

Royal Society submission to House of Lords Science and Technology Select Committee call for evidence on nanotechnologies and food

1. The Royal Society welcomes this opportunity to respond to the Select Committee's call for evidence on nanotechnologies and food. This submission has been prepared from previous policy work, and takes account of recent developments in nanotechnologies and food. Our submission focuses on aspects of the call under 'health and safety', 'regulatory frameworks' and 'public engagement and consumer information'.

Introduction

2. The Society agrees with the Select Committee that the use of nanotechnologies and nanomaterials in the food sector requires investigation. We first reported on the opportunities and uncertainties of nanoscience and nanotechnologies in 2004 (Royal Society and Royal Academy of Engineering 2004). At that time, we noted that nanoparticles and nanomaterials would find future applications in the food sector; we recognise that applications are now with us including food ingredients, food additives and food contact materials (e.g. Chaudry et al 2008).
3. Nanoscience is likely to bring benefit to manufacturers and consumers of foodstuffs and related products. We note however that technical, social and ethical uncertainties, that we documented in 2004 and which have not been wholly addressed, relate to nanotechnologies and food just as they do for other uses of nanoscience. Yet use in food brings new concerns in the areas of health and safety, regulation, public and stakeholder engagement, and consumer information.
4. There is need for openness and clarity in this area. There is a paucity of information on the current state of commercial development of nanotechnologies applied to food, not helped by industry reticence and by a general difficulty of determining genuine uses of nanoscience and nanomaterials in the commercial field. We would welcome a survey from the Select Committee of the extent of research, development and use of nanoparticles related to foodstuffs, to add to other organisation's inventories (see for example www.nanotechproject.org/inventories/). It would seem reasonable to say that commercial activity is in its early stages (Chaudry et al 2008). Therefore there remains a window of opportunity to address uncertainties, but it will close fast.

Health and safety

5. When we published our major report on the risks and opportunities associated with nanotechnologies in 2004, we concluded that most nanotechnologies posed no new risks. However, we highlighted at that time, and have done repeatedly since, that there is a lack of evidence about the risks posed by manufactured nanoparticles, particularly those that are free rather than fixed. Our concern has been updated and reinforced by the Royal Commission on Environmental Pollution (RCEP) report *Novel materials in the environment* which concluded that we remain ignorant about many aspects of the toxicology of nanomaterials (RCEP 2008:30).

6. The Food Standards Agency (FSA) has undertaken a review of current procedures for identifying, assessing and controlling any potential risks arising from the use of nanotechnologies or the presence of manufactured nanomaterials in food (FSA 2008). We note that the FSA concluded that whilst current approaches to risk assessment would be appropriate for nanomaterials, there are limited toxicological data on nanomaterials available at present (p15). The European Food Safety Authority (EFSA) came to a similar conclusion but went further, stating that the adequacy of current toxicological tests for nanomaterials has yet to be established (EFSA 2009). We have to improve our fundamental understanding of these substances and high priority must be given to ensuring that the underpinning research is undertaken to allow the assessment of risks associated with manufactured nanoparticles. The balance must be found between the amounts of funding allocated to the development of new applications compared with that being spent on the research needed to underpin the responsible development of these technologies.
7. In March 2007, the Council for Science and Technology said that Government had not made sufficient progress on its commitments to research, pointing in particular to research on toxicology and health and environmental impacts (CST 2007). We acknowledge that Government has directed or contributed to a range of research projects on risk and other aspects of nanotechnologies (e.g. DIUS 2008, Defra 2007). Previously we have argued for an alternative approach, suggesting that an interdisciplinary research centre with a directed research programme would be the best mechanism for addressing knowledge gaps (RS/RAEng 2004, 2006a, 2007). The House of Lords might consider if a fragmented approach can grow capability in the UK and lead to outcomes comparable with that which might be expected from an interdisciplinary research centre (physical or virtual).
8. The import of nanomaterials into the food chain through unintended or accidental means must not be overlooked. Previously we noted that organisms such as bacteria and protozoa may take in nanoparticles through their cell membranes, allowing the particles to enter a biological food chain and introducing a possible exposure route (RS/RAEng 2004:36). We note that the RCEP similarly considers incidental mechanisms by which nanomaterials may enter the food chain, and highlight that the issue of bioaccumulation and entry of nanoparticles and tubes into the food web has yet to be seriously addressed (RCEP 2008:38)

