TUESDAY 31 MARCH 2009

Present

Crickhowell, L
Haskel, L
Krebs, L (Chairman)
Methuen, L
Neuberger, B
O'Neill of Bengarve, B
O'Neill of Clackmannan, L
Selborne, E

Witnesses: **Dr Andrew Wadge**, Chief Scientist, Food Standards Agency, **Dr Stephen Axford**, Head of Science and Society, Department for Innovation, Universities and Skills and **Mr John Roberts**, Head of Chemicals and Nanotechnologies, Department for Environment, Food and Rural Affairs, examined.

Q1 Chairman: Good morning, I should like to welcome our first three witnesses; this is the first public hearing of the Select Committee's inquiry into nanotechnologies and food and I should like to thank you very much for coming to join us to kick off our inquiry. I should inform you that the proceedings are being webcast, so your *sotto voce* comments will be picked up and broadcast to the nation. I should also draw attention to the information note which is available to members of the public. This sets out the interests which have been declared by members of the Select Committee, so I will not be asking members to repeat their interests whilst they are asking questions because you have those written down. Before we start on our questioning I should like to invite the three witnesses to introduce themselves and also, if they have any opening statement they would like to make at this stage, to make a statement please. Perhaps we could start with Dr Axford.

Dr Axford: Stephen Axford from the Department for Innovation, Universities and Skills, where I am responsible for Science and Society. That comes with a specific interest relevant

to today of the public engagement, public dialogue and attitude of the public towards the science.

Dr Wadge: I am Andrew Wadge. I am the Director of Food Safety and Chief Scientist at the Food Standards Agency, so considerable interest obviously in the topic today.

Mr Roberts: I am John Roberts from the Department for Environment, Food and Rural Affairs. I head the division which deals with chemicals and nanotechnologies.

Q2 Chairman: Are there any general comments that the three of you would like to make before we move to the questions? Do you have any prepared opening statement you would like to make or are you happy just to go to the questions?

Dr Wadge: I am happy to go straight to the questions.

Q3 Chairman: I will kick off with a very general question which is to ask you how the Government see the opportunities and challenges for nanotechnologies in the food sector. We are obviously just starting this inquiry but we have heard various comments about the very large potential for nanotechnologies in the food sector, which is of course why we are carrying out this inquiry at this point. I should be interested to hear your views on both the opportunities and the challenges.

Dr Wadge: The words "potential" and "challenge" are very much pertinent here in that a lot of the applications are very much at a potential stage; they are still in the laboratory. There is a lot of talk about what might be in the future in terms of applications, perhaps in food contact materials or in relation to specific ingredients. Those are potential applications which may bring benefits for food manufacturers and possibly for the consumers as well. In terms of challenges, our number one challenge, certainly from the Food Standards Agency perspective and Government perspective more generally, will be to ensure consumer safety. It is assessing the safety and looking at whether the risk assessment paradigms are appropriate, looking at

the regulatory framework, whether the current regulatory framework is appropriate and also another challenge is around consumer and public engagement and understanding of nanotechnologies. We have obviously learned from previous experience where technologies have developed without some appreciation and understanding amongst the public that whilst on one level they may confer certain benefits, if the public are not convinced or are mistrustful of those benefits, then they will not be interested in purchasing the products. In general there is tremendous potential there but it is very much at the potential stage; uncertainties exist in terms of what that might mean and real challenges centre around assessing safety and public acceptance.

Q4 Chairman: I do not know whether the other witnesses wish to add anything at this point. You say that the development is still at the laboratory stage and we will come back to that later on in the session to try to understand where we are. Are you talking about the UK or are you talking about globally when you refer to the product still being at the research and development stage rather than in the market?

Dr Wadge: In general, a lot of the potential is still in the laboratory stage. There are products on the market globally and there are two products that we are aware of that are currently on the market in the UK; rather niche products, I have to say, that are both food supplements. It is very much the case that we are looking at potential applications in the UK rather than products on the market but we are aware that in other parts of the world there is perhaps a greater range of products on the market.

Q5 Chairman: What areas do you think the applications are likely to be in and are the Government doing something to encourage development of those applications?

Dr Wadge: I will leave colleagues to talk about the extent to which we are encouraging the innovation of new technologies. The main areas in relation to food are food contact materials

and the opportunities that are present for nanomaterials to provide greater impermeability. I see prevention of permeability, antimicrobial applications, perhaps intelligent packaging and sensors and also, in terms of food ingredients, greater solubility of fatty materials in an aqueous media, ingredients and contact materials as the most likely. That is the intelligence that we have got from our conversations and discussions with the food industry.

Q6 Chairman: What about initiatives? Maybe DIUS can give us a view on initiatives for encouraging nanotechnology development.

Dr Axford: Yes. We would have to look to the structures we have in place such as the Technology Strategy Board, Knowledge Transfer Networks and so forth which are ways of getting the science out of the laboratory and into those businesses which can find ways of developing innovative products and developing the commercial opportunities.

Q7 Chairman: Can you say anything more specific about that?

