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Applications of nanotechnology in the food industry

A nanoscale surface has been developed by researchers from Cornell University. The technology uses an electrochemical process called anodization to create nanoscale pores which can change the electrical charge and surface energy of a metal surface. This exerts a repulsive force on bacterial cells which can prevent attachment and biofilm formation. Anodized Aluminium is already used in commercial applications including cookware and is known to have non-stick properties.

The researchers demonstrated that cylindrical nanopores increased the repulsive forces exerted on the bacterial cells due to their increased surface area. The team are also attempting to perfect a process of anodization to reduce the diameter of the pores which will further improve the bacteria repelling effect.

Another application of nanotechnology which has potential in the food industry is graphene. Graphene is pure carbon in the form of a very thin, nearly transparent sheet, one atom thick. Graphene is remarkably strong for its very low weight and it conducts heat and electricity with great efficiency. Scientists at the University of Manchester won the Nobel Prize for Physics in 2010 for their work on graphene. The applications of graphene are endless, but the material has been shown to have significant antibacterial properties. Amazingly the layers of graphene act like a fisherman's net and physically trap the bacterial cells, with different types of

graphene being shown to either wrap or trap the bacteria when studied by electron microscopy.

The potential for application of these nanotechnologies within the food industry is still being considered, but it is conceivable that in the future food will be processed on food contact surfaces to which bacteria will not be able to adhere to, and be packaged in material which will trap and kill bacterial cells.

EU illness report shows increase in Listeria

The number of Campylobacter cases has leveled off in Europe, while Listeriosis is still on the rise, according to a report by the European Food Safety Authority (EFSA) and the European Centre for Disease Prevention and Control (ECDC).

The European Union Summary Report on Trends and Sources of Zoonoses, Zoonotic Agents and Food-borne Outbreaks in 2013 released this week summarized disease surveillance in 32 European countries.

Campylobacteriosis was the most commonly reported zoonotic disease in 2013, but, after several years of an increasing trend, the human infections have stabilized. Chicken was the main source of the pathogen, according to the report.

This however runs contrary to a report issued by the Food Safety Authority of Ireland which shows an increase in cases of Campylobacter from 2,288 in 2014 to 2,600 in 2014.

Salmonellosis fell for the eighth year in a row, with a 7.9-percent decrease over 2012. The report attributes this to Salmonella control programs in poultry, and most Member States met their reduction targets for prevalence in poultry.

Listeria cases increased by 8.6 percent between 2012 and 2013, while Verocytotoxigenic *E. coli* (VTEC) infections rose by 5.9 percent.

The rise in reported VTEC cases may have been an effect of increased awareness in European countries following the 2011 outbreak of *E. coli* O104:H4 associated with the consumption of contaminated raw sprouted seeds that affected more than 3,800 people in Germany and additional cases in 15 other countries.

The risks associated with eating insects

In last month's bulletin we considered the challenges in feeding the ever increasing global population, and as there are over 1,500 edible insect species in the world, they offer great potential as an alternative source of dietary protein. However it has been acknowledged in a recent survey by the Scientific Committee of the (Belgium) Federal Agency for the Safety of the Food Chain, that there isn't much scientific literature on the food safety of insects

The paper addresses the potential microbial, chemical (including allergens) and physical hazards specifically related to the consumption of insects.

These hazards depend on the insect species, the cultivation conditions (feed and environment) and the subsequent processing, and can largely be controlled by the adequate application of the prevailing good hygiene and manufacturing practices during breeding and marketing of insects.

In their study of insects for human consumption, Belgian researchers centered on about a dozen species that were marketed in the country in 2011. They included: house crickets, greater and lesser wax moths, litter beetles, buffalo worms, silk moths, banded crickets, field crickets, African migratory

locust, American desert locust, yellow mealworms and super worms.

The paper acknowledges that "eating insects is rather uncommon and often considered strange," clearly "I'm a Celebrity Get Me Out Of Here" cannot have reached the TV screens of Belgium.

Cooking instructions not always adequate to ensure food safety

In the December 2013 micro bulletin we commented on how the increasing popularity of restaurants offering rare cooked burgers was causing a potential health risk as consumers may mistakenly believe that the risks are comparable with consuming rare or blue steak.

At a Food Standards Agency meeting in January the FSA board agreed that the agency needed to offer definitive advice governing the sale of rare burgers as a matter of urgency. They stressed the need for burgers to be cooked thoroughly for an equivalent of 70°C for 2 minutes.

New strain of Salmonella discovered

The Salmonella reference laboratory at the Pasteur Institute in Paris has confirmed that a new strain of Salmonella isolated by researchers at the Tech University in Texas, is in fact a new serotype and have named the organism *Salmonella lubbock*.

The researchers claim that the new organism is sufficiently similar to two current strains, *Salmonella montevideo* and *Salmonella mbandaka* and that strains of *Salmonella lubbock* may have been mis-identified as these two strains in the past.

The identification was made as a result of whole gene sequencing with DNA sequences found which are specific to the lubbock serotype, which raises the possibility that as whole gene sequencing of established serotypes increases, it is possible that several new strains may be discovered.

IBM and Mars Inc have recently announced a food safety whole gene sequencing project collaboration.