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Microbiome used as a biomarker in non-invasive cancer diagnosis

It's not strictly connected with food microbiology, but an article in this month's British Medical Journal has demonstrated a link between certain specific gut microbiome populations and pancreatic ductal adenocarcinoma.

The advent of whole gene sequencing has enabled the complexity of our gut microbiome to be better understood as many of the organisms which make up our microbiome were hitherto unknown as they are not culturable by traditional laboratory methods.

As more research is being carried out it is becoming clear that specific microbiome "patterns", (the number of different species of microorganism in the intestine and their relative numbers in relation to one another) can act as biomarkers for diseases.

The research demonstrated a specific link between the pancreatic cancer patients and their microbiome, presumably because of the altered level of pancreatic juices caused by the cancer affecting digestion and nutrient availability for the gut microorganisms, and the article concludes by stating that this offers a non-invasive, robust, and reliable faecal based screening procedure.

Whilst it is probably true that in this instance the specific microbiome pattern is a consequence of, rather than the cause of the disease, it is becoming increasingly apparent that many of our "21st century" illnesses such as diabetes, obesity, IBS and Crohn's disease may be influenced, or in some cases caused by our own microbiome.

And this is where it very much becomes relevant to food microbiology because if it is indeed proved to be the case that a healthy microbiome can prevent certain diseases, or conversely an imbalance in the microbiome can cause disease, then the food testing laboratory of the future may look very different.

As well as screening for pathogens, spoilage organisms and indicator organisms we may also have to make sure that certain foodstuffs have the required microorganisms (probiotics), and we may also have to ensure that foods have the requisite levels of fibre and nutrients (prebiotics) to provide the fuel to maintain a healthy microbial gut population. This is already a requirement for some probiotic yoghurts but in the future, this may be expanded across a much greater range of both fermented and non-fermented products.

France – HUS/STEC outbreak

Officials in France are investigating an apparent Shiga Toxin E coli (STEC) outbreak following an increase in cases of Haemolytic Ureamic Syndrome (HUS) which has affected over 20 infants and caused 2 fatalities.

Since early February 26 cases of HUS have been identified with another 22 cases under investigation, although the source of the contamination has yet to be identified.

Coleslaw recall in Ireland

The Food Safety Authority of Ireland has issued a recall notice for coleslaws and other products containing shredded cabbage and carrots due to the presence of *Listeria monocytogenes*.

This product recall is poignant because although Listeria was first described in 1926, it wasn't until 1981 that *L monocytogenes* was identified as a cause of foodborne illness. This followed an outbreak of listeriosis in Halifax, Nova Scotia involving 41 cases, and which caused 18 deaths, mostly in pregnant women and neonates, which was epidemiologically linked to the consumption of coleslaw containing organically grown cabbage that had been contaminated with sheep manure.

More petfood recalls

The FSA has issued two separate product recall notices for petfood within the last week due to the presence of Salmonella in an ingredient which was used to manufacture several different varieties of petfood. Looking at the list of highly appetising products included in the recall notice, it did leave me wondering what is the common ingredient in varieties as diverse as Highland Venison & Trout, Clear Water Salmon, Succulent Chicken, and Haggis?

Salmonella in pistachio nuts

The FSA has also issued a recall notice for Alesto Californian Pistachios Roasted & Salted because Salmonella has been found in the product.

Feeder rodents from Lithuania banned

In last September's bulletin we reported on the link between imported feeder rodents from Lithuania (used to feed pet reptiles) and a Salmonella outbreak which had affected over 900 people in the UK. Following on from these investigations the Department for Environment, Food and Rural Affairs has now placed a ban on all imports of these rodents from Lithuania.

EFSA issue scientific opinion on high pressure processing

We have looked at High Pressure Processing (HPP) as an alternative to traditional thermal pasteurisation techniques in previous bulletins, and now the European Food Safety Authority (EFSA) have released a scientific opinion paper on the efficacy and safety of high-pressure processing in food.

HPP is a non-thermal technique of food preservation that inactivates pathogens and vegetative spoilage organisms. In HPP pressures of about 400 to 600 MPa are applied to both liquid and solid foods at refrigeration temperatures. It has minimal effects on taste, texture, appearance, or nutritional value, and is applied mainly to pre-packed juices, sauces, dips, fishery products, meat products and ready-to-eat meals. Due to the obvious advantages of reducing energy costs there is also an increasing interest for the use of HPP of milk as an alternative for pasteurisation as it is claimed that this would lead to the retention of the desired organoleptic qualities of raw milk.

