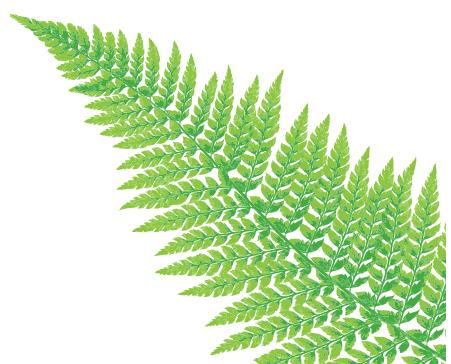




An introduction to food and drink nanotechnology

A communications-focused
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Processing food is not new; salting, drying, smoking, and pickling, have been used for hundreds of years to preserve foods for consumption weeks or months later. Processed food is not only the preserve of developed countries; it also affords a greater degree of food safety and security in developing countries. Modern-day food processing technologies, including nanotechnologies, extend this further – providing consumers with greater variety throughout the year, new sensations, and added nutritional value.

Should we be worried? This largely comes down to choice. Many ‘traditional’ processed foods on the market have high levels of fat, salt, sugar, and artificial chemicals (such as preservatives and flavour enhancers), which have been shown to have deleterious effects on health. As consumers we choose to eat these or not, driven by flavour, smell, and texture. Nanotechnologies afford the same choice, but in response to consumer demands, with potentially fewer drawbacks.

However, food is personal, and given the access we all have to information and mis-information, it is important to have an open debate on the use of nanotechnologies in food, with participation of industry, scientists, regulators, and consumer groups to better understand needs and fears. Only through this can we produce processed food that is accepted by society and ultimately profitable to support the 11 million plus people who work in the agrifood industries in Europe. We welcome this discussion document which goes some way towards starting that debate.

Executive summary

Feeding the world’s rapidly growing population is putting an increased amount of pressure on our finite natural resources. The case for sustainable food production, and the reduction of food waste, has therefore never been stronger. Nanotechnology, in its various forms, can go some way towards offering solutions to these challenges, although just how integral a role it may come to play is yet to be determined.

However, while the science is moving fast, the general public, lay spokespeople and regulators are at risk of not keeping up, and there is a real danger of a misinformation or malformed messaging creating unhelpful media-fuelled scare stories.

The key to avoiding this is exemplary, proactive, two-way dialogue, by the nanotechnology community with all of its stakeholders, from government to the general public. This needs to happen now, before others take control of the debate. Social media must be embraced, for the personal, immediate and two-way

communication opportunities these channels provide, as well as for their access to large, contemporary groups of users.

With less than half (44%)^[1] of UK consumers claiming to understand what nanotechnology is, and 38%^[1] claiming they would be unlikely to purchase foods containing man-made nanoparticles, there is clearly a great deal of work to be done.

During these early days, as we await the necessary investment in research and measurement technology development, we must deliver transparency in communication to ensure that all stakeholders understand the possibilities, opportunities and risks of nanotechnology.

For now, it is essential that the industry and its regulators ‘own’ the data they do have and establish reliable, trusted sources of information for all those wanting to know more.

What is nanotechnology?

Nanotechnology is regarded by some as an obscure term from science fiction novels and to others as a very tangible, albeit invisible, enabling technology that aims to revolutionise most industry sectors.

In simple terms, nanotechnology is engineering on a very small scale. 'Nano' comes from the ancient Greek 'nanos' meaning dwarf or small. One nanometre (nm) is one billionth of a metre—equivalent to 30,000 times thinner than a human hair. Generally nanotechnology deals with structures measuring between one and 100 nanometres in at least one dimension. It's purely a definition of size not origin, function or application.

This is one of the reasons that nanotechnology^[2] finds its applications in most aspects of our life today. Nano- and micro-electronics drive our electronic devices. Medical science uses nanotechnology for monitoring and treating patients. Construction, automotive and aviation industries use a wide variety of coatings, composites and powders for delivering cheaper and longer-lasting designs. The textile industry designs smart clothing with woven functionality to protect the users and enhance durability. The food and beverage industries are not exempt. A large number of proposals and practical implementations aimed at improving food shelf life, functionality, taste and texture have been reported in recent months.

