

IFST: Current Hot Topics



Salmonella typhimurium DT 104

The Institute of Food Science & Technology, through its Public Affairs and Technical & Legislative Committees, has authorised the following Information Statement, dated 11 November 1997, prepared by its Professional Food Microbiology Group:

SUMMARY

Salmonella typhimurium DT 104 is attracting attention from the public health authorities in the UK and the media because it is causing increasing numbers of cases of salmonellosis in man. Comminuted meat products are the main sources of foodborne infection, especially sausages and burgers. The organism is resistant to a wide range of anti-infectious agents and, as a result, the illness is more difficult to treat. A relatively high mortality (3%) is associated with infection by this organism, especially in the elderly.

Salmonella typhimurium DT 104 is primarily associated with cattle but it has spread to a range of food animals, including pigs, sheep and poultry. There are now often no effective antimicrobials for use in cases where a veterinary surgeon considers it necessary to treat a clinical infection by *Salmonella typhimurium DT 104*. We must anticipate that it may become more widespread in the environment and hence throughout the food chain. We must regard it as an 'emerging' pathogen and monitor the situation accordingly.

INCIDENCE OF FOODBORNE SALMONELLOSIS

The large increase in foodborne salmonellosis which was observed in England & Wales in the 1980s has levelled off to about 30,000 reported cases per year from 1990-1995. The most common salmonella involved is *Salmonella enteritidis*, followed by *Salmonella typhimurium*. However, whilst the overall incidence of human salmonellosis has apparently become constant, illness caused by *Salmonella typhimurium DT 104* is gradually increasing: in 1991 there were

about 500 reported cases and by 1996 there were 4006, i.e. 13% of all cases of salmonellosis.

THE ORGANISM

Salmonella typhimurium DT 104 is now the most commonly reported phage type of **Salmonella typhimurium** in England & Wales. Its unique feature is that it is resistant to many of the commonly used antibiotics including ampicillin, chloramphenicol, streptomycin, sulphonamides, and tetracyclines. Strains resistant to these substances (designated as R-type ACSSuT), accounts for 58% of all isolates of **Salmonella typhimurium** DT 104 whilst only 5% of **Salmonella typhimurium** DT 104 isolates are sensitive to all of the commonly used antibiotics. Indeed, some organisms are now appearing that are also resistant to trimethoprim and to quinolone antibiotics such as ciprofloxacin (known as R-types ACSSuTTm and ACSSuTCp). (Threlfall, Ward and Rowe, 1997)

Quinolones are used in humans for the treatment of salmonellosis, including enteric fever; they are also used for the treatment of salmonellosis in cattle, pigs and especially poultry and have been licensed for use in animals in the UK since late 1993. Prior to that date, resistance of **Salmonella typhimurium** DT 104 to this group of antibiotics was rare.

Apart from its multiple resistance to antibiotics, **Salmonella typhimurium** DT 104 has similar characteristics to other salmonellae and is no more resistant to food processing conditions such as acids, drying, preservatives or disinfectants than other serotypes. There is some evidence to suggest that it might be slightly more heat-resistant than many strains of salmonellae and this is a topic listed on the MAFF strategic research programme for 1997/8.

SOURCES IN THE FOOD CHAIN

Salmonella typhimurium DT 104 is primarily associated with cattle but it has spread to a range of food animals, especially pigs and chickens. In 1994, it accounted for nearly 60% of **Salmonella typhimurium** and 30% of all **Salmonella** incidents in cattle. As with many other salmonellae, **Salmonella typhimurium** DT 104 may infect animals without showing any signs of illness although cases of clinical disease are also reported. The antibiotic resistance has emerged as a result of widespread use of antibiotics and antimicrobials both prophylactically and therapeutically. The result is that the range of effective antibiotics that can be used on farms to control the spread of this pathogen is severely limited.

Salmonella typhimurium DT 104 appears to be spread from farm to farm by raw water and once a farm becomes contaminated with **Salmonella typhimurium** DT 104 it is very difficult to eradicate, primarily because it survives in dry as well as in wet environments. Dogs and cats are known to have acquired the infection (Wall et al, 1996) and we must expect that it will continue to spread throughout the environment.

FOODS INVOLVED

The organism has been found in UK beef, pork, chicken and cereals. It has also been found on one occasion in a supermarket's own brand of salami; a public recall was initiated and no illness was reported. Epidemiological studies have shown that burgers, sausages and sausage rolls have been associated with illness.

Until recently, there has been little information as to whether foods sourced from other EU countries or elsewhere are also becoming increasingly contaminated with antibiotic-resistant *Salmonella typhimurium* DT 104. However, recently-published US statistics have shown a dramatic increase in the proportion of multi-resistant isolates of all *Salmonella typhimurium* from 7% in 1990 to 28% in 1995, 83% of the latter being *Salmonella typhimurium* DT104 (Anon, 1997; Benson & Munro, 1997).

SURVEILLANCE AND CONTROL IN THE FOOD CHAIN

So far, MAFF does not appear to have taken any specific measures to stem the spread of infection by *Salmonella typhimurium* DT 104. However, the PHLS Communicable Disease Surveillance Centre (CDSC) and the PHLS Laboratory of Enteric Pathogens (LEP) are carrying out a national case control study of *Salmonella typhimurium* DT 104 infections that aims to identify the risk factors for human infections and the implicated food vehicles.

The worst scenario imaginable would be that the organism will become very widespread throughout the food chain and result in a huge increase in human salmonellosis, similar to the increase observed in the early 1990s when *Salmonella enteritidis* became endemic in poultry flocks. In the case of *Salmonella typhimurium* DT 104, such a situation would be very much more difficult to control because, whereas *Salmonella enteritidis* was confined to poultry and eggs almost exclusively, *Salmonella typhimurium* DT 104 already occurs more widely.

CONTROL IN FOOD FACTORIES

From our present knowledge, it seems that the methods used by food factories making comminuted meat products to control salmonellae and other infectious pathogens must be vigorously applied if we are to control this 'emerging' pathogen. This means:

- ensuring that suppliers of all raw meats operate effective GMP and HACCP programmes in order to control growth of the organism and prevent build up of contamination within the factory
- safe cooking and handling instructions on retail packs of raw products
- good food hygiene and safe cooking procedures in all catering services.

CONCLUSIONS

Clearly, this 'emerging' pathogen is becoming more widespread in the UK. Although human intestinal illnesses are not normally treated with antibiotics, when treatment is needed the illness caused by *Salmonella typhimurium* DT 104 is more difficult to treat than illness cause by other salmonellae and it also has a higher mortality rate. Its unusual antibiotic-resistance 'fingerprint' suggests that *Salmonella typhimurium* DT 104 infections will be far easier to trace to a branded food than other common *salmonella* serotypes. Microbiologists need to monitor the situation and advise the food and veterinary industries if further control measures are needed.

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