



Himmat Rai, Director, Sentinel Safety Solutions and BHSEA Member

Food Safety: From 'Horsegate' to Nanotechnology'

Himmat became a member of BHSEA some months ago and was delighted to have been asked to deliver today's presentation.

Himmat's Background

Himmat has been Director of Sentinel Safety Solutions Ltd since founding the company in 2000. It provides consultancy, training and support services to a wide range of clients throughout the UK, mainland Europe and the Far East. In addition to health and safety, Sentinel has expertise in food safety – mostly from the perspective of risk management - and helps companies to minimise their exposure to risk, thereby reducing the likelihood of claims.

Himmat originally qualified as an Environmental Health Officer in 1988 and worked for Sandwell MBC, specialising in enforcing health, safety and food legislation until moving to the private sector and joining Law Laboratories in 1997, where he was an advisor to multiple retailers and food manufacturers for three years.

Himmat has provided expert witness reports in court for solicitors defending companies being prosecuted following a workplace fatality, where he has been asked to establish whether the HSE or the Environmental Health Office investigated the matter properly. So the gamekeeper turned poacher!

He is the author of 'Food Emergencies – A Practical Approach to Prevention and Control', a book which was published by the commercial wing of the CIEH – Chartered Institute of Environmental Health - some 10 years ago. The CIEH was looking to do a series of books on food safety and picked up on an article Himmat had written about his dissertation on food law for his Masters degree.

Food Safety: Two Themes

Himmat's presentation today would discuss two themes:

- nanotechnology – what it is and how it applies to the food industry.
- food safety from the perspective of risk management.

Although food safety is often a topic of controversy in the press, Himmat pointed out that the information is usually quite vague and hopefully his presentation today would enlighten the membership and "put more flesh on the bones".

NANOTECHNOLOGY - OPPORTUNITIES AND THREATS

Nanotechnology is a relatively new field with a lot of research being done and there are huge opportunities. However, there are concerns for:

- the consumer of food containing nano-particles,
- those employed within the food industry; and
- the general public being exposed to nano-materials within the environment.

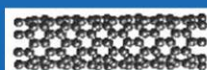
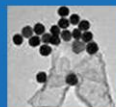
What is Nanotechnology

Nanotechnology is a broad set of processes, materials and applications that span physical, chemical, biological and electronic sciences and engineering fields that involve manipulation of materials in the nano scale – that is between one and a hundred nanometres. One nanometre is one billionth of a metre and $1/80,000^{\text{th}}$ of the diameter of a human hair.

What is Nanotechnology?

Nanoparticles of various shapes and forms:

- Uniform/ irregular shaped
- Dispersed particles/ agglomerates
- Free/ bound form



Manufactured nano particles come in various shapes and forms - spherical, regular and irregular, or nano tubes.

At nano level the properties and behaviours of particles can be very different to the same product or substance at the normal scale. For example, gold is a precious metal which is very stable and inert but very different at nano level.

Depending on what size of particle it is, it will change colour, its properties will change and it can become quite unstable, reactive and even toxic.

At the nano scale things are extremely small but they have a very large surface area. This means there is an increase in the reactivity for the equivalent weight of the same product at the normal level. This change in behaviour generates new properties and functionalities and this is where the opportunities lie - in the world generally and the food sector particularly - for novel materials to be developed in both food and food packaging. One of the significant properties of nano-particles is their strength - nano tubes for instance are 100 times stronger than steel.

The UK government set up a committee some five years ago to look at nanotechnology. What followed were a number of predictions. One being that by 2015 the market in nano-enabled products would be worth approximately 81 billion dollars. Because of the fast pace of change in this field this figure could very well have been exceeded by now.

The University of Birmingham is very active in research in this area, from both the point of view of medical applications of nano-materials and in the context of food.

Products Employing Nanotechnology

Approximately 1300 consumer products use nanotechnology. The majority are readily available in the Far East - China and Taiwan - within:

- Cosmetics and personal care products
- Paints & coatings
- Textiles & sports
- Medical & healthcare
- Food & nutritional supplements
- Food packaging
- Agrochemicals
- Electrical & electronics
- Fuel cells & batteries
- Weapons & explosives

Opportunities – Medical Advancements

In the field of medical and health care, nano-particles are being developed to target some medical interventions. For example, cancer research is looking at ways of using nano-particles to target cancer cells specifically, through drug delivery direct to the malignant cells. This could help reduce the suffering from the side-effects associated with the traditional treatment of chemotherapy, which is still quite a crude treatment.