Purpose of this discussion document

This document aims to explore the specific challenges involved in the communication of nanotechnology in the food and drink industry and makes outline recommendations about the way ahead. It is aimed equally at those who have some technical understanding of the emerging technologies and their application, as well as those whose technical knowledge is currently limited, but who are interested in knowing what these technologies potentially have to offer the food, beverage and related industries.

We begin by putting the communication challenges for nanotechnology in food and drink squarely on the table, along with outline recommendations. For those readers who want more background information, we then go on to detail the various current and potential food, drink and packaging applications. A closer evaluation of the perspectives of different stakeholder groups then leads to a distillation of the outstanding issues – commercial, technological and sociological – that need to be addressed as a matter of urgency in the interests of industry and the public.

We do not claim to have all the answers – we simply aim to facilitate discussion about effective communication of nanotechnology in food.



Communicating nanotechnology

Why communicate nanotechnology?

We face an unprecedented chapter in the dilemma of how to feed the planet sustainably. Since the GM debate first started raging in the late 1990s, the world's population, according to UN statistics, has grown by an astonishing one billion people. Meanwhile, our finite natural resources are being depleted at an alarming rate and climate change is affecting the water balance of our food producing areas.

As this document discusses, given a chance, nanotechnology could potentially go a long way in helping to solve these challenges – from increasing agricultural productivity and reducing food waste, to improving the absorption of nutrients in the body.

Nanotechnology's potential to solve problems is met, however, with very serious questions about its long-term effects on health and the environment.

Some opponents of nanotechnology claim that, while there is not enough scientific evidence to support either side of the argument, we should ban all nanotechnology from food and packaging.

With such major challenges to be tackled, now is the time for a grown-up debate to fuel our understanding of how best to utilise nanotechnology and help overcome the inherent and complex contradictions, both real and apparent, of providing sustainable food. Recent studies and reports indicate that the majority of the general public do not know what nanotechnology is. And the same situation exists in some sectors of industry.

Online, the sources of information relating to nanotechnology are abundant and contradictory, leaving today's information-hungry consumer at a loss for which sources to trust. Public services such as the Food Standards Agency (FSA)^[3] and the European Food Safety Authority (EFSA)^[4] aim to present an unbiased depiction of the facts but, to the uninformed, picking out reliable resources from a seemingly endless list can be tantamount to finding a needle in a haystack.

For decision makers, the natural course of action is to consult expert advice since this is the only way to find out how nanotechnology affects their particular sector or industry. However, the experts are still seeking answers themselves.

Our survival instinct has given us a natural fear of the unknown. While many of the facts about nanotechnology are still being worked out – not least how to regulate something that is currently not even detectable – it's critical that the food and drink industry demonstrates ownership of the data we do have and establishes reliable, trusted (and more demonstrably trustable) sources of information for all those wanting to either scratch the surface or find out more. With this in mind, Safenano and the Institute of Occupational Medicine has produced a comprehensive report (EMERGNANO)^[5] on what is being done to determine the safety of nanoparticles or nanomaterials. Currently over £160million is being spent on some 394 studies of various sizes around the world.

Ultimately, the success of nanotechnology in the food and drink sector will not be solely determined by ground-breaking science or product innovation; it will be about establishing genuine consumer trust, reputation and managing expectations. It will be also be about communicating in the right way and through the correct channels, and with the right tools so people can make their own, informed choices.

But with concerns regarding the protection of intellectual property, and so many unknown quantities about the science itself, not to mention the fear of unleashing a GM-style backlash, it's little wonder that the House of Lords Select Committee on Science and Technology^[6] concluded that the government needs to "work with the food industry to secure more openness and transparency about the research and development and future plans for the application of nanotechnologies in the food sector".