Dr Axford: I do not know a huge amount of the detail of some of those specifics around particular technologies, certainly not specifically in relation to food. I would have to look to colleagues who were closer to the food sector.

Chairman: Perhaps that is something you could send us a note on to follow that up, just to look more specifically at what is being done to encourage R&D and translation in relation to food.

Q8 Lord Crickhowell: We had a seminar the other day with a wide representative group of advisers and I asked the same question then. We are told today, as we were told then, that there are only two known products, supplements and so on, in this country; we are going to cover questions about European legislation later. However, the fact is that we live in a global world and therefore I am rather sceptical about the view that because products are not known

to be here, that are known to be in use in other parts of the world, they will not be here and it seems that if they are not now, they very soon will be, either in large quantities or brought in in various ways. Could you enlarge a little on this slight disregard for what is happening globally elsewhere? We heard, for example, of one manufacturing company based in the United States and what it was doing in the way of research and so on. Clearly there is a great deal going on in other parts of the world. How are we setting about really seriously identifying the global impact, which must be a UK impact as well?

Dr Wadge: I certainly would not want to give the impression that we are complacent about what is happening around the world. That is partly why we have commissioned two projects and we have provided you with reports on them in terms of what the current state of the market is. We have not been solely looking within the UK; we have been looking more broadly. You are absolutely right; if products are being developed in other parts of the world then we have a global food supply. Obviously within Europe we have European food legislation which requires that any food which is imported into the UK or any other part of the EU needs to meet at least the level of food safety requirements within the EU. That provides some reassurance but that is why we need to look at specifically improving methods of assessing the hazard characterisation and identification, exposure assessment, better understanding about what happens when nanomaterials are ingested, how they are distributed through tissues in the body and the toxicity of these materials. Those will be important areas for research that go along side by side with the development of the products. It is important as well that we tailor the research to meet the specific nature and properties of the nanomaterials which are being developed.

Q9 Lord Haskel: Dr Wadge spoke about the challenges of safety and public engagement. It seems to me that one of the challenges would be, from the point of view of the man in the street, the fact that these materials are so small. Are we able to detect them so that we know

whether they are present or not? Is the state of the science of detecting them sufficiently advanced as well?

Dr Wadge: Yes, it is a significant challenge and it is one which we will need to address over the years. At the moment I do not think we can be clear about the distribution of nanomaterials within the body, whether we can detect them in tissues and therefore to carry out a full and complete risk assessment you would need that type of information.

Q10 Lord Haskel: Can we detect them in food?

Dr Wadge: It depends what we are talking about. Part of the challenge here is that we are talking about nanotechnologies, a whole range of different technologies from micelles to hard particles to biodegradable particles. Certainly, with products which are going to be approved and put on the market, that is something which we will look at very closely to make sure that there are appropriate testing methods and means of assessing the exposure and the safety of those products.

Q11 Baroness O'Neill of Bengarve: This is a very general question. How do the Government coordinate their work on nanotechnologies? How do they strategise? How do they prioritise funding through research and innovation? I should say that in the next question we will come to some more specific points about the Nanotechnology Research Coordination Group, so we know that exists. Generally how do the Government coordinate?

Dr Axford: Taking an overview of that, you mentioned the Research Coordination Group and that is down a level below the strategic. There is a ministerial group on nanotechnologies, currently chaired by Lord Drayson, including representatives speaking for the ministers who speak for health and safety; I think that is Work and Pensions. Other members of the high level ministerial group are Huw Irranca-Davies from the Department for Environment, Food and Rural Affairs, Dawn Primarolo from Health, Lord McKenzie of

Luton, responsible for health and safety and Ian Pearson from Business, Enterprise and Regulatory Reform. That sets Government's direction on nanotechnologies overall; obviously not exclusively with relation to food but across the piece. Below that there is also effectively a policy group called the Nanotechnology Issues Dialogue Group. That allows the Government to coordinate activity at a policy level, that is between all interested parties, between Government and other stakeholders. Then there are other bodies such as the Nanotechnology Research Coordination Group which looks at how the publicly funded research, say in research councils and elsewhere, is covered and looked after. Then there is a number of other groups as well which inform those various bodies such as the Stakeholder Forum which is open to the public, which allows wider views to be input to the system.

Q12 Baroness O'Neill of Bengarve: That lists the bodies, which is extremely helpful. When we come to the actions which are taken, for example in December 2006 the DTI – of which I take it DIUS is the successor body here – published a review of the framework of current regulations covering nanomaterials. How are the Government responding to that review? Who is coordinating the response specifically?

Dr Axford: In relation to how it responds on the nanotechnology regulations, that is Defra.

Mr Roberts: The BRASS report reviewed the regulations which were applicable to nanotechnology and demonstrated in fact that there is a very wide range of potential regulations. Many of them in fact derive from European regimes; many of the regulatory regimes are determined by European legislation. We are currently pulling together responses from departments because a wide range of different departments have responsibility for the particular regimes and we are asking them to make sure that they continue to have regard to nanotechnology issues as they develop those regimes. The European Commission has also published its own review of the European regulation; that was done towards the end of last

year. They also are monitoring and keeping an eye on how those various regimes need to respond.

