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Another outbreak associated with sesame paste products

Just like the story on Enoki mushrooms last month, another troublesome product which simply refuses to go away and seems to be a staple of the Micro Bulletin is tahini, made from toasted ground sesame seeds.

New Zealand are the latest country to experience issues with this product with 3 cases of *Salmonella kintambo* being associated with the consumption of tahini imported from Syria.

In Europe, 121 people had been affected in outbreaks associated with tahini, halva (also made from sesame) and sesame paste since January 2019.

The illnesses in Germany, Sweden, Norway, Denmark, and the Netherlands have been caused by six different serotypes of *Salmonella*. The most common is *Salmonella havana* followed by *Salmonella mbandaka*, *Salmonella orion*, *Salmonella kintambo*, *Salmonella senftenberg*, and *Salmonella amsterdam*.

In the United States in 2013, 16 cases of salmonellosis were linked to consumption of tahini sesame paste imported from Turkey. Both *Salmonella montevideo* (4 cases) and *Salmonella mbandaka* (12 cases) were associated with this outbreak. Both outbreak strains were isolated from the product

So why does this product have such an association with *Salmonella*?

A study by the International Committee for the Microbiological Safety of Food (ICMSF) in 2000 identified key risk factors associated with the on-farm production of sesame seeds, which included the quality of the irrigation water, use of untreated manure as fertiliser and animal access to the crop. They found that plants may be dried unprotected in the open air and in some cases the product is left to dry directly on the ground. Risk factors associated with these practices include the cleanliness of the drying area and the presence of animals and birds that can shed or transmit *Salmonella* spp.

Sesame seeds used in sesame seed products undergo a roasting step that should be sufficient to inactivate *Salmonella* spp. However, contamination of sesame seed products can occur after the heat treatment step due to poor hygiene during the subsequent grinding, slicing, packaging, and transport of the seeds. The risk factors were further exacerbated by the presence of both a high lipid content and a low water activity in sesame seed products, which enables *Salmonella* spp. to survive in these matrices for long periods.

The ICMSF report concluded that sesame seeds and sesame seed products that are not further processed after roasting (for example retorting or cooking) have a significant potential to be contaminated with *Salmonella* spp.



French *E coli* 0157 outbreak caused by cucumbers

An *E coli* 0157 outbreak in France last year has been found to have been caused by imported Belgian cucumbers. Of the 35 cases which were identified, 29 were children from four schools, all of whom consumed a cucumber salad as part of a school meal. The same meal was also given to 5 elderly adults through a local home delivery program the following day. One case was the parent of a pupil. Two children were admitted to hospital with Haemolytic Uraemic Syndrome (HUS).

Shiga toxin-producing *E. coli* (STEC) O157 was isolated in stool samples for 8 patients including the 2 HUS cases, and in a sample of cucumber salad. Whole genomic sequencing analysis of the isolates confirmed that all human and food strains belonged to the same cluster, indicating the source was the same.

Investigations identified a failure in the decontamination process (a chlorine solution was used that had an expiry date of 2018), and incomplete peeling of cucumbers that didn't eliminate surface contamination as factors contributing to the outbreak.

Although the cause of this outbreak appears to be clear cut and has not been disputed, the headline did remind me of the huge European *E coli* (STEC) 0104 outbreak in 2011, which resulted in over 4,000 cases, 48 deaths and 771 people with HUS. Initial epidemiological investigations, which were subsequently proved to be incorrect suggested that the cause was Spanish cucumbers, and as a result the growers suffered greatly due to the initial product withdrawals and subsequent adverse publicity. It was reported at the time that Spanish exporters suffered losses of hundreds of million euros per week. The true cause of the outbreak was organic fenugreek sprouts from Egypt, and coincidentally there has been a recall in Germany this month of dried fenugreek leaves, only this time due to the presence of *Salmonella*.

Duck eggs recalled in Ireland

The Food Safety Authority of Ireland (FSAI) has issued a warning about the safety of duck eggs following a recall because of *Salmonella*. The egg producer had recalled duck eggs because of the possible presence of *Salmonella* earlier this month. The FSAI stated that there was 1 potentially related illness, but further testing was required before a definitive link could be made.

There is a belief that duck eggs carry more of a hazard with regard to *Salmonella* than hen eggs. In the US, the Centre for Disease Control (CDC) estimate that 1 in every 20,000 hen eggs are contaminated with *Salmonella* yet a survey in 2016 in the UK detected *Salmonella* in 2 out of just 145 duck eggs which were collected and analysed, so why is *Salmonella* apparently more common in duck eggs?

Eggs (of all species) are formed from the inside out., with the first step being the creation of a tiny ova which takes about a week to grow into a recognisable egg yolk. When the yolk is ready it is released along the oviduct where the egg white (albumen) is added. The egg carries on along the oviduct where it grows two connecting strands at the top and the bottom called chalaza, which anchor the yolk to the shell keeping it in the centre of the egg as the shell membranes start to form around the white.

After this the egg continues down into the uterus where the shell is added. The shell is made from calcium carbonate, which is also found in marble and chalk. The shell is on average only 0.3mm thick but it is incredibly strong. Duck eggshells are more porous than a chicken eggshell which means that they are more susceptible to taking up the odours of things stored near them, and may explain why they potentially contain more *Salmonella* than hen eggs. It has also been suggested that duck eggshells are formed lower in the uterus than their hen equivalents so that it is easier for the internal contents (the egg yolk and white) to be subjected to potential *Salmonella* contamination from the bird's own faecal material.