Regulatory framework

9. Mechanisms must be explored that support the commercial development of nanotechnologies and which take into account business interests whilst at the same time addressing uncertainties over the potential environmental, health and safety risks of some nanomaterials. The Society has had success in raising and discussing areas of uncertainty with business and industry, and we acknowledge that it does not only fall to Government to fund research into the potential implications of products. With Insight Investment and Nanotechnology Industries Association, the Royal Society held a workshop in November 2006 to explore strategic responses to technical, social and commercial uncertainties of nanotechnology. The workshop brought together 17 European companies with commercial interests in nanotechnologies from food and chemicals manufacturers to retailers of healthcare and fashion (Royal Society/Insight Investment/Nanotechnology Industries Association 2007).
10. Participants felt that business should be fully involved in the processes of agreeing common definitions, standards and regulatory approaches so that their needs could be taken into account. One of the main

outcomes of the workshop was unanimous agreement on the requirements for a voluntary Code of Conduct for businesses engaged in nanotechnology. To date *Seven principles of the code* and a series of *Examples of good practice* have been published (www.responsiblenanocode.org/). Some organisations represented on the Code Working Group have interests in the food sector. These representatives could be used to develop links with business and industry to explore the specific area of nanotechnologies and food.

11. The early initiation of discussions with businesses in the food sector may avert difficulties that have come to light in the cosmetics sector where environmental, health and safety research has lagged behind commercial exploitation. Lessons need to be learnt from the cosmetics experience. A particular concern concerns methods of risk assessment. The European Commission's Scientific Committee on Consumer Products (SCCP) has indicated that we cannot ensure the adequacy of risk assessment methods for cosmetic products containing nanomaterials, including products already on the market (SCCP 2007). We understand that attempts to assess methods have been hampered by industry reluctance to provide SCCP with information on the use of nanoparticles and methods employed for their risk assessment. We recognise that proprietary and other issues may limit the free and open exchange of information. Yet early discussion with representatives in the food industry may begin to address barriers to business and industry working cooperatively with Government and regulators.
12. Reluctance to participate is a pattern repeated in the Defra Voluntary Reporting Scheme for engineered nanoscale materials (VRS). We have previously said that if participation in the VRS was poor, then Defra should be prepared to take steps to make the scheme mandatory (RS/RAEng 2006b). With eleven submissions in the two years that the voluntary scheme was operational, take-up was not encouraging. We have no reason to change our opinion and recommend Defra look to put in place a mandatory reporting scheme. We note that the RCEP (2008) also recommended mandatory reporting of nanomaterials, and that the Canadian Government recently moved to introduce the world's first mandatory scheme (Sanderson 2009), although we understand that this will be a one-off request for information on material used in 2008 (see e.g. www.nanotechproject.org/news/archive/7061/).
13. We acknowledge that progress is being made towards understanding the fate and toxicity of particular nanomaterials (e.g. the work of the OECD, to which the UK Government is contributing; DIUS 2008; Defra 2007). The programme of work however must continually evolve, not only to address sector developments (such as the emergence of nanotechnologies applied to food) but also to assess, and if necessary control, coming generations of nanotechnologies and nanomaterials.

Public engagement and consumer information

14. Public perception is broadly well disposed towards nanotechnologies and public thinking on nanotechnology has previously been explored through engagement projects initiated by Government and others. This should not be considered a finished project. First, public perception is dynamic and may change due to myriad factors. Second, public dialogue on nanotechnologies needs to be more closely linked with policy making processes than has been the case so far. Third, public dialogue needs to be a long term commitment that follows and intersects with the evolution of the field, and considers significant developments as they arise. We suggest that nanotechnologies and food is an area that now needs focused public dialogue work and opportunities should be sought for the findings to feed into policy and innovation processes. A leading example from which lessons can be drawn is the recently

completed public engagement work by the Engineering and Physical Sciences Research Council (EPSRC) on potential applications of nanotechnology to healthcare. Public thinking was integrated into EPSRC's subsequent prioritisation process.