Opportunities – Food Industry

The food industry is embracing the huge potential of this technology. Amongst its applications it can:

- improve uptake of nutrients/supplements

- reduce the salt, fat and sugar content as well as additives such as colours, flavours and preservatives
- block the micro pores in plastic bottles and prevent the escape of carbon dioxide in order to keep the drinks 'fizzy'
- extend the shelf life of food and therefore reduce waste. *(40% of the food which is retailed currently goes to waste. 'Best Before End' dates are often for the benefit of the retailer and not the customer as food is still fit for consumption. 'Use By Dates' are used on perishable foods and therefore more relevant.)*
- incorporate 'smart' and 'intelligent' packaging which identifies the presence of pathogenic organisms and has sensors built in to inform the consumer, by way of a colour change, as to the safety of the food within.

Retailers are now paying for research into incorporating nano-particles within the bar codes on all their products in order to eliminate the need for individual items to be scanned at the 'check out'.

Opportunities – Bacteria

The technology also has antibacterial properties. Fridges are now available with nano-silver particles injected into them to kill bacteria - the internal labelling should indicate if this applies. Sticking plasters used in first-aid have similarly been incorporating silver to reduce the risk of infection. Nano-materials incorporated into the manufacture of machines would reduce the time spent stripping them down to clean them.

Threats – Health Implications

Nano-particles can enter the body through inhalation, ingestion or absorption through the skin and they behave in unexpected ways within the body. They could cross membranes and reach unintended parts of the body, the bio-persistent or insoluble ones remaining in the cells with unknown consequences. The concern is that there could be resultant health problems some years into the future, similar to the way in which exposure to asbestos and silica has caused problems decades later. However, the food industry is not keen to draw attention to this as they do not want the kind of controversy that surrounded genetically modified foods. Such debates could lead to objections and halt progress.

Legal Framework

There are very few nano foods in use at the moment. There are, however, nano-materials which are naturally occurring, for instance milk has nano-scale ingredients.

New regulations came into force in the UK in December 2014 and nano ingredients must now be declared on food labels. Allergens must also be clearly identified.

The European Food Safety Authority, which serves the whole of the European Union, produced some guidance in 2011. If a member state requests guidance or scientific opinion, they are duty bound to provide it. Nano materials are

already covered by general food safety legislation but any new or re-formulation of an existing additive will be subject to safety evaluation - in the same way that new drugs are evaluated in the pharmaceutical industry.

Nano materials present challenges in the risk assessment process as very little toxicological data is available and extrapolation from conventional materials is not feasible. This will limit the number of drugs coming on to the market.

Other legislation relevant to nanotechnology includes:

There is already a robust legal framework:

- Health and Safety at Work Act
- COSHH
- REACH enforcement regulations
- Environmental Protection Act

FOOD SAFETY AND RISK MANAGEMENT

Food Crime

DEFRA estimates that the food industry in the UK is worth 196 billion pounds and the manufacturing sector adds a further 24 billion pounds. Therefore there is a lot of scope for fraud and crime. The food industry is very complex and convoluted. It is now quite unusual to buy meat from a local butcher knowing he has acquired the animal carcasses direct from the nearby farm. Food can now come from all over the world – wherever is cheapest.

Often the food is imported into the UK and then goes back out again. Consequently it is very difficult to keep track of where it originates and what it contains.

There is continual pressure to increase profits and reduce costs but it is the consumer who is the ultimate victim as he gets something he didn't ask for. In the wake of 'Horsegate' two years ago some sampling was carried out in Birmingham and London. Lamb curries and lamb kebabs were purchased at 20 sites in Birmingham and London. 40% of them had no lamb in them at all.

Food crime can range from a relatively minor offence to organised crime.

Examples are:

- mixing inferior or low grade meat with fresh
- adulteration of milk with water
- extending the shelf life illegally by re-branding it from premium meat and re-dating it
- injecting meat with water – sometimes this is legitimate as in the curing process
- adding anti-freeze to white wine
- using industrial alcohol in vodka
- adulteration of olive oil with cheaper oils
- bleaching meats to disguise decay

It is likely to be the smaller businesses that could fall prey to those committing fraud as they are unable to have in place the necessary testing equipment.

'Horsegate'

Himmat reminded us of a major scandal in the food industry in 2012 which the media referred to as 'Horsegate'. The scandal highlighted that the regulatory authorities and controls within the food industry itself were actually very weak. The UK only became aware of it when the Food Standards Authority in the Republic of Ireland identified the contamination of beef products with horse meat and alerted the UK Food Standards Agency. Local butchers who were able to give reassurance to customers as to the origins of their meat actually benefited from increased trade.

Horsemeat itself is not the problem, if the horse is slaughtered in the right way and by an approved slaughterhouse. Horses are slaughtered in the UK but are mostly exported. Larger parts of the carcass should have a stamp to indicate its origin. However, there have been court cases where horses have been supplied but no records kept as to where they have gone to. There has also been some concern about the presence in the animal of the veterinary tranquiliser bute.