Q13 Baroness O'Neill of Bengarve: In their evidence to us DIUS talked about the development of a national strategy for nanotechnologies. What progress is there at this point on that strategy and who is responsible for coordination?

Dr Axford: Agreement to the strategy will be taken by the ministerial group. They are next meeting towards the end of April, when they will agree the way ahead for the next steps of the strategy, potentially including a consultative process through the summer into the autumn. That is where that is at the moment.

Q14 Baroness O'Neill of Bengarve: So there is a draft strategy at this point.

Dr Axford: I do not believe there is a draft strategy.

Q15 Baroness O'Neill of Bengarve: The workings for one?

Dr Axford: It is certainly work in progress with, no doubt, an awful lot of evidence and information already collated. It has to capture the work of many other parties who are also similarly developing what you might call strategies both on the research end but also the Technology Strategy Board also has its own development of a strategy for nanotechnologies. Government have to somehow capture all of these in their overarching strategy.

Q16 Baroness O'Neill of Bengarve: It is now nearly five years since the Royal Society and Royal Academy of Engineering report on nanotechnologies was published. Is this not quite a slow pace at which to be developing a strategy?

Dr Axford: I do not know the answer to that question. I would imagine that it is an incredibly complex area and as others have already alluded to, there are huge issues around knowing who should be accountable, who should be responsible, where the regulatory

regimes reside and I imagine it is finding one's way through the forest which is slowing it down.

Q17 Lord O'Neill of Clackmannan: What was the purpose of the 2006 review which followed the Royal Society and Royal Academy study? DTI published a review of the framework of current regulations and nanomaterials; that was in 2006, three years ago. It does seem an unconscionably long period. Who is responsible? Which department was responsible for leading on this?

Mr Roberts: May I just answer that slightly differently by saying that the government approach is based on two things? First of all we need to get the science in place because the science has to underpin the way that the regulatory system develops. Then we need to keep an eye on the regulatory system. To the extent that it needs to be changed, we need to make the changes. The BRASS report showed that in a lot of areas the regulation is in principle capable of dealing with nanotechnology, provided that one understands the risks and the hazards that nanotechnology may present. It is a question of developing the science and developing the regulation step by step to keep the two together. Would it be helpful if I talked a little bit about how the research agenda has been carried forward since the Royal Society report, because I think that may help?

Q18 Chairman: Yes.

Mr Roberts: Following the Royal Society report the Nanotechnology Research Coordination Group identified 19 research priorities which were set out. There are five taskforces under that coordination group which take forward particular aspects. Those are to do with measurement and detection and characterisation of nanomaterials, fate and behaviour in the environment, human toxicology, co-toxicology and social engagement. It has taken a while to get momentum on the research, but it is true to say that the research is now accelerating. Over

the period 2005-2008 the Government spent about £10 million on research in these areas and I suspect the pace has picking up since. I can refer to a number of particular initiatives but not an overall figure. I just make the point that some of the research we are doing for underpinning regulation is actually also relevant to innovation. For example, characterising and detecting nanomaterials is important for regulation, but it also forms the basis for the industry to take forward, so some of the research covers more than two areas. In terms of research, last year we commissioned an independent review of the progress we have made on those 19 research objectives, a very comprehensive piece of research which was done by a team of academics and it will be published very shortly; it is going through peer review and final preparation for publication. That was encouraging in the sense that they found a lot of evidence that progress is being made on all the research objectives but it also indicated that on none of the research objectives have we yet completed the task. We do not yet know the answer fully on any of the research objectives. What we are going to do with that research is to use it to revisit the 19 research objectives to identify the gaps and the next directions so that we can take forward the next phase of research. If I may, the other two points I would make about research are first of all that we need to do this internationally. As Lord Crickhowell was saying, the issue is global; there is a lot of experience in other countries and we can get much better results if we coordinate our research programmes. That is being done through OECD, which has a similar structure of task forces, and we are sharing out research tasks among us to cover the field. The other observation is that the most productive research tends to come from collaborative projects involving different institutions and different disciplines. We are seeing much stronger results coming through from that, although it does take a little bit longer to get the research proposals put together and in place. In my own area, two quite exciting issues are the environmental nanoscience initiative, the second phase; the first phase was worth about £850,000, the second phase will be worth about £4.5 million and almost half

that money is coming from the US because we have a partnership with the US EPA, so we will get the benefits of collaboration there. OECD has set out an ambitious programme to look at 14 of the most commonly produced nanoparticles. We are taking forward analysis of two of them; as it happens they are not food products but cerium oxide and zinc oxide. We have just launched a £3.5 million programme to characterise those two nanomaterials. Other countries will be doing others which are on the list. When that work is done we will know about those particular substances in much more detail but we will also have a much better knowledge of how to do the assessment of nanomaterials, how to do the characterisation, the measurement and the assessment of health and safety implications.

Q19 Lord Methuen: We have talked quite a lot about the national Research Coordination Group but in 2007 the Council for Science and Technology expressed concern over the progress of funding for health and safety research. You indicated that quite a lot of progress has been made in addressing these concerns. Would you comment on that?