How should nanotechnology in food be communicated?

The good news is, that since the GM debate exploded in the late 1990s, traditional methods of communication have been turned on their head, with well-established social media networks now in place for effective peer-to-peer communication. According to the Audit Bureau of Circulations (ABC) 13 million national newspapers were being sold daily in the UK in 2000, compared with just 9.9 million in 2010, and the trend looks set to continue.

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“ ...if the industry and regulators don’t fill the ‘nanotechnology in food’ discussion space then somebody else soon will.”

“ ...proactive, two-way dialogue needs to start now, before others take control of the debate”

Meanwhile, Facebook, which was only founded in 2004, now has more than 500 million active users worldwide, half of whom are daily visitors to the site. More than 100 million people are now using Twitter – with the site expected to process almost 10 billion tweets in a single year. Similarly, LinkedIn has over 70 million members in more than 200 countries, with a new member joining approximately every second, and the English language version of Wikipedia has 3.3 million articles.

These new channels are fast becoming the one-stop-shop for research being undertaken on the internet; so while the authors of this document welcome the government’s intention to make information available about nanotechnologies on a “portal website”^[7], we encourage the use of these well-established social media channels to ensure a representative two-way informed debate. We recommend building on the proposed Select Committee utilisation of the Nanotechnologies Stakeholder Forum and the Nanotechnology Issues Dialogue Group (UK) meetings to discuss the issues surrounding nanotechnologies in the food sector.

What can be communicated?

An open, serious discussion would be beneficial for consumers, regulators and the industry.

Almost regardless of which channels of communication are selected, the real challenge at this stage in food nanotechnology infancy is what can be communicated. The very nature of such cutting-edge science means that it unavoidably, and inevitably, moves faster than our ability to regulate it, never mind communicate meaningfully about it. So where does that leave us?

Public opinion abhors a vacuum: if the industry and regulators don’t fill the ‘nanotechnology in food’ discussion space then somebody else soon will. It’s critical, even in these early stages, to fill that void with what information is available.

This communication needs to be co-ordinated across the industry and government to ensure consistency of message, a message which at this stage might be as simple as – “it’s clear we don’t yet have all the answers, but rest assured we are asking the right questions, and won’t be proceeding until we do have all the facts”.

The details of this comprehensive communications programme clearly still need to be ironed out and questions of ownership, resource and budgets addressed, but what is clear is that proactive, two-way dialogue needs to start now, before others take control of the debate.

Unfortunately, some industrial players have pulled out of openly communicating and promoting nanotechnology. Preferring to play down the fact that they run a well-structured research programme in a particular aspect of food nanotechnology in an effort to avoid appearing too progressive to a risk-averse public.

We have a responsibility to explore the science available to us and, providing we find the answers, build trust to help its wide-scale adoption rather than hiding it in a closet.

Why nanotechnology NOW?

Nanotechnology is a relatively young sector. The term was officially coined in the late eighties and it means different things to different people.

According to a recent Omnibus survey carried out by BMRB on behalf of College Hill, understanding of the terminology among the general public varies greatly depending on factors ranging from geographical location to social grade, however, with 44%^[1] of the population, there does appear to be some level of understanding of the concept in broad terms – as a ‘technology that involves using very small particles’.

To a specialist, ‘nanotechnology’ says very little. Any expert would have to clarify what area of nanotechnology is actually being referred to.

However misleading the term ‘nano’ is, it has already acquired distinct connotations in the scientific, commercial and, more importantly, social senses of the word.

Throughout its short history, nanotechnology has seen a revolutionary increase in funding^[8,9], investment and research activity. It has also seen a more cautious approach from some who question the safety of nanotechnology^[10,11].

There is ongoing debate about the implications of nanotechnology^[11]. The most relevant discussion to this document is the evaluation of safety or nanotoxicity of products containing nanomaterials.

Here, we are referring to the long-term health effects of nanoparticles on humans and their environment.

