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An alternative to milk pasteurisation

A new technology has been revealed in Australia which is claimed to be an alternative to milk pasteurisation, which will successfully kill pathogens whilst retaining the vitamins, proteins, and enzymes that are often damaged by traditional thermal processes.

It is also claimed that with the alternative technology, the milk has a 60 day refrigerated shelf life, which is four times longer than traditional pasteurised milk.

The process will also inactivate spore formers such as *Bacillus cereus* which may be present in the milk.

High Pressure Processing (HPP) is not a new technology but until now, much of the available industrial applications of the technology have proven expensive and were not commercially viable.

High pressure induces conformational changes in the bacterial cell membranes and changes the cell morphology. It disrupts biochemical reactions, as well as the genetic mechanism of the microorganisms, all of which brings about a reduction in the microbial count.

Many people still choose to drink unpasteurised (raw) milk in the belief that it provides health benefits. Whilst undoubtedly some enzymes and vitamins are destroyed by the thermal process, raw milk can contain pathogens such as Campylobacter, Salmonella, Listeria and the Shiga Toxin E coli (STEC). If the new technology can enable microbiologically safe processing whilst enabling the product to retain all of its vitamins, minerals, and proteins, then people may be persuaded to consume the HPP version.

It may be possible to expand the use of HPP to other food matrices, and previous studies have demonstrated the efficacy of HPP for inactivating a wide spectrum of Gram-negative and Gram-positive bacteria in suspensions, as well as in solid food items. However, the rate and pattern of HPP-induced microorganism inactivation is quite variable and influenced by the processing conditions, composition of the food matrix, and the microorganism type/strain, so it is clear that different levels of HPP would be required for different foodstuffs as opposed to a “one size fits all” approach to the technology.

Increase in numbers of Yersinia in Sweden during January

Last month we reported on a Yersinia outbreak in Norway which was linked to the consumption of salad containing spinach leaves, and there has now been a reported increase in the number of cases of Yersinia in Sweden, with twice the monthly average cases of Yersiniosis being recorded in January.

In 2019 an outbreak of Yersiniosis in both Sweden and Denmark was linked to the consumption of imported fresh spinach from Italy or Spain.

The European Centre for Disease Prevention and Control (ECDC) has recently issued data for cases of Yersiniosis in 2019, and stated that there were 7,048 reported cases in 29 countries. The highest rates per head of population came from Finland, Lithuania and the Czech Republic although Germany and France have the most notifications.

In a separate article, published in January the rates of Yersiniosis in New Zealand were shown to have increased significantly from 2012-2019.

Even though the recent outbreaks have been linked to the consumption of salad products, the consumption of undercooked or contaminated meat, or the cross-contamination of other foods during handling and preparation of raw meat is still considered to be the main route of infection.

Cooked and frozen seafood recalled due to the presence of Salmonella

Last month several retailers in the UK recalled cooked and frozen seafood products due to contamination with Salmonella.

The affected products included Cockles and Mussels, and seafood selection mixes containing the two ingredients. Although Salmonella is not an organisms which can survive for long periods in a marine environment, it can often be found in the estuary waters (where the filter feeders are harvested) due to run off from agricultural land which has been used for livestock.

US Pet food aflatoxin outbreak - update

The Food and Drug Administration has updated the number of pet deaths from 70 (as reported in last month’s bulletin) to 110 in connection to levels of aflatoxin in dog and cat food products. In addition to the deaths there are more than 210 pets that are reported to be ill after eating the implicated pet food.

FSAI issue report on RTE spreads and dips

The Food Safety Authority of Ireland (FSAI) have issued a report detailing a survey which investigated the prevalence of common foodborne pathogens and indicator organisms in refrigerated Ready to Eat spreads and dips such as hummus, guacamole and meat and fish pates.

A total of 1,063 samples of spreads and dips were collected over a four month period in 2018 and *Listeria monocytogenes* was detected in four samples and Salmonella was found in one. Five samples had unsatisfactory levels of *E. coli* and 10 had high counts of Enterobacteriaceae.

The report did not detail whether the levels of *Listeria monocytogenes* exceeded 100cfu/g, but apparently recalls of three out of the four products were instigated. The only product which was not recalled had already exceeded its shelf life by the time the results were confirmed.

Salmonella freetown was detected in one sample of green pesto, which resulted in a recall of three products as they shared a common potentially contaminated ingredient.

This type of food matrix relies on pH control as the main growth limiting factor, but the presence of organic acids, use of preservatives and storage temperature all provide additional hurdles.

The mechanisms involved when bacterial cells "wake up" from dormant periods

We know that we can control the growth of bacteria by intrinsic factors within the food such as pH and Aw, and by extrinsic conditions such as temperature control. We also know that once the bacterial cells are subjected to these conditions, although their growth rate is restricted or even stopped completely, this does not mean that the bacterial cells will necessarily die.

Although many organisms will indeed die when subjected to adverse conditions for a prolonged period, some simply enter a state of "suspended animation" and once the growth conditions become favourable again, they can "wake up" and start to grow again.

When cells are in the dormant phase, this poses problems for ourselves in the laboratory as often the dormant cells (although still potentially viable) may actually be non-culturable (and therefore not detectable) using traditional microbiological methodologies. When they go dormant, the bacteria can often change shape, reduce respiration activities and they don't grow like healthy bacteria on agar plates used in standard laboratory tests, so they are much harder to detect.

Recently published work which has been carried out at the University of Exeter looked into how *Vibrio parahaemolyticus* emerges from its viable but non culturable (VBNC) or dormant state. In the study, the VBNC state was induced in *Vibrio parahaemolyticus* by nutrient restriction and lowering the temperature to mimic poor environmental growth conditions.

The researchers then identified a sub-population which was better at coming out of the dormant state and claim to have linked this to the procession of the enzyme lactate dehydrogenase which breaks down lactic acid into pyruvate, a key component of several metabolic pathways which are required for growth. The findings suggest that lactate dehydrogenase is essential for maintaining bacterial dormancy and resuscitation back to an active form.

Scientists investigate the possibility of "genetic modification" to facilitate resistance in poultry

Researchers from the Royal Veterinary College, Roslin Institute, and poultry breeding company Aviagen have published details of an investigation into the genetic make-up of 3,000 broiler chickens.

The aim of the study was to demonstrate whether parts of their genetic code were associated with resistance to Campylobacter colonisation. They looked at variations in the chickens' genome and investigated if this was linked to the levels of Campylobacter in the intestines of the birds.

Although the development of specially bred or genetically modified poultry which are naturally resistant to Campylobacter sounds like a utopian ideal, unfortunately the researchers found that there is only a low genetic basis for resistance to Campylobacter colonisation and that non-genetic factors play a more significant role in carriage of Campylobacter in chickens.

Further evidence that COVID related measures are affecting foodborne illness

We have reported in previous issues how the number of foodborne outbreaks has significantly reduced as a result of the COVID pandemic, and further evidence was published this week from the Robert Koch Institute in Germany which stated that there has been a drastic decrease in reported diseases including foodborne infections in Germany.

The report (which mirrors data from other countries) stated that restricted contact, social distancing and hygiene rules, reduced travel and school and day-care closures could have impacted the transmission of gastrointestinal infectious diseases.

The objective for us all must be to harness the positive aspects which has led to the observed decrease in foodborne infections and outbreaks, and try to incorporate these measures in a workable and sustainable way to create a safer environment for the future.