Mr Roberts: Those were the points I have been covering to some extent. The EMERGNANO report has looked at something like 650 projects which have been financed globally over the last three or four years. It has demonstrated that there has been progress on all of our research objectives but there is still progress to be made on all of them.

Q20 Lord Methuen: The CST stated that the primary reason for this lack of research was the Government's over-reliance on responsive funding to deliver the necessary research. What has been done to overcome that problem or would you not agree with that?

Mr Roberts: The question of funding is an important one and the route we have chosen to go down is using the existing mechanisms and existing programmes and seeking to coordinate them, for example relying on the budgets of my department to look at environmental issues, the Medical Research Council and the DoH to look at toxicological issues, the Food

Standards Agency to look at food issues. This has the strength that the research is embedded in those departments' programmes and those are the departments who will need to use the research for their regulatory processes but it does not mean that we have a single centrally directed budget to drive forward the research.

Dr Axford: In terms of research councils, there is a major cross-council programme on nanotechnology and even within that, on the issues, for example, of toxicology, the Medical Research Council has specifically had a call to look at that area, to look at the implications of nanotechnology on health to the tune of about £3 million.

Q21 Lord Methuen: What is being done to look at the long-term effects of possible toxicity due to nanomaterials?

Dr Axford: I would imagine that will be part of the research undertaken.

Q22 Lord Methuen: But you are not aware of what is going on at the moment.

Dr Axford: No, not the detail of what has actually been funded under that programme.

Q23 Chairman: What sort of response has there been to the MRC's call?

Dr Axford: It is fully taken up. It is a direct programme but it is obviously there to be responded to[1].

Q24 Chairman: Mr Roberts, in your helpful summary of the OECD assessment of risk associated with 14 nanomaterials, as I understood it the 14 did not include any potential food applications. Do you think it should?

Mr Roberts: I think it is right that it does not contain many that are connected with food, although possibly the nanoclays may be used in bottles and therefore may have some link

[1] "To date the MRC has made five awards totalling approximately £3 million from response (not directed) mode funding. There is an open call and the submission of further proposals is being encouraged. Details are included in the additional written evidence provided by DIUS".

with food. They were chosen on the basis that they are ones which are in production now and therefore where there is potentially exposure to the environment or to human beings from those. It is those where we have some evidence available in order to make the assessments. It was a programme designed to capitalise on what we already have and the challenges we face today rather than a more prospective programme looking at potential applications in future.

Q25 Chairman: We have heard that, for example, the nanosilver particles are used in food contact materials like chopping boards or refrigerators. Is nanosilver included in the list of 14?

Mr Roberts: It is. Nanosilver was identified by the Royal Commission as one that was potentially something we should be concerned about. Defra has asked our Advisory Committee on Hazardous Substances to have a look at the issues around nanosilver and they are due to give us preliminary advice, although it will require some further work.

Q26 Earl of Selborne: On silver, when you mentioned earlier that there were two known food products with nanoparticles, was silver one of them?

Dr Wadge: Yes, in relation to a supplement.

Q27 Earl of Selborne: Yet the European Food Safety Authority has said that there is not enough evidence to suggest that this is cumulatively safe. How is it then that this has got through the system already?

Dr Wadge: Yes, that is one which will fall within the system; at the moment it is outside the system, it is quite a niche product and has been around for a long time. Under the new controls on supplements, that will fall out of the permitted list from January next year, 2010, because the safety data has not been provided to support that.

Q28 Earl of Selborne: That means that the material which is already available will be withdrawn.

Dr Wadge: Yes.

Q29 Lord Crickhowell: May I ask a general question and then follow up with a specific one which has already been touched on? Mr Roberts, you have been giving very helpful and impressive evidence, if I may say so. We were a bit surprised that Defra's response to our enquiries was a one-page note on pesticides. We wondered what Defra were up to. Clearly Defra are more heavily involved than that indicated. You have been doing your best to cover a lot of ground in response to specific questions. Surely what we are going to need from you is a pretty detailed report from Defra about all this work you are clearly engaged in and about which we have not yet been informed except by you this morning. May I ask that you follow up your evidence – I hope the Chairman agrees to my request – with a really detailed account from Defra of what you are doing, covering all these points you have been talking about and adding any more that you would like to include. May I then put my specific question which follows two which have already been asked by Lord Methuen and the Earl of Selborne in a way and that is on long-term toxicology? Certainly the medical evidence that we received in an interesting seminar we had indicated that we do not really know a great deal yet about long-term effects. We know a good deal about the way the gut absorbs and the effectiveness of the gut in dealing with all the normal things, including some of the natural nanoparticles which it has been dealing with for millennia, but we do not know the long-term effects yet and we do not know therefore how these nanoparticles move on into the other parts of the body, the brain particularly and so on. Is one of these 19 research projects really homing in on the need for this long-term assessment of nanoparticles on the human body? If not, what is going to be done about it?