Unfortunately, there is still a lot of scientific research to be done to confirm the safety of nanoparticles. The properties of these nanoparticles are significantly different from larger size objects made of the same material. The fact that these particles are small makes them more reactive and more mobile – they can penetrate cell walls. Current scientific opinion is that there is not enough information about the physiochemical and toxicological effects of nanoparticles, making it difficult for the food industry to be certain that its use for ingredients and packaging is safe.

Most systematic studies on nanoparticles in powder or solution distinguish between naturally-occurring nanoparticles and artificially-engineered nanoparticles. In fact, we ingest nanoparticles daily from milk products that contain casein micelles (100 nm) or whey proteins (3 nm). Similarly, some forms of nanoemulsions are found in mayonnaise. These are naturally occurring nanoparticles. Artificially-engineered nanoparticles are made by humans and could be soluble and biopersistent. Most toxicology studies are focussing on the latter type due to fears of their long-term effects.

It is the fear of the unknown rather than significant scientific facts that are being exploited by anti-campaigners. The EMERGNANO report^[5] highlighted that, although there are a large number of toxicological studies related to nanoparticles and nanomaterials, only 30 per cent of them have reported their findings and some are in the initial stages of development.

Applications in food and drink

The nano-enabled food and beverage applications market is predicted by industry experts to be worth tens of billions of pounds by 2015. However, it is still only a small percentage of the entire nanotechnology sector and generates only about 100 international patents per year. By far the biggest market share is held by applications in food packaging.

In the following, we discuss some of the main nanotechnology-enabled agriculture, food, beverage and food contact material applications.

Agriculture

The combination of the growing population and environmental resources becoming increasingly scarce has led a number of governments and private corporations to look into more environmentally-sustainable and resource-efficient agricultural methods. More than 60 per cent of the world's growing population relies on agriculture for its livelihood, helping to propel this topic to the top of the global agenda. Micro- and nanotechnology could impact the sector

through two separate streams of technological development. The first is smarter monitoring of plant growth and the second is based on the development of highly efficient and well-targeted fertiliser, pesticide and growth regulators.

One of the existing concepts is known as precision farming. It relies on constant monitoring and control of environmental parameters for the optimised growth of plants. This concept has nothing to do with nanotechnology, yet nanotechnology has a lot to contribute to the monitoring of soil chemicals, humidity, temperature and pollution. The proposed monitoring is based on distributed sensor networks and provides quantitative local information through GPS systems. Active monitoring of crops may well become one of the highlights of nano-agricultural applications since it optimises the crop growth without impacting the produce in a negative way. Commercially, these systems are still very costly and would be applicable to high-added-value crop growth sectors.



With the growth in the agricultural use of soil around the world, more and more pesticides and fertilisers find their way into ground water and river systems. Some pesticides have even been prohibited. In general, the use of pesticides or fertiliser agents should be optimised and well-targeted. Nanotechnology may provide some solutions to this problem through the use of micro and nanoencapsulation or nanoemulsions for the delivery of fertilisers or pesticides to control the growth of plants. It should be noted that most emulsions, such as emulsion-based fertilisers (Primo MAXX®) and micro-encapsulated insecticides (Karate® with Zeon Technology), are not really nano. The encapsulation is at a micron scale and only aids delivery of the product in a non-micro form. It is worth noting that the technical distinction between 'nano', 'micro' or 'macro' may become particularly important in the future, especially with the mounting pressure from regulators and pressure groups.

Despite all the advances in nanotechnology for agriculture, some questions remain unanswered, such as the impact of nanoparticles on the environment and living organisms. This topic is controversial and more research is needed to convince the opponents in this debate of which nanotechnology applications are safe. In the meantime, The Soil Association^[13] has called for a nanotechnology and nanomaterials ban from organic foods. Supported by the Canada-based ETC Group^[14] this movement has led to governments around the world tightening their policy on the use of nanomaterials and nanoparticles in agriculture. In May 2010 Canada banned the use of nano-pesticides from organic food certification.

