

House of Lords Science and Technology Select Committee

Call for Evidence: Nanotechnologies and Food

Evidence submitted by the Institute of Nanotechnology

State of the science and its current use in the food sector

- What are the main potential applications and benefits of nanotechnologies and nanomaterials in the food sector, either in products or in the food production process?

Includes processes to encapsulate chemical compounds within foodstuffs (such as vitamins, minerals, flavours, aromas) and protect them from degradation before consumption (e.g. moisture, oxygen) or allow them to be absorbed better by the gastro-intestinal tract. Such processes include nano emulsions, liposomes, solid lipid nanoparticles. This has the benefit of adding nutritional value to processed foods. Other advances are in packaging where nanocomposite materials can increase gas barrier properties thus helping maintain the desired environment of the packaged foodstuff (e.g. prevent fizzy drinks going flat, reduce the rate of food spoilage). For food production, coatings of nanostructured materials can help prevent microbial build-up and fouling of machinery.

- What is the current state of the market for, and the use of, food products and food production processes involving nanotechnologies or nanomaterials, either abroad or in the UK?

Packaging materials containing nanoclays are being used by a number of companies, including Miller Brewing, for bottles, coatings on paperboard, and films. Such materials are manufactured by companies such as Bayer (Durethan), Honeywell (Aegis), and Nanocor (Imperm). There are a number of companies manufacturing delivery systems for nutrients such as Aquanova (based in Germany- most of the others are outside the EU). Several companies within the EU manufacture nanostructured coatings and filtration systems that could have applications in the food processing industry, including ItN Nanovation, SuSoS AG, Few Chemicals GmbH, Sarastro GmbH, NanoGate and Aquamarijn Micro Filtration bv.

- What might the 'next-generation' of nanotechnologies and nanomaterials look like? How might they be applied in the food sector, and when might they enter the market?

There is much research into next generation biodegradable polymers for packaging purposes. The rationale is to use materials that would normally be regarded as waste (e.g. stalks from cereal plants), process the cellulose into nanostructured material and combine with other materials such as nanoclays to provide a robust composite that can be composted at the end of its useful life. For foodstuffs we will see evermore ingenious emulsion technologies, allowing multiple nutrients/minerals to be stably incorporated in different foodstuffs according to their solubility, and we will see lower fat, lower salt and lower sugar processed foods, that from the consumer's perspective will still taste the same. These could be expected on the market within the next 10-15 years.

- What is the current state of research and development in the UK regarding nanotechnologies and nanomaterials which have or may have an application within the food sector? How does it compare to research and development in other countries?

With the exception of Unilever and Leatherhead Food International, most industrial research on nanotechnology applications in agrifood takes place outside the UK, e.g. Germany (Bayer, BASF, Evonik). The hubs of academic research are Netherlands (Wageningen, NIZO) and US (Uni Mass, Rutgers, Rensselaer, Georgia Tech). In the UK we've have excellent polymer (e.g. University of Sheffield) and sensor research (e.g. University of Strathclyde) for food applications.

- What are the barriers to the development of new nano-products or processes in the food sector?

For food additives, the main barrier is consumer acceptance. The reality is that we all rely (at least partly) on processed foodstuffs. Nanotechnology applications can help increase shelf-life of these (while reducing the use of preservatives) and increase nutritional value.