Dr Wadge: While John is looking through the particular 19 projects, I should like to comment on that, if I may? One of the real challenges for us is around the toxicological assessment and the risk assessment. We have received advice from our independent Committee on Toxicity and also the independent panel which advises the European Food Safety Authority that whilst the current risk assessment paradigm is appropriate there are considerable gaps in our understanding along the way around exposure and distribution and toxicity. I think that there will need to be a considerable amount of research in this area and I know that the MRC are picking up some of that. However, it raises bigger, wider questions about whether we have the appropriate capacity of toxicologists within the UK and that is something we need to look at. I am sure that at an OECD level, consideration will be given to develop harmonised risk assessment processes for nanomaterials. OECD currently agree the toxicological assessments for long-term effects of contaminants and other chemicals and it will be OECD which agrees those risk assessment methods for the very specific thing you mentioned around long-term toxicity. You are absolutely right that this is an area which will need a lot more research.

Q30 Chairman: Before we move on to the next question, perhaps we could home in on the particular issue of toxicology in the gut which Lord Crickhowell mentioned. We have gained the impression that, at least in this country, there is rather limited expertise in that area which is crucial of course to understanding potential risks associated with food. I just wondered, either from the Food Standards Agency or from DIUS, how many grants have been issued for research in relation to toxicology of nanoparticles in the gut which would be a central issue in understanding and filling the gaps.

Dr Wadge: We have just put a call out for our first project on the toxicokinetics of nanoparticles and that will be a collaborative project. We are very much at the early stages here. The research we have commissioned so far has been to carry out reviews: reviews of

what products are available; reviews of the regulatory framework; reviews of public engagement and public attitudes to nanotechnology. We are very much at the early stages and a lot more needs to be done. I am not familiar with what MRC are doing.

Dr Axford: I am not familiar with the absolute detail of what the specific projects are. We could come back to you with information on that.

Chairman: Please do.

Q31 Lord O'Neill of Clackmannan: Much play has been made of the OECD and EU. Where are our partners in these organisations in relation to research and in relation to the seemingly endless process of reviews that you have been telling us about this morning? Are we missing out on other people's research or are we further ahead? At the moment we do not really know how we are comparing against, let us say, the French or the Germans or the Italians or the Swiss. I am not asking for a league table but we need to know how you are behaving or how you are performing by comparison with people alongside whom you are supposed to be working in these international organisations.

Mr Roberts: If I may say on nanotechnology generally rather than on food, my impression is that the amount being spent on EHS, environment, health and safety issues is broadly similar in three markets, Japan, Europe and the US? They are broadly of similar orders of magnitude both in terms of investment in innovation and investment in health and safety research. We can see whether there are more detailed figures and if the information I have given is not absolutely right, I will try to provide something in more detail.

Chairman: It would be helpful if we could have some figures on that.

Q32 Lord Haskel: Like other members of the Committee I am quite impressed with all the work that you are doing on getting the science in place and getting the research done. Meanwhile this industry has to be regulated. It seems to me that the first thing you do when

you regulate is to define what it is that you are regulating. I wonder whether you could tell us how you are going to define nanotechnologies and nanomaterials in this context of regulation.

Dr Wadge: There are very many definitions out there at the moment and we provide the BSI definition in our evidence to you. I know that the European Commission is also looking at definitions currently in relation to cosmetics but what they have agreed there will also no doubt be broadened out at some point in relation to food. From our perspective it is not so much the exact precise cut-off point in terms of size, it is far more around the properties which will have a bearing on the risk assessment; whether it is biodegradable or not, whether it is persistent and so forth, those are the key points. It is important that there is some agreed definition and that is something which is being worked up at a European level because that is where European food law is agreed.

Q33 Lord Haskel: Is this work on agreeing a definition within Europe proceeding through the European Parliament Committee on the Environment?

Mr Roberts: May I make two observations? First of all, I am not sure it is clear that we have to have a common definition of nanotechnology across all regulatory regimes. Clearly we need consistency; we also need to deal with the circumstances of each regime. A lot of regimes will say that products have to be safe and they have to be safe irrespective of whether they contain nanotechnology or not. If they contain nanotechnology then of course there has to be an assessment of the nanotechnology component but you do not have to define nanotechnology in legislative terms in order to achieve that. In terms of chemicals and nanotechnologies generally, the EU Scientific Committee on Emerging and Newly Identified Health Risks has proposed some definitions. I can provide a copy of these but for nanomaterials it simply says any form of material that is composed of discrete functional parts, many of which have one or more dimensions of the order of 100 nanometres or less.

Q34 Lord Haskel: So it is size.

Mr Roberts: It is size as the starting point for consideration of risk.

Q35 Chairman: Does that make sense toxicologically?

