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The Thistle QA CEU No is: **MT00025**.

Each attendee should claim **THREE** CEU points for completing this Quality Control Journal Club exercise, and retain a copy of the relevant Thistle QA Participation Certificate as proof of registration on a Thistle QA EQA.

Cycle 23 Organism 8:

Salmonella enterica serotype typhimurium DT 104

Food-borne salmonella infections have become a major problem in the industrialized world. *Salmonella typhimurium* DT104 is the second most common Salmonella species isolated from humans, second only to Salmonella Enteritidis phage type 4.

The first report of epidemics caused by *Salmonella typhimurium* DT104 in livestock and humans came from Great Britain in 1984. In 1990, there were 259 cases of human disease caused by S.T.DT104. In 1996, there were 4006. S. t. DT104 is emerging as a foodborne pathogen, having been detected in many areas of the world. Antibiotic resistant organisms do not respect national boundaries.

Humans acquire infection primarily through consumption of contaminated animal food products. Multi-drug resistant *Salmonella typhimurium* DT104 can be found in a broad range of foodstuffs. Outbreaks have been linked to poultry, a variety of meats and meat products, and unpasteurized milk. Foods may be contaminated in different ways: meat by faeces during the slaughter process, animals with bacteria in its blood at the time of slaughter; milk by faeces during the milking process, or by mastitis in the milked cow.

In addition to acquiring infection from contaminated food, human cases have also occurred where individuals have had contact with infected cattle. A small proportion of cases may have contracted infection from pets such as cats and dogs, which can also be infected with this strain of Salmonella. Pets probably acquire the infection like humans, in other words through consumption of contaminated raw meat, poultry or poultry-derived products. Cats have been reported to shed *S. typhimurium* DT104 in faeces for twelve weeks or longer after recovery from an acute illness.

The persons most at risk of disease caused by *Salmonella typhimurium* DT104 are persons at the extremes of age; the young and the elderly. The very young have poorly developed microbial gut flora (which is protective in older children and adults) while the elderly may have waning immune systems or weak gastric acidity. Most cases are reported in children less than four years old. However, immuno-suppressed individuals are at increased risk of infection.

Food borne transmission of S. t. DT104 has been documented in several outbreaks. Suspected vehicles for transmission of the organism included roast beef, ham pork sausage, salami sticks, "cooked meats", chicken leg, and unpasteurized milk. Analyses of 786 samples of fresh and frozen sausages in England in 1994 demonstrated that 17% were contaminated with Salmonella spp., including S.t. DT104. This indicates that these bacteria are commonly present in some types of meats and pose a significant risk if such foods are not cooked and handled properly. Animals infected with S.t. DT104 have diarrhoea and can carry this organism up to several months after recovery.

Clinical signs of S.t. DT104 infection in humans may include diarrhoea, fever, headache, nausea, abdominal cramps, bloody stools, and vomiting. In some cases, particularly in the very young and in the elderly, dehydration can become severe and life threatening. A study in the UK reported severe illness including septicaemia, which resulted in hospitalization among 41% of the patients and death in 3% of them. The symptoms become evident 12 to 36 hours after ingestion of the contaminated food and usually last for about 5 days. The duration and severity of symptoms is dependent on host factors and the dose of the bacteria ingested.

S.t. DT104 is diagnosed by faecal testing. S. t. DT104 infection should be considered in any patient with moderate to severe gastroenteritis, especially if fever and headache are present. Diagnosis may also be made though a positive blood culture. Tests for identification of this organism include culturing for Salmonella, serotyping of Salmonella isolates to determine if they are typhimurium, phagetyping, and antibiograms to determine the pattern of antibiotic resistance.

S.t. DT104 infections in healthy persons are usually self-limited and management consists of supportive medical care (fluid and electrolyte replacement). Antibiotics are reserved for treatment of severely ill persons who have systemic (septicaemic) disease.

The common antibiotics used for treating Salmonella infections cannot be used for people infected with S.t. DT104 because this strain is resistant to five commonly used antibiotics (ampicillin, chloramphenicol, streptomycin, sulfonamides, and tetracycline). Fluoroquinolones are the drugs of first choice for bacteraemia and serious intestinal infection. However, recent reports have suggested increasing resistance of S.t. DT104 to fluoroquinolones (ciprofloxacin) related to the use of this antibiotic for the treatment of Salmonellosis in farm animals. This will pose further problems for treating this infection especially in patients with underlying health problems.

Although not all cases of S.t. DT104 infections are reported, and precise information on the incidence is not available, several countries have reported significant increases during the last several years. The clinical features associated with infection with S.t. DT104 may be more severe than other Salmonella infections. In a study in the United Kingdom of 83 cases of S.t. DT104 infection, 3% died, compared to a case-fatality rate for non-typhoid Salmonella infections of approximately 0.1%.

In the U.S., infections caused by multi-resistant strains of *S. t* DT104 were more likely to cause bacteraemia and were associated with longer hospitalization. In the UK, there was a ten-fold increase in the number of human cases caused by this multi-drug resistant strain over a six year period (1990-1996). There has also been an increase in the number of isolates with additional resistance to trimethoprim and ciprofloxacin. These strains have been associated with hospitalization rates twice that of other salmonella infections and with ten times higher case-fatality rates. In a report from British Columbia, Canada, it was shown that the highest incidence rate of case persons with *S.t.* DT104 was in the 1-4 year old age group.

CPD Questions:

1. Discuss the role of the immune system in people becoming infected with this organism.
 2. Why would there be "increasing resistance" by this organism to ciprofloxacin?
 3. Food borne infection is likely with this organism. What do the foods mentioned in this article have in common?
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