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Editorial Open Access

Yersinia enterocolita as an Important Pathogen of Food Safety Concern

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Editorial

Foodborne diseases of microbial origin have been documented as an important public health and economic issues, as these accounts for 20 million cases in the world each year. In developed nations, about one third of the people are affected due to microbial foodborne diseases. These infections pose a serious threat, particularly to the infants, children, elderly, pregnant women, and immunocompromised persons. The last decades have shown the emergence of many foodborne bacteria, such as *Aeromonas hydrophila*, *Arcobacter butzelri*, *A. cryaerophilus*, *A. skirrowii*, *Plesiomonas shigelloides*, *Camylobcater jejuni*, *Cronobacter sakazakii*, *Escherichia coli*: 0157:H7, *Yersinia enterocolitica*, *Clostridium difficile*, *Listeria monocytogenes*, *Vibrio vulnificus*, *V. parahaemolytica*, *Helicobacter pullorum*, and *Edwardsiella tarda*, which are important from food safety point. Microbial food safety is a growing public health concern in industrialized as well as developing nations of the world. It gives assurance to the consumer that food is safe, and will not cause any infection following ingestion. Among many foodborne microbes, *Yersinia enterocolitica* is an emerging versatile foodborne zoonotic pathogen, which causes morbidity and mortality, particularly in infants and young children. The concept of the genus *Yersinia* was established by Van Loghem in 1944 but the Genus name *Yersinia* was proposed in the honor of Alexandre Yersin, the discoverer of the plague organism. It is a Gram negative, small rod shaped, coccobacillus, facultative organism, which is motile at 22°C, and produces acid from maltose and sucrose. The organism is susceptible to chlorine but resistance to cold temperature, and common antibiotics, such as penicillin. *Yersinia enterocolitica* has a wide temperature range as it can grow from -2 to 42°C. The pathogen is isolated from a wide variety of foods such as raw milk, pasteurized milk, chocolate milk, butter milk, pork, beef, poultry meat, fish, shrimp, oysters, mussels, blue crab, carrot, cabbage, celery, lettuce, and stewed mushrooms. The presence of *Y. enterocolitica* in pasteurized milk indicates poor hygiene in milk plant, The organism is widely prevalent in environment, and is recovered from soil, water, sewage, sludge, fish tank, humans, and animals including birds. The organism is primarily transmitted through faecal-oral route by ingestion of contaminated food/water. Infection can also be acquired by direct contact of pig farmers, and slaughterhouse workers with animals. Human to human transmission is observed in nosocomial outbreak. Cross contamination of pork can occur *via* air, equipment, and food handlers in abattoirs, retails shops, and home kitchens. The incubation period of disease is usually 3 to 7 days. The symptoms depend on the age of the affected individual. The main clinical manifestations of infection in humans include fever, diarrhoea, and abdominal cramp. The other symptoms are headache, vomiting, dehydration, malaise, septicaemia, ileitis, mesenteric lymphadenitis, pesudoappendicitis, uveitis, mycarditis, glomerulonephritis, sore throat, pharyngitis, rigor, arthritis, cellulitis, sepsis, and erythema nodosum. The bloody diarrhoea has been reported in about one fourth of the cases. The abdominal pain may sometimes mimic appendicitis. The epidemiology of yersiniosis is not well defined. Due to underreporting, the exact data on global burden of disease is not easily available. Disease mainly occurs in sporadic form, however, outbreaks are also recorded from Bangladesh, Japan, India, Iraq, and Netherlands. *Yersinia enetrocolitica* infection is responsible for 87,000 cases of gastroenteritis in USA annually. A plethora of foods, such as milk and milk products, meat and meat products, sea-foods, vegetables etc., are implicated as source of infection to humans. Pig act as an important reservoir of *Y. enterocolitica* infection in humans. However, the bacterium is also isolated from other animal species, such as cattle, cat, dog, goat, sheep, buffalo, deer, horse, fox, monkey, mice, squirrel, chinchilla, hare, guinea pig, poultry, and wild birds. The role of these animals in the transmission dynamic of *Y. enterocolitica* needs to be established. The pig farmers, abattoir workers, and pig handlers are at a greater risk of acquiring infection. Person to person transmission was observed in a familial outbreak of *Y. enterocolitica* in Japan. An outbreak of *Y. enterocolitica*, which involved 25 of 48 persons following the ingestion of buttermilk during a feast, was reported from Southern India. The epidemiological investigation suggested that contaminated water used to dilute buttermilk was the source of this outbreak. Incubation period was 7 to 49 h. Both sexes and all age groups (3 to 80 years) were affected. The prevalence of *Y. enterocolitica* infections in adults and children was reported 0.47% and 0.87%, respectively. Currently, more than 50 distinct serotypes of *Yersinia enterocolitica* are reported worldwide. The serotypes, such as 0:3, 0:5, 0:8 and 0:9 are most commonly implicated with human infections. In Australia, Canada, China, and Europe, the predominant serotype is 0:3 whereas serotype 0: 8 are frequently recovered from humans in Japan, and USA. Therefore, typing of *Y. enterocolitica* strains is important from epidemiological point of view.

The laboratory help is needed in order to confirm an unequivocal diagnosis of yersiniosis by employing microbiological (isolation on nutrient media), immunological (enzyme linked immunosorbent assay) and molecular techniques (polymerase chain reaction). The isolation of pathogen from stool, vomitus, throat swab, blood, or foods can be attempted on *Salmonella-Shigella* deoxycholate calcium chloride agar, MacConkey agar, and Cefsulodin-irgasan-novobiocin (CIN) agar. It is suggested to use cold enrichment in phosphate-buffered saline or in phosphate-buffered saline with sorbitol and bile salts for better recovery of organisms from clinical, food, and environmental samples. It is pertinent to mention that the isolation *Y. enterocolitica* is very noteworthy for confirmation and characterization.

As the infection is self-limited, no antibacterial antibiotics is advocated for treatment. However, in severe cases, tetracycline, chloramphenicol, kanamycin, and ciprofloxacin can be used to treat the patients. Pasteurization of milk, cooking of meat, protection of water from contamination, chlorination of water, use of clean water for

washing vegetables, removal of sick person from food establishment, sanitary disposal of animal excreta, maintenance of good hygiene in food processing plants keeping raw and processed food separately, and surveillance of food and water can certainly reduce the risk of foodborne yersiniosis. Health eructation must be imparted to the consumers, food preparers, and food handlers about the source of infection, mode of transmission, environmental sanitation, kitchen cleanliness, and personal hygiene. It recommended that all food processing plants should implement the good hygienic practice, good manufacturing practice, and hazard analysis critical control point from food safety point of view.

Yersinia enterocolitica being psychotropic organism plays a significant role in food chain of humans, and hence sincere attempts should be directed to prevent the contamination of food at all levels (farm to table). Emphasis is given on the development of simple and cost effective test, which can be easily afforded by poor resource nations of the world to detect *Y. enterocolitica* in foods and other samples. Further comprehensive and systematic studies are needed to elucidate the epidemiology of *Y. enterocolitica*, which has emerged as an important invasive enteropathogen of global concern from food safety point of view.