Another possible risk factor is that because duck eggs are larger and heavier than hen eggs, they are more likely to be undercooked and not receive a sufficient heat treatment to inactivate potential pathogens such as *Salmonella* which may be on the inside of the egg.

Ferrero chocolate outbreak -update

The latest update by the European Centre for Disease Prevention and Control (ECDC) suggests that the outbreak associated with Kinder chocolate egg products is under control with only 10 new cases being announced bringing the total to 455. The most recent recorded case of *Salmonella typhimurium* case was recorded in the UK on June 16th. Concerns had previously been raised by authorities that potentially contaminated chocolate could still be on sale despite a recall in April, although the low number of new cases suggest that the vast majority of contaminated product has now been removed. The UK has the most recorded cases with 128 followed by France with 121.

Rapid assay for *Listeria* utilising bacteriophages

In previous bulletins we have mentioned how bacteriophages may play a role in both pathogen reduction and disease prevention, but now researchers in the University of Georgia College of Engineering have published details of a rapid assay which they claim is able to detect *Listeria monocytogenes* in food samples due to electrochemical changes which are brought about following the specific interaction between the bacteriophage and its bacterial host. The authors of the study claim that the rapid technique is comparable with current molecular methodologies and has the potential to be carried out in manufacturing facilities rather than specialist laboratories, thus enabling positive release of short shelf-life products which currently isn't possible due to the timescales involved in conventional analysis.

Emerging pathogens - *Arcobacter*

Ever it's since its discovery and subsequent classification in 1991, researchers have been trying to establish a link between *Arcobacter* (a gram negative micro-aerophilic spiral shaped bacterium in the same family as *Campylobacter*) and foodborne gastroenteritis and bacteremia. This has been further examined in a paper published this month in the International Journal of Food Microbiology in which researchers at the University of the Basque Country examined various food matrices and food manufacturing environments and found that *Arcobacter* was detected in 22% of the samples analysed. They also found that the organism was particularly adept at forming protective biofilms on various surfaces.

Positive isolates were found in marine animals (especially baby squid) and vegetables including carrots, lettuce, and spinach. A range of species were detected but *A. butzleri* (which is the species which has frequently been linked to human illness) was the predominant isolate, and the researchers claimed to have identified virulence genes in most of the *Arcobacter* isolates.

Although *Campylobacter* was first described by Theodor Escherich (of *Escherichia coli* fame) in 1886, it wasn't until the 1960's and 70's when cultural and incubation techniques improved that the true incidence of the number of *Campylobacter* infections and its foodborne association was fully appreciated. *Campylobacter* is now recognised as being the major cause of gastroenteritis and bacterial food poisoning so with that in mind, and acknowledging that most food poisoning incidents remain undiagnosed, are we about to expose another significant organism responsible for foodborne infections?

Detection of this organism can be made either by traditional cultural techniques or by molecular PCR methodologies. Unlike *Campylobacter*, *Arcobacter* are aero-tolerant and can grow at temperatures below 30°C.



Norwegian *Salmonella* outbreak caused by watermelons

An outbreak of *Salmonella* in Norway has been linked to the consumption of watermelons. The monophasic *Salmonella typhimurium* has affected 18 individuals with 8 requiring hospital treatment. All 13 people who have been interviewed to date report consuming watermelon (purchased from various retail stores) 3 days prior to becoming ill.

The Norwegian Food Safety Authority said it was highly unlikely that watermelons associated with the outbreak are still on the market as they have a shelf life of three to four weeks, and most people became ill from the end of June to the middle of July.

This is yet another example (like the Ferrero kinder-egg chocolate) of an outbreak which has been caused by the monophasic form of *S typhimurium* and the incidence of this multi-drug resistant variant has increased significantly over the last 20 years.

Whereas *Salmonella* normally expresses 2 flagella or H antigens, i and 2, the monophasic variant does not express the second phase 2 antigen, so has the serological profile of O=4, H=i.

Different strains of monophasic *S. typhimurium* have emerged in various countries at different times, and applying phenotypic and molecular typing methods, these strains have generally been distributed in three prevalent clonal lines, known as the Spanish clone, the European clone, and the U.S. clone. The multidrug resistant Spanish and European clonal lineages are also characterised by a high occurrence of genes encoding tolerance to copper, silver, and mercury. The use of non-antibiotic compounds (heavy metals) with antimicrobial activity in animal husbandry to control foodborne pathogens suggested as a possible reason for the increasing prevalence of these lineages.

Another *E coli* outbreak causes the closure of two Scottish children's nurseries

Two children's nurseries in East Lothian Scotland have been closed this week following reports of illness caused by *E coli* 0157 which has affected 28 children. To date there has been no information on the potential source of the infections. This follows an *E coli* 0157 outbreak in May at a children's nursery in Hawick in the Scottish borders.

Latest updates from the FSA

And finally for this month, the latest round of alerts from the Food Standards agency includes a recall notice for two types of Dutch pancakes due to the presence of *Listeria monocytogenes*, and a white lasagne sauce due to an unspecified microbiological risk which is attributed to a production fault.

Coincidentally the Danish Veterinary and Food Administration have issued a recall notice on what they describe as dessert pancakes due to the presence of *Listeria*, but it is not clear if this is linked to the UK Dutch pancake recall.