Dr Wadge: I think it does as a useful starting point. If I may broaden out to the regulatory framework in relation to food, we have looked at that and asked the very specific question as to whether nanomaterials, nanotechnology, nanoparticles will fall under the current regulation or could somehow squeeze through the current regulatory framework. We received some reassurance on that point from that review. Under general food law there is a requirement on food businesses to make sure that any food which is put on the market is not unsafe. That provides a general level of safety. Then there are some specific pieces of legislation relating to novel foods, food additives and food contact materials. The food additives regulations have recently been amended so that where an existing food additive is produced through nanotechnology it would have to be assessed by EFSA for its safety, so it would have to go through some independent assessment. Similar proposals are currently underway and we are supporting those for the novel foods and food ingredients regulations, also for food contact materials. There is a sense that the existing regulation, once it has been strengthened to capture the specific requirements around altered particle sizes and changed composition and properties of nanomaterials, that they would be captured under the regulations.

Q36 Lord Haskel: What definitive view then are you giving to the food industry if they come to ask you whether to label something as a nanomaterial or not?

Dr Wadge: Labelling is a separate issue. The first point is whether it would be permitted and we would provide advice, as we do generally and we are in discussion regularly with the food industry about products, about whether they fall within certain requirements of novel food legislation and so forth. If we felt that it was a novel property or a new size that was being

produced, then our advice would be that it would need to be submitted for pre-market approval under the novel food regulations or food additive regulations.

Q37 Lord Crickhowell: What measures are currently in place to allow the Government to monitor the use of nanotechnologies in the food sector?

Dr Wadge: That is something that is being considered at the moment. Obviously if we are starting from a point where there is not very much on the market in the UK we need to look at what our role might and should be in relation to monitoring the use of that technology. There are proposals for the European Commission to produce a European register of nanotechnologies in relation to food and we also have the option of producing something within the UK. Our current thinking is that it would make sense to work alongside the Commission to make sure we are familiar with what they are doing and to see whether we then need to add a further register within the UK. In terms of really understanding what is happening in the market, a register clearly could be very useful. However, our experience has been that as useful for us certainly is the regular dialogue that we have with all parts of the food industry about the technologies that they are developing, the products they are developing and how they fit within the regulatory framework. I have to say that a register might have some benefit in terms of actually dispelling some of the myths which are currently around that somehow nanotechnologies are being widely used in food currently on the market in the UK because those are some of the suggestions I have read in some articles. So a register might be helpful in terms of dispelling myths in that way and setting straight what products really are being used and not being used.

Q38 Lord Crickhowell: At one point in your answer I thought I was going to sum up as "There are no measures currently proposed" but you actually then said "We have our usual ongoing discussions with the food industry and they are really the existing measures".

However, in your evidence you did say that you were seriously considering a register. If you did have it, how do you think it would work?

Dr Wadge: It is still very early stages and we are still thinking that through and we want to see what the proposals are from the Commission. I have to say that it is not something we have done in any other field and we need to think through the benefits of that. We do not, for example, have a register of GM technologies that are used, a register of other different types of technologies which are used in food. We would need to think carefully about what the benefit of putting that effort in to a specific area such as nanotechnology might be and that is something we are considering.

Q39 Lord Crickhowell: Defra has a voluntary reporting scheme. How successful do think that has been?

Mr Roberts: It has not been terribly successful. It has only generated a dozen or so responses in the first two years. We are examining how we can make that more successful. There is a challenge here between industry's desire for confidentiality of new developments and our interest in knowing what they are doing.

Q40 Lord Crickhowell: You made exactly the point I was going to put to you. Is there not a real problem here because with the best will in the world I am sure many of the best companies are doing some very serious research and very responsible research and we have had an account of one company doing just that. But one is extremely sceptical about their willingness to reveal what they are doing, if it is going to make a difference to them in the competitive market if they suddenly have a smoother ice cream or dressing using much less fat or whatever they are seeking to achieve and want to show that it is of benefit to the customer and not just for themselves, which is the big lesson learned from the GM disaster.

So you have quite a problem, have you not, in getting real material out of companies about the research they are doing?

Dr Wadge: There is a genuine tension there is there not? However, we do have regular dialogue, for example we talk with beverage manufacturers around possible use of micelles to put colours in and so forth so there are technical developments which they are happy to discuss with us but they would not necessarily want to discuss more widely because of commercial pressures. The fundamental safeguard here is that these companies know and are very familiar with the need to make sure that their products fall within the requirements of general food safety and even wider than that the general requirements of the public acceptability. There will be a real caution amongst these companies about learning the lessons from the GM experience in terms of simply thinking that because they have some new bit of technical kit, somehow this will be broadly welcomed by the public at large. They are very, very cautious on that point.

Q41 Chairman: In the evidence that DIUS submitted it mentions that in Germany it appears from the table that there are 17 products on the market which use nanotechnologies. Presumably *de facto* those are also on the market in Britain because Europe operates as a single market? What kind of approval process have they been through?

Dr Wadge: I am not sure. They would be permitted under EU law but I am not sure whether they would be on sale in the UK. I am not sure what 17 products are being referred to there. I can refer to one specific product, which is the co-enzyme Q10, where we had quite detailed conversations with our counterparts in Germany around whether that particular product should fall within the novel food requirements and they were quite clear that the micelles which were being used were not changing the nature of the properties of the coenzyme Q10 so it did not need to go through that additional safety assessment. In a way that shows the ability of regulatory bodies such as ourselves to communicate, as we do regularly with

counterparts across Europe, so that where there are products on sale in one Member State we will talk and discuss as to why those products are on sale and whether they should or should not need to go through further assessments.