Government Response to Food Crime

DEFRA/DoH commissioned the '**Elliot Review into the Integrity and assurance of Food Supply Networks**' - A National Food Crime Prevention Framework (published July 2014).

Elliot Report Recommendations

8 Pillars:

- Consumer First
- Zero Tolerance
- Intelligence Gathering
- Laboratory Services
- Audit (additional modules for fraud prevention and detection)
- Government Support (for the FSA to take a lead)
- Leadership (New Food Crime Unit within FSA)
- Crisis Management (at Cabinet Office level)



One of the Report recommendations was to have a dedicated food crime unit within the Food Standards Agency consisting of police officers and former police officers recruited to focus 100% of their time on investigating food crime.

The latest report from the FSA as of last week is that they have voted for all of the recommendations and are on the way to implementation.

Intelligence Gathering

FSA commissioned NSF International (www.nsf.org) to develop a diagnostic model to identify and risk rate different types of food.

Focusing on 3 key areas:

- Potential profit that can be made by the criminal
- Potential cost/difficulty of making the substitution
- Likelihood of detection

High risk foods include Saffron, Coffee, Wheat, Beef Trim

Insurance Implications

- Potential risks to consumers of food and drink, workers, environment
- Implications for employers, public and products liability
- Challenges in assessing the risk of exposure to nano materials
- Fast pace of technological advances
- Equated to the asbestos experience – risk not recognised until decades after first use
- Insurers reluctant to offer – ‘Precautionary Principle’ being adopted
- The insured will have to demonstrate that all the regulatory hurdles have been passed via the FSA and EFSA (European Food Safety Authority).

Product Recall

If nano-materials are included in products but not declared, there will have to be a recall, which has huge financial implications. Even a small scale recall can cost a company half a million pounds.

In 2005 a contaminated food dye was discovered in chilli powder that found its way into the food chain via Worcestershire Sauce, which affected nearly 600 products and ready meals. It caused the largest ever food recall in the UK. It's estimated to have cost Premier Foods £150m.

Cadbury had an issue with salmonella being found in one of their chocolate bars and they recalled over a million of those. They later reported that the direct costs of the recall were £30m. But the cost of a recall also extends to the fines imposed by supermarkets for every day that a company's product is off their shelves. These fines run into tens of thousands of pounds per day. In addition, it was estimated to have cost Cadbury a further £30-35m in lost sales and left them ripe for a takeover. They were bought out by Kraft Foods a few years later.

The concerns are that a significant percentage of food manufacturers hold no product recall insurance. There is a misconception that companies are covered by their public liability insurance, which is not the case. Product recall insurance is very expensive. For a £2m cost of recall, there would be a premium of some £20,000 – a significant cost for a small business with turnover of £20-30m per year.

Startlingly (although this is anecdotal) approximately 50% of large manufacturers and 70% of small and medium sized manufacturers have no product recall insurance. Or even product recall procedures.

Companies with a turnover of less than £50m supplying a single product to one or two retailers are most at risk. A product recall for them could result in the failure of their business.

Members' Questions

Steve Parton had noticed that a number of restaurants are now displaying allergen information on their menus and asked why this was occurring and how it was being enforced around the UK. Himmat confirmed that the labelling has been in place for many years but the introduction of the legislation in December 2014 now requires them to be much more pro-active in identifying allergens in their food.

Lee Dargue asked if the use of nanotechnology was automatically required under Hazop. Himmat confirmed that it should be. However, as nano-particles are difficult to measure it will probably be the end product that will be tested and results only released where they are negative.

Another Member asked whether there were nationally recognised standards for the food safety industry. Himmat confirmed that there were and premises should be inspected at regular intervals. A slaughterhouse would come under the Foods Standards Agency but a manufacturer or retailer would come under the local authority – Environmental Health - and premises have to be approved for specific use. However, local authorities have been affected by the significant cuts to funding over the last 5-8 years and they now do not have the resources to do what they want to do.

Another Member asked whether Himmat was aware of anyone, either a consumer or a worker, complaining of any health issues that have occurred since nano materials came on the scene some years ago. Himmat advised that there was very little evidence out there and the number of nano materials within the European Union was small. One application is the Pilkington self-cleaning glass product. But there is a lot of research being undertaken, particularly by University of Birmingham, to look into the medical implications.

Mark Hoare from University of Birmingham confirmed that they were trying to impose some standards and were keeping records.

Himmat was quite assured that we have the correct regulatory framework in place within the European Union. However, it could be some time before we see any negatives.