15. In 2004 we anticipated the use of free nanoparticles in consumer products including food, yet have been surprised at the speed with which products have reached the market. If food products containing nanoparticles reach the market whilst there are uncertainties over their possible health effects &/or methodologies used in their risk assessment (as has happened in the case of cosmetics), then those products should identify the fact that manufactured nanoparticulate material has been added (cf. RS/RAEng 2006a). But we stress that labelling is no substitute for prioritising research that reduces those uncertainties.
16. The issue of food labelling may be a good candidate for focused public and stakeholder engagement. Nanotechnologies have the potential to bring benefit to manufacturers and consumers, and open dialogue between the science, policy, commercial and public communities will be an important part of realising this.

References

Chaudry Q, Scotter M, Blackburn J, Ross B, Boxall A, Castle L, Aitken R, Watkins R. (2008). *Applications and implications of nanotechnologies for the food sector*. Food Additives and Contaminants, **25** 241-258

Council for Science and Technology (2007). *Nanoscience and nanotechnologies: a review of Government progress on its policy commitments*. CST: London. Available at: www2.cst.gov.uk/cst/business/nanoreview.shtml

Defra (2007). *Characterising the potential risks posed by engineered nanoparticles*. Defra: London. Available at: www.defra.gov.uk/environment/nanotech/index.htm

DIUS (2008). *Statement by the UK Government about nanotechnologies*. DIUS: London. Available at: www.dius.gov.uk/policy/documents/statement-nanotechnologies.pdf

European Food Standards Agency (2009). *The Potential Risks Arising from Nanoscience and nanotechnologies on Food and Feed Safety: Scientific Opinion of the Scientific Committee*. The EFSA Journal **958** 1-39. Available at: http://www.efsa.europa.eu/cs/BlobServer/Scientific_Opinion/sc_op_ej958_nano_en,0.pdf?ssbinary=true

Food Standards Agency (2008). *Report of FSA regulatory review*. Available at: www.food.gov.uk/multimedia/pdfs/nanoregreviewreport.pdf

Royal Commission on Environmental Pollution (2008). *Novel materials in the environment: the case of nanotechnology*. Available at: www.rcep.org.uk/novelmaterials.htm

Royal Society, Insight Investment, and Nanotechnology Industries Association (2007). *How can business respond to the technical, social and commercial uncertainties of nanotechnology?* Workshop report available at: royalsociety.org/document.asp?tip=0&id=6655

Royal Society and Royal Academy of Engineering (2004). *Nanoscience and nanotechnologies: opportunities and uncertainties*. RS Policy document 19/04. Royal Society: London. Available at: www.nanotec.org.uk/

Royal Society and Royal Academy of Engineering (2006a). *Joint Academies response to Council for Science and Technology's review of Government's progress on nanotechnology*. RS Policy document 35/06. Available at: royalsociety.org/document.asp?tip=0&id=5451

Royal Society and Royal Academy of Engineering (2006b). *Response to Defra's consultation on a proposed voluntary reporting scheme for engineered nanoscale materials*. RS Policy document 14/06. Available at: royalsociety.org/document.asp?tip=0&id=5039

Royal Society and Royal Academy of Engineering (2007). *Joint Academies initial response to the Council for Science and Technology's review of Government's progress on nanotechnologies*. RS Policy document 11/04. Available at: royalsociety.org/document.asp?tip=0&id=6179

Scientific Committee on Consumer Products (2007). *Opinion on safety of nanomaterials in cosmetic products*. European Commission: Brussels. Available at: ec.europa.eu/health/ph_risk/committees/04_sccp/docs/sccp_o_123.pdf

Sanderson K (2009). *Tighter nanotech regulations touted*. Nature **457** 647.

Contact

Please send any comments or enquires about this response to:

Matthew Harvey
Senior Policy Adviser
Science Policy Centre
The Royal Society
6-9 Carlton House Terrace
London SW1& 5AG

matthew.harvey@royalsociety.org