Q42 Lord O'Neill of Clackmannan: In the case of the Federal Republic there are two quite substantial supermarket chains, German owned and German directed. Has nobody thought of looking at their range of products and sending anybody to do that? This is quite a sizeable part of the supermarket market share in the UK. I would have thought that major players like that might well have been taking advantage of nanotechnology on some of their products.

Dr Wadge: You referred earlier on to the reviews that we are doing and two of the reviews were looking at the use of nanomaterials, food contact materials and food ingredients more generally and that showed very little is currently in use in the UK market, but we fully expect that to change and that is why we are so concerned about getting the regulatory framework and the risk assessment frameworks right in anticipation of that change.

Q43 Baroness O'Neill of Bengarve: Do you have a sense of the timeframe? How urgent is it? It is rather a different story, requiring the withdrawal of a large number of products which have been on the shelves and would have had bad effects on public confidence in the technology and preventing them getting on the shelves until the assessment has been done. How much time do you think you have to get this regulatory framework in place?

Dr Wadge: The particular silver product that we talked about earlier is an anomaly in the sense that it is a product which has been around for some time, it is a rather niche product, as a food supplement it will fall from the permitted list and no longer be permitted. What I was trying to explain earlier is that the regulatory framework is such that any nanoparticle that is either changing the size or the nature of the property of the material will need to go through

additional safety checks so that we will not be in a situation where we have lots and lots of products out there on the market which then have to be withdrawn.

Q44 Baroness O'Neill of Bengarve: The "we" there is European, is it?

Dr Wadge: Yes.

Q45 Baroness O'Neill of Bengarve: So there is an expectation that a number of these products on the market in Germany will quietly be withdrawn because they will need to go through additional checks before they come back on the shelves.

Dr Wadge: I would be very happy to look into that and provide some additional information because I am not familiar with the particular products that you are talking about. I would rather not comment without being familiar with what they are.

Q46 Chairman: Perhaps you could follow that up. They were listed in an annex to the DIUS submission in a table produced by the German Federal Risk Assessment Institute.

Dr Wadge: Yes; okay.

Q47 Earl of Selborne: I should like to take us back to the European regulatory framework and in answer to Lord Haskel's question Dr Wadge helpfully referred to the review which the FSA had conducted on the European regulatory framework. I think you referred to the general safety requirements of the EU food law regulation which would be the same whether the food was nano-engineered or not. You referred to novel food and food ingredients and noted that this is in course of revision. The regulation for food additives has already been added. Then there is provision under packaging regulations which presumably are relevant, animal feed and the like. Would you like to comment on whether you are satisfied that the amendments either in progress or already in place put the regulatory framework in a fit-for-purpose state?

Dr Wadge: I think that they do. I think that they do provide the necessary regulatory framework. Where the challenges and difficulties will lie will be far more around the precise nature of the risk assessment and the toxicological testing rather than the regulatory framework. It is there that more work is needed. I feel reasonably confident around the regulatory framework that products would need to go through additional safety testing. Once a product has been developed then the nature of that safety testing will be adapted on a case by case basis according to the properties of the particular material that is being looked at and that is one of the very specific bits of advice that we have received from the independent toxicological experts.

Q48 Earl of Selborne: You refer to the problem about the adequacy of current test methods. In your evidence you refer to the International Risk Governance Council's report which says that whether you are looking at Japan, America, European Union, all seem to be approaching this in roughly the same way but you point out that questions have been raised about the adequacy of current test methods and the ability of regulatory bodies to monitor and control measurements and risk assessments. In other words, the technology does not appear to be there to give the sort of assessments which are clearly going to be needed. You have identified the problem. How do you see this being resolved?

Dr Wadge: It is an area where we clearly have a part to play and we have just put the call out for our first particular project looking at toxicokinetics which will really address one specific part of that. The MRC is starting to fund projects and there is an international programme which is being coordinated through OECD of risk assessment work. If I were a budding young toxicologist then that is an area I would be getting into because I think there will be considerable research funding in that area over the next ten to 15 years and that is what is required.

Q49 Earl of Selborne: We have already talked about colloidal silver which has been around for a long time. We are now realising that the EFSA is not likely to list it as an approved supplement. At what moment does the precautionary principle rear its head? Do we just wait until the final review is listed and presumably there will be other such products coming forward which eventually will be withdrawn but meanwhile they could or could not be cumulatively toxic. Why do we not take the precautionary principle seriously?

Dr Wadge: The precautionary principle is what is going to lead to the colloidal silver being withdrawn because the company has not produced the safety data to support the sale of that particular product. The regulatory framework that is set out requires a pre-market assessment of safety that would be approved by independent experts on scientific committees. That is a precautionary basis; it is one where the onus is on the manufacturer, the food business, to demonstrate safety before it is put on the market.

Q50 Earl of Selborne: It just seems surprising, as you can already anticipate that in a year or so this will be withdrawn, that you do not enact the principle sooner rather than later. Precaution usually means you take it sooner rather than later, rather than just allow the process to continue.

