]. The pathogen possesses some important features which allow them to grow in food at high salt concentration, low pH (acidic foods) and low temperature (refrigerated condition) [2]. Infection with the pathogen, during pregnancy causes either abortion or stillbirth depending upon the time of infection [3]. Another important aspect of the pathogen is they escape from phagocytosis.

WHO WILL GET LISTERIOSIS?

Listeriosis affects individuals whose immune system is weak. The disease also affects healthy people when huge amount of pathogen has been ingested through food contamination. Normally our immune system becomes weak during the period of continuous fasting coupled with poor food habits; menstrual cycle, pregnancy time, malnourishment, stress (both physical and mental stress), exposure to UV-rays (spending time outside under hot sun) and insufficient sleep with poor diet are major factors affecting the immune system. People with chronic disease conditions like AIDS/HIV, cancer, kidney problem are at the risk of getting Listeriosis. Aged persons are highly vulnerable for Listeriosis because their immune condition is weakened due to ageing [4]. Additionally, pathogen load in the food at the time of consumption also plays significant role in the disease development. Most invasive infections (95%) are characterized by sepsis or meningoencephalitis.

SYMPTOMS OF LISTERIOSIS

Symptoms of Listeriosis may vary from person to person and may occur within 24 hours of infection or sometimes it may take 20 to 25 days [5]. Symptoms include fever, chill, nausea, headache, muscle pain, stiff neck, diarrhea, prostration (energy deprived state) and shock. Compared to healthy individual, in people with weaker immune system, symptom is manifested in severe form. In the absence of early diagnosis and treatment, death may occur due to any one of these such as meningo-encephalitis/brain stem encephalitis/brain abscess/bacteraemia (bacteria in the blood). In pregnant women, the infection develops fever, diarrhea, miscarriage, and stillbirth. Carrying women usually infected with listeria in the last 3 months of pregnancy, but is often asymptomatic, or has mild fever [6]. Even neonates (newborn up to 4 weeks) are very vulnerable to the pathogen and they may get sepsis, and pneumonia. Death rate among the infected individuals is 20-30 per cent; i.e. almost one in three infections will be of fatal. Regarding the disease incidence at global level, 0.1 to 11.3 cases per million populations have been reported [7]. In India due to less awareness about the pathogen, many incidences are misdiagnosed or not documented. Many scientific reports are available on Listeriosis in animals as well as listerial infection in the uterus of pregnant women whereas very few studies have been conducted regarding Listeriosis in human, as food borne pathogen.

FOODS THAT ARE FREQUENTLY CONTAMINATED BY *L. monocytogenes*

Nature of food, food processing, water activity ($a_w < 0.92$, regardless of pH), duration of refrigeration and initial load of *L. monocytogenes* (> 100 CFU/g of food) in food, at the time of packing are the major factors, governing contamination of food by *Listeria monocytogenes*. Mostly raw milk, Ready To Eat (RTEs) foods (hot dogs, baked non vegetarian items, ice-creams) dairy products, meat and other non vegetarian items, fruit juices having pH more than 4.5 (added with milk, vegetable (Coriander, Cabbage, Knool Khol, Cauliflower and sprouted grains) and fruit salads (all vegetables and less acidic fruits pH above 4.4) are frequently contaminated with *L. monocytogenes*. Because not all foods are treated through listericidal process (heat treatment, High-pressure treatment, adding preservatives) to eliminate the pathogen.

SOURCES OF CONTAMINATION

Lack of good manufacturing processes may be the main source of contamination. Which include improper handling of foods (inadequate washing, and sterilization) unhygienic habits of food handler, and inadequate storage system, and poor environmental sanitation around the units. Additionally when such contaminated food items are purchased, refrigeration of the foods adds extra hazard because *Listeria monocytogenes* can multiply even during refrigeration. Similarly at home, refrigerated foods are not heat-treated up to the boiling point of 100°C . Many people believe in keeping meat and dairy products in the fridge would prevent microbial contamination. Milking without cleaning the udder of the animal, not washing the milk can thoroughly, and consuming refrigerated foods without reheating it to boiling temperature are some of the major factors, contributing for food contamination by *L. monocytogenes*.

IS LISTERIOSIS, A GLOBAL ISSUE?

Recently, the organism *L. monocytogenes* has been listed by the US Centre for Disease Control, as the second deadliest food borne microbe next to *Salmonella*. The U.S has announced 'zero tolerance' policy for *L. monocytogenes* in ready-to-eat (RTE) foods, as it can grow at temperatures as low as 1°C [8]. Through 'Food Net' the U.S government is collecting food-poisoning episodes, including Listeriosis and the associated food item caused the incident. Australia New Zealand Food Standards Code-standard 1.6.1 prescribes microbiological limits for food (applicable for food imported from other regions also) and it has been recently amended in 2015, February. Whereas in India, unlike other food-borne diseases (*Bacillus sp*, *Salmonella sp*) the disease is given only little attention; the reason may be due to lack of awareness on the pathogen and symptoms; misdiagnosis of Listeriosis, as common flue.

In developing and under developed countries, awareness level on the disease is very low even among the physicians. Many illnesses are considered as flue or meningitis. More importantly such incidences are not being properly documented by the health authorities. This may be the reason for less number of Listeriosis incidences, reported in India.

WHY LISTERIOSIS SHOULD BE TREATED AS SERIOUS EMERGING FOOD-BORNE DISEASE IN INDIA?

People living in the present era cannot avoid eating ready-to-eat food items and therefore risk of acquiring Listeriosis is highly unavoidable. Additionally, in many states power cut is becoming weekly or daily event particularly during summer. In the above prevailing situation, continuous refrigeration of food articles under prescribed temperature is practically impossible. Dairy products, meat and fishery products are having more chances for being contaminated by the pathogen. In our earlier study, conducted at Tiruchirappalli, Tamil Nadu, India we found that Milk and milk products sold in the city were not up to the satisfactory level, particularly the local milks, and flavored milks. Sacred milk given in temples were having the pathogen and therefore not safe for consumption by the children, old age people and pregnant women Among the meat items beef and pork were having *Listeria monocytogenes*. In vegetable and fruit items, pathogen was detected in larger number in cabbage, coriander, broccoli, cantaloupe, watermelon and apple.

It is therefore essential for the country to collect evidences for incidence of Listeriosis. Additionally the pathogen should be included in the list of food borne pathogens. Government should tighten food standard to safeguard the vulnerable groups such as pregnant women, elderly people, and patients with chronic illness.

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