Foods and beverages

Food and drink applications of nanotechnology^[15] are limited at present, yet the potential for growth is high. A patent search in the nanofood sector yielded an annual increase of over 20% in filed patents for the last three years. The main applications of nanofoods are found in particle encapsulation, emulsions and, in some cases, the direct use of nanoparticles.

Nanoencapsulation offers the potential to produce functional foods with small (nanometre length) capsules containing



ingredients that are otherwise difficult to incorporate in a mixture. A good example of this is the AquaNova oil and water mixture.

Nanoemulsions can already be found in some types of chocolate, mayonnaise and ice cream. Smaller droplets of immiscible liquids lead to a longer shelf life with, in many cases, accompanying taste and texture benefits.

Food supplements

The nanosupplements market has boomed in the United States in the past few years. The majority of applications use biodegradable nanoparticles to deliver a specific drug, vitamin or ingredient to the digestive system. Due to the fact that most nanoparticles have a high surface area compared with their volume, the metabolic activity of such supplements can be enhanced. This means that their ingestion is accelerated. The same applies to ingredients such as salt, fibre additives and protein meal supplements.

One example of a meal supplement using nano particles listed on The Project on Emerging Nanotechnologies website^[15] is a low fat chocolate milkshake that uses inert nanoparticles to enhance the creamy texture of the product.

Food and drink packaging and processing

By far the fastest growing sector among nanofood applications is nano-packaging. Passive and active nano-packaging aims to increase the shelf life of products as well as providing consumers with more accurate ways of evaluating product safety and freshness. Thin film coatings and antibacterial fillers (nano-silver) both aim to reduce the overall amount of packaging used to protect products. Food packaging aims to prevent the formation of bacteria on food contact surfaces. One of the main applications of nano-silver is to suppress the formation of bacteria due to its antibacterial properties. Nano-silver is embedded in packaging plastic and thus remains only in partial contact with the produce.

Some packaging and food processing manufacturers follow a different path to combat bacterial accumulation by coating surfaces with hyper-smooth coatings.



Stakeholder perspectives

This type of coating simply prevents adhesion of bacteria and food to processing or packaging surfaces, thus reducing the risk of bacterial growth. Such thin films are costly, but would, in the long run, reduce the use of detergents and water for food processors.

Active packaging refers specifically to the use of miniaturised detection of bacteria or gas inserted into the packaging. Food quality and its freshness can be monitored from the

direct readings of the packaging. This would reduce food waste and improve the customer experience, while presenting little toxicological and technological uncertainty.

Beverage packaging is often engineered with several layers controlling moisture, gas and light barriers. In this case the insertion of nano-clay serves a dual purpose – as a gas and light barrier. Nano-clay applications in packaging are commonplace and have already reduced the cost of manufacturing.

Nanotechnology applications in food, drink and food contact materials present a number of benefits to industry and consumers alike, yet some controversy hinders the widespread usage of the technology. Major stakeholders include: consumers, food manufacturers, retailers, governmental agencies and non-governmental organisations. Only by understanding the needs and points of view of each of these key players will a balanced debate and productive outcome be achieved.

