Staphylococcal food poisoning

The signs or symptoms of staphylococcal intoxication or food poisoning usually appear within 2-4 hours of consuming contaminated food. This short incubation period is because it is the absorption of pre-formed toxins that occurs, not the establishment and multiplication of a bacterial population in the gastrointestinal tract, which initiates the food poisoning.

Typical clinical signs indicative of Staphylococcus aureus food poisoning include nausea, vomiting and, less frequently, diarrhoea. Diarrhoea does not occur in the absence of vomiting. Sometimes, but not often, headache, dizziness, weakness and double vision are also reported by victims.

Staphylococcal food poisoning is self-limiting and rarely lasts for more than a day. Death is rare, but has been seen in cases involving the very young, the very old or those suffering from a debilitating disease. Clinical signs are age dependant. For example, in one large outbreak 89% of children aged 5-9 years old suffered vomiting, whereas for those aged 10-19 the figure was <65%.

The clinical signs of staphylococcal food poisoning are very similar to those seen in Bacillus cereus food poisoning because of the very similar style of the two aetiologies, that is, they are both toxin induced.

Human carriage of Staphylococcus aureus

There is a high carriage rate of Staphylococcus aureus by human beings and this is an important factor in why this particular bacterium is a cause of human food poisoning and why staphylococcal food poisoning is the only major type of food poisoning in which food handlers play an important role.

Staphylococcus aureus is a common skin bacterium and is found in large numbers in infected boils, spots and scratches. It is also present in the nose and throat. It should be stressed that human carriage is also common in perfectly healthy people.

Discharge from septic sores and cuts, as well as from the nose and mouth, are the route by which Staphylococcus aureus gets from man into human foods, whether directly or indirectly. Thus, the importance of waterproof dressings and food handlers not spitting or nose picking should be obvious.

Staphylococcus aureus in the environment

As well as man, other animals can carry Staphylococcus aureus including various pets and farm animals. However, it is the human strains of Staphylococcus aureus that most frequently produce enterotoxins.

Staphylococcus aureus is stress resistant and this favours its survival in the environment outside its animal hosts. It can be a long term pollutant of water and can colonise food processing plants and equipment. A good example of this is the feathering area and equipment in poultry processing plants.

Staphylococcus aureus in foods

It should be remembered that it is not the actual Staphylococcus bacterium in foods but the presence of the enterotoxin it forms which causes staphylococcal food poisoning. So, the significance of microbiological testing results must always be viewed with caution in that one can have relatively high levels of the bacterium present with no enterotoxin or high levels of enterotoxin in a reheated food in which the reheating has killed off the Staphylococcus aureus bacteria but not destroyed the heat resistant enterotoxin(s).

Staphylococcus aureus is often found in raw meats and, in low numbers, in milk. It is frequently found at low levels in cooked meats. Preparation of buffet meals well in advance of their consumption, coupled to their storage at room temperature, is an ideal scenario for creating a Staphylococcus aureus food poisoning outbreak as the failure to store the food properly favours rapid bacterial growth and enterotoxin production.

The preparation of some cooked meats involves a two stage process. The meat after the first cooking is an ideal substrate for rapid Staphylococcus aureus multiplication and enterotoxin production, the latter of which then survives the second cook and becomes the cause of a food poisoning outbreak. Warm holding is another process which favours the production of staphylococcal enterotoxins.

Staphylococcal food poisoning is also associated with bakery products containing cream or whipped cream as machines used for whipping cream are notoriously difficult to clean and products containing whipped cream are often stored at ambient temperatures or, worse still, are put on display in the sunshine! In recent years in the UK the number of Staphylococcus aureus related food poisonings has declined and this is thought to be related the increased use of refrigerated display cabinets.

Mechanism of pathogenicity

The clinical signs or symptoms of staphylococcal food poisoning are virtually 100% due to the ingestion of pre-formed enterotoxin.

Staphylococcus aureus enterotoxins are a mixed group of heat stable, water soluble proteins. These properties play a significant role in many outbreaks – the former enables them to survive the warming up or reheating of foods, whereas the latter aids their movement in the gastrointestinal contents and probably helps in facilitating their absorption into the victim’s body.

Seven different enterotoxins are produced and these are known as A, B, C1, C2, D, E and toxic shock toxin or TST. All of these, except the last, have been associated with food poisoning. The most common are enterotoxins A and D either acting alone or in combination. The staphylococcal enterotoxins do not act directly on the cells of the gastrointestinal tract but on the abdominal viscera following their absorption where they trigger off nerve impulses which go to and stimulate the vomiting centre in the brain.

Importance of temperature

The key temperatures for Staphylococcus aureus are:
- For bacterial growth: 7-47.8°C with an optimum of 37°C
- For enterotoxin production: 10-46°C with an optimum of 40 to 45°C

A recent case of staphylococcus food poisoning

Commercially catered buffet – Australia, June 2013
Some 22 individuals became ill after eating a commercially catered buffet dinner. All recalled eating fried rice which had been intended for lunch service earlier that day and 20 of the 22 reported eating chicken stir fry. The known epidemiology of staphylococcal food poisoning suggested a food contaminated by an infected food handler, which was then subject to temperature abuse, may have caused the outbreak.