The paper concluded that pathogen reductions in milk caused by the current HPP conditions applied by the industry are lower than those achieved by the legal requirements for thermal pasteurisation. However, the paper does state that minimum HPP requirements could be identified to achieve specific log10 reductions of relevant hazards based on performance criteria proposed by international standard agencies (5–8 log10reductions). It was found that the most stringent HPP conditions currently used in the food industry (600 MPa for 6 min) would achieve the above-mentioned performance criteria for all pathogens except *Staphylococcus aureus.*

The report also noted that the Alkaline phosphatase test which is widely used to verify adequate thermal pasteurisation of cow's milk, is relatively pressure resistant and its use would be limited to that of an overprocessing indicator, and currently there is no appropriate indicator to verify the efficacy of HPP under the current conditions supplied by the industry.

Butchers shop found to be the source of Listeriosis outbreak

A former butcher from Mansfield was fined £25,000 and ordered to pay £40,000 in costs following a trial at Nottingham Crown Court last month which highlighted several food hygiene failures which lead to a fatal Listeriosis outbreak in 2019.

Mansfield District Council launched an investigation in April 2019 after being told by the UK Health Security Agency (formally Public Health England), that whole genome sequencing (WGS) had linked two cases of listeriosis to potted beef sold at the premises.

The court was told that *Listeria monocytogenes* taken from blood and stool samples from an elderly lady who was admitted to hospital and later died revealed that the bacteria had an identical WGS profile as those found in cooked meat products and on food production equipment taken from the butcher's premises, where she was a regular customer. Two care homes had also been supplied with meat from the shop.

An inspection of the premises revealed cross contamination was not adequately controlled between raw and ready-to-eat food preparation areas. Once produced, potted beef was given a seven-day shelf life, but no records to support this had ever been produced and there was dirt in equipment used to produce the potted beef. Officials also found that that cracked walls and floor surfaces had not been thoroughly cleaned and sealed.

Despite the council recommending the shop be closed for deep cleaning, it was still trading the next day.

New biofilm research article

An article in this month's Pathogens journal entitled Biofilms through the looking glass offers an in-depth overview of this fascinating subject. The amazing complexity of biofilms is illustrated, and it details how food-processing facilities can harbor a wide diversity of microorganisms that persist and interact in multispecies biofilms. These biofilms can provide an ecological niche for pathogens and offer tolerance against chemicals used in sanitisation.

The paper details how synergistic interactions between organisms provide a vital role in the formation, maturation, and dispersion of the biofilm. Within the biofilm, cell to cell communication allows groups of microorganisms to behave in a coordinated fashion to regulate biofilm formation. In this process Gram-positive and -negative bacteria produce and sense small diffusible compounds called autoinducers and the mechanisms for producing and detecting autoinducers is referred to as quorum sensing.

The paper concludes that studies related to foodborne pathogen or microbial interventions on biofilms are mostly designed on single-species biofilms, overlooking the fact that in most environments, microorganisms coexist. Mixed-species biofilms are more tolerant to sanitisers than single-species biofilms, and the authors of the paper state that there is a need to explore how multispecies biofilms help in protecting foodborne pathogens from common sanitisers, and how they can disseminate from the biofilm hotspots and contaminate food products.

Large food poisoning outbreak reported at Indian wedding reception

Having a daughter in her late 20's I am all too aware that one day I may have the expense of a wedding to consider. However, as our colleagues at ALS in India will confirm, I may think myself lucky that any possible future wedding plans won't be as large (and expensive) as some of the celebrations commonly seen in that part of the world. It was reported last week that over 1,000 guests at a wedding in the Mehsana region of Gujarat were taken ill following the reception at which there were between 12-15,000 guests in attendance!!!

Mass catering events like these are fraught with problems as food tends to be manufactured in bulk, and issues surrounding the maintenance of the appropriate temperature control means that spore forming organisms such as *Bacillus cereus* and *Clostridium perfringens* can often germinate and produce toxins in the extended and inadequately controlled post cook holding conditions.