Consumer perspective

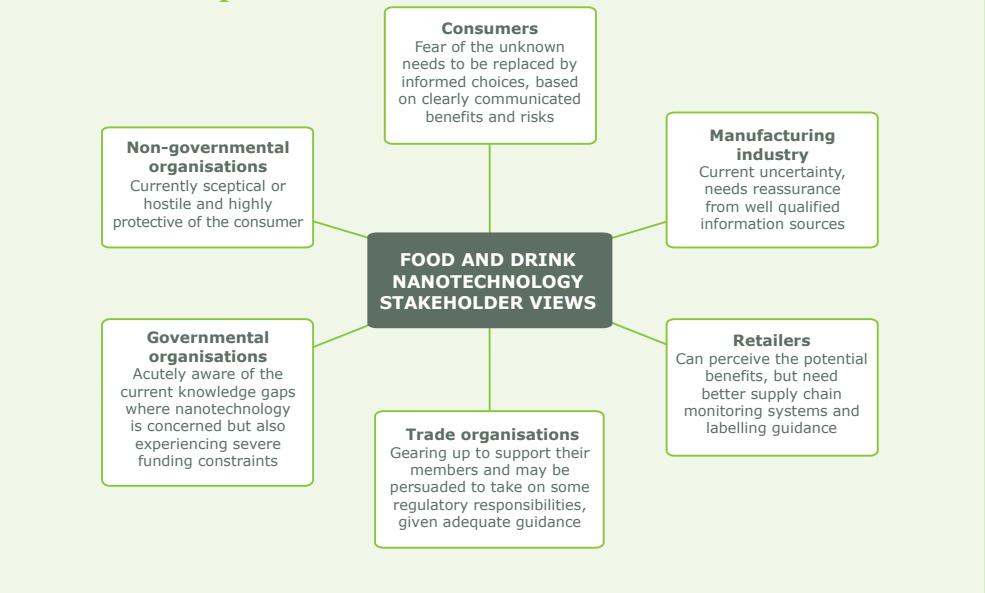
We all have a special relationship with the food we eat. In fact we attach much more attention to internally ingested products than to cosmetics or other recent technological innovations with which we come into regular contact. In 1997 Unilever and Lancaster University published

a significant study that compared our attitudes towards genetically modified produce and the use of mobile phones^[16]. Although mobile phones have been linked to causing long-term damage to brain cells, it was the strong opinion about GM food products which dominated the discussion.

In the case of nanotechnology, the discussion about a ‘potential’ threat dominates the headlines.

It should be noted that the threat is only potential since the scientific evidence has not yet filled the knowledge gaps. This is a precarious situation where the public is dealing with the unknown and, with the backdrop of the GM foods debate and the potential for propulsion by social media, this fear of the unknown could well escalate to dominate public opinion.

Stakeholder map



Omnibus research conducted by BMRB on behalf of College Hill in summer 2010^[1] corroborates the fear that public awareness of the subject is low – with just 44% of those surveyed showing some understanding of the term ‘nanotechnology’ when given a list of options to choose from. If the consumer view on nanotechnology is dominated by negative messages this is how the information void will be filled, bringing with it a serious risk of consumer backlash.

Industry and governmental organisations have a long way to go to convince consumers of the benefits of nanofoods. However, this sceptical view is by no means universal: countries such as India, China and Japan have witnessed positive public attitudes towards nanotechnology developments in food and beverage products^[17].

One main recommendation that came out of the House of Lords report on nanotechnology and Food^[6] was the call for a greater dialogue between various stakeholders. The report suggests that it is unhelpful and patronising to assume that the public is ignorant and should be kept in the dark while the scientists do their work. Only when clear and quantified consumer and societal benefits, such as better nutrition, healthier food choices, improved crop yields, longer shelf life and better packaging, are weighed against the acknowledged emergent nature of the technologies, can consumers begin to make an educated choice for themselves.

A social study in Switzerland^[18] demonstrated that public perception of nano-enabled foods differed from that of nano-food packaging. Whilst the acceptance of nano-foods was low, the acceptance of nano-food packaging was much higher. The study concluded that the degree of acceptance was related to the perceived benefits of the technology and how clearly these benefits were communicated.

Manufacturing perspective

Industrial innovation has led entire civilisations into prosperity and improved the quality of life for many people in the past. One should not forget that commercial aims of producing cheaper, more energy-efficient, longer lasting, better presented and, of course, higher quality products have led to an increase in consumer choice.

With regard to the applications of nanotechnology in food and drink, however, the industry does not have a unified standpoint. Most food and packaging manufacturers are simply observing the situation and waiting for someone else to make the first move. This ‘you first’ strategy is understandable given the uncertainty surrounding nanotechnology, such as reliability, toxicity of nanomaterials, regulation and public acceptance.

“ ...the proposed Novel Foods Regulation (EC) No. 258/97 could result in mandatory labelling of nano material across the EU.”

For most commercial applications the reliability, and more importantly, the link to the claimed benefits is essential. Commercial applications are often scrutinised for what they purport to be benefits and, in the USA alone, the number of cases against unfounded nanotechnology claims has climbed to a record high. In addition to the looming prospect of potential health litigations^[19] there is a more real and immediate threat of under-delivering on the promise of nanotechnological benefits. This situation is critical for the food additives and food supplement sectors, which are growing very fast, especially in the USA. Would it help if the food and drink products using nanotechnology were labelled accordingly? After all, this would provide a way of informing consumers. It seems that the industry is divided on this issue. Unilever is in favour of labelling nanoparticles in products “where they [labels] provide meaningful and specific information to consumers”^[20]. Others argue that this would stigmatise certain products. The issue of labelling nanomaterials in food and drink products is being discussed at EU level in the proposed Novel Foods Regulation (EC) No. 258/97 which could result in mandatory labelling of nano material across the EU^[21].

The nanofood and drink industrial sector is at the information-gathering stage which places it in a state of flux. No one wants to be the first to speak out on the topic. There is a great need for a reliable information source for manufacturers of food, drink or food contact materials with regards to the developments in legislation, industry and consumer understanding and priorities.

Retailer perspective

The attitude of retailers across the UK and EU towards nanotechnology applications in food seems to be more pragmatic than that of the food manufacturing sector, due mainly to the highly competitive nature of the retail market. The developments in nanopackaging are viewed positively by retailers as the improved shelf life of products, storage hygiene and product monitoring benefits offer significant cost savings to supermarkets and their suppliers.

This view is balanced by caution with respect to consumer rejection of novel nano-enabled products. With the EU’s regulation and labelling directives still in their early stages, the retailer community is monitoring developments very closely. Some have expressed fears relating to accidental nanotechnology use in the supply chain. Unfortunately, the detection and monitoring of nanoparticles in food and drink products is still in its infancy. The Food Standards Agency^[21] and the EU (Framework 7)^[9] are issuing calls for research into appropriate detection methods.

Governmental organisations

The report by the UK’s House of Lords on Nanotechnologies and Food^[6] highlighted the main uncertainties and challenges of introducing nanotechnology in the food and drink industries. One of the challenges is filling the gaps in knowledge of the interaction of nanomaterials with living organisms. The challenge is such that no single enterprise could shoulder a full toxicological study of a particular nanomaterial. In addition, such a study must be verified by an independent regulator, such as the Food Standards Agency (FSA) in the UK, the European Food Safety Authority (EFSA) or the Federal US Food and Drug Administration^[23].

Interestingly, there are considerable funds available for nanotoxicology fundamental research at national and international level, even in this current climate of public spending cuts and general austerity.

The government position is difficult due to the lack of robust knowledge both about the use of nanomaterials in commercial products and the best means of detecting and regulating them. The detection aspect is so serious that the Department for Environment, Food and Rural Affairs (DEFRA) and EU (Framework 7) are both launching their own calls for research into detection and characterisation of nanoparticles in food-related products. How can one regulate effectively if there is no way of detecting, counting and identifying the nanoparticles involved?



Trade organisations

Numerous trade organisations, representing the industry as a whole, are gearing up for the challenge of representing a growing number of members who are interested in finding out more about nanotechnology, or are already working on some research and development in this area.

Trade associations are best suited to maintaining high quality and objectivity in monitoring and, if required, regulating nanotechnology usage. This task has traditionally been assigned to governmental organisations, but in light of recent political changes in the UK and the austerity measures being adopted, the government will have little appetite to run costly monitoring and regulatory programmes. This paves the way to a self-regulatory path for the industry, which cannot be followed in isolation from other stakeholders such as the non-governmental organisations (NGOs).

Non-governmental organisations

Non-governmental organisations (NGOs) such as Greenpeace^[24], Friends of the Earth^[25], ETC Group^[14] and the UK Soil Association^[13] have argued for many years that the use of nanotechnology in everyday life should be limited if not eradicated. The report by Friends of the Earth in 2008^[25] called for a "moratorium on the further commercial release of food products, food packaging, food contact materials and agrochemicals that contain manufactured nanomaterials" as well as completely transparent and clear labelling.

Most NGOs aim to become the true voice of the public, but fall short of that expectation due to the same problems in communication. The work of NGOs is invaluable in pushing forward a conservative message about any technology. This brings some balance to discussions and lobbying going on at local, national and international levels. A well-developed and balanced approach to the food safety debate in the EU has avoided several serious public backlashes in the past and has led to EU parliament policies on novel foods.

Outstanding issues

Commercial viability

Nanotechnology offers great cost and energy savings in the food and drink sector through improved packaging and product monitoring technologies. In order for the technology to be implemented responsibly, these cost savings need to be offset by the necessary expenditure on toxicology, life cycle and end-of-life product research. The public needs thorough dialogue to be satisfied that nanotechnology is the best solution for energy savings, for reducing waste and for food supply in general^[27].

Labelling

Labelling may offer a solution for a transparent and responsible use of the technology, yet it is unclear how the toxicology knowledge gaps will affect future acceptance by the public of nano-labelled products. At present there is no clear consensus with regard to labelling, but nanomaterial labelling may enter the consumer market very soon considering the efforts from the EU to provide some framework for novel foods accountability and transparency.

Toxicology

Issues with the long-term effects of nanoparticles need to be addressed as soon as possible. It is, however, important to realise that such studies take time and funding. Some work has already been done for a small number of material and particle size compositions. The FSA^[3] has recently launched a number of studies on the effects of nanoparticles. DEFRA has tendered out a large contract to find and evaluate nanomaterial detection techniques. These are all steps in the right direction.

International dimension

The World Health Organisation and its International Food Safety Authorities Network (INFOSAN)^[28] aim to encourage the flow of information between countries and stakeholders on an international stage. Nationally, the UK Institute of Food Research^[29] and the Food Standards Agency^[3] work closely with technology developers, consumer groups and regulators to fill the knowledge gaps that are influencing acceptance of the technology.

“More investment in research and measurement technology is required before wide-scale acceptance can be anticipated.”

“New frameworks need to be established to enable a more open and collaborative approach to take root and flourish.”

Detection and monitoring

In order to regulate and control the use of nanomaterials in the food and drink sector, it is of paramount importance to be able to detect and characterise reliably any nanomaterials in the food chain. At present the detection techniques are either too costly, too slow or inadequate for detecting nanoparticles in certain forms. More investment in research and measurement technology is required before wide-scale acceptance can be anticipated.

Having these measurement tools will no doubt lead, in turn, to other questions such as, which nanoparticles do we need to regulate against? At present our foods are full of a large number of particles, some of which reach nanometre scale. Would we need to call milk, cheese or chocolate nanofoods? Would we open Pandora’s box with this new measuring technology? One point is certain: there is no blanket approach – every product must be studied on a case-by-case basis.

Joined-up thinking

NGOs and industry players have much more in common than is generally recognised. Recently, some NGOs have begun to break the traditional “us and them” attitude towards government and private sector organisations and this is a development to be welcomed. After all, each major player within this debate has a vested interest in striving for responsible and sustainable use of nanotechnology. New frameworks need to be established to enable a more open and collaborative approach to take root and flourish.

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College Hill advises in or near the boardroom on communicating with the principal stakeholders in business, notably the media, employees, influencers and capital markets.

Its Crisis and Issues practice focuses particularly on servicing clients in the food and drink industry – providing a depth of insight it believes is second to none.

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BREC provides advice, training and funding application services to public and private sector organisations of various sizes.

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