Dr Wadge: The area of food supplements is quite a specific area apart and the UK in particular compared to other Member States has a long history of quite large consumption of a range of food supplements which are perhaps not consumed in other parts of Europe and there are current measures under way to bring the sale of those products under greater control and assessment of safety. This particular product and a number of other supplements have been on the market for a while and manufacturers now have to provide the safety data to support their continued use. These are not nanotechnology supplements in general but it is just the nature of that area of legislation in relation to supplements. In relation to food more generally, we have been able to demonstrate that there is not currently a range of

nanotechnology materials on the UK market and that food businesses would need to go through a pre-market assessment of safety that would be considered by independent experts.

Q51 Earl of Selborne: On the revision of the novel foods regulation, a 1997 regulation which is to be updated, the European Parliament has proposed that any new regulation should explicitly apply to all nanomaterials. I gather that is under discussion by Member States and the European Parliament. What is our position on this?

Dr Wadge: We support the additional controls and requirements to assess safety of nanomaterials which would have a different size or a different property compared with the existing foods that are on the market. The whole way the novel foods regulation works is that it makes a comparison and sets a date back in 1997 where, if a food has been in continued use for a period of time within Europe then it is not considered to be novel. What this change in the legislation is ensuring is that a change in the size or the properties due to nanotechnology would make that a novel product and would require further assessment before it is used.

Q52 Chairman: Presumably that is going to involve a definition of nanotechnology. You said earlier on that the definition is a bit woolly. So when we talk about a new product being defined as a novel product, I assume there will have to be a precise definition.

Dr Wadge: Yes.

Q53 Chairman: As a related question, you talked about this product involving a co-enzyme which was deemed not to be a novel product even though it had nanotechnology in it. How does that square? Is that the current situation which will change in future and will not be able to slip under the radar screen in future?

Dr Wadge: In the end the debate was around the properties of that particular material and although it was produced by nanotechnology, under the current novel food regulations the

properties were not considered different, therefore it was not considered novel. If the regulations are changed to include anything produced by nanotechnology methods, then perhaps it may come under that requirement in future.

Q54 Baroness O'Neill of Bengarve: You have been telling us about the likely shape that the European regulation will have. Will that put the European regulation on a different track from the Japanese or US regulation? We have been there before in other areas and it does create difficulties.

Dr Wadge: There are very specific differences of approach and we have seen that clearly in relation to GM between North America and Europe. In a sense that reflects the different political and social environments that the regulations are derived from. Probably what is most important from a scientific point of view is that we have international agreement on the risk assessment procedures and that is where the OECD work has a really important part to play. There will always be an opportunity for a much wider socio-political layer which is then put on top of the science in terms of the types of controls which are required in one part of the world compared with another part of the world. That is just the nature of the differences between different parts of the world.

Q55 Lord O'Neill of Clackmannan: In your evidence in relation to project A03063 you give a helpful description of the proposed changes to the food packaging regulations. What is the attitude of the Government to this? You are rather coy. I realise this is just a résumé of the regulations but what is the Government's attitude to that? How do you envisage implementing this on labels which are small enough to be acceptable to the packaging requirements?

Dr Wadge: There are two questions there. One is: what are the changes required to make sure that nanomaterials are properly assessed and need to be assessed before they are

permitted for use such as nanoclays for example. Then the second question is the question of labelling. At the moment labelling is something which in broad terms is required where consumers need information that is meaningful to them. The priority has always been around information on safety and nutritional composition. For genetically modified materials there is a requirement for safety assessment and also labelling. Given that we are at such an early stage in nanotechnology we have not had that debate yet around what the nature of the labelling might be and how useful it would be for consumers to have the word "nano" put on one part of the label. That is certainly something where we would be engaging with consumers to find what type of information they would find useful. Once we get to a position where there are very specific products which are much closer to coming onto the market, of course we are in a position there where there are competing demands of clarity and useful information and a very small space on particular products to provide information around safety and use-by dates and nutritional composition, some environmental factors and possibly also information about the nanotechnology as well. It is something we are going to need to engage in and that is something we have done in the past. We will engage with consumers quite broadly with deliberative research to find out what sort of information they need and what is actually useful. There is no point putting "nano" on a label if it does not actually mean anything to anybody.

Q56 Lord O'Neill of Clackmannan: One of the problems we have had so far is the debate about nutritional information and whether it should be something which is imposed or be the right of the manufacturer or provider of the food to put down with their own particular spin. I find I am an avid reader of breakfast cereal nutritional values and if there are more than two cereals on the table I get totally bewildered. I understand the problem and I wish you well in your endeavours.

Dr Wadge: Thank you.

Q57 Lord Haskel: We have had a fair bit of discussion about the draft report on Regulatory Aspects of Nanomaterials by the European Parliament and indeed I think you told us you are conducting a review about this. Can you tell us whether you think that this is going to be a basis for having the same risk assessment procedures throughout Europe? Are you working with your counterparts in Europe on this? What is your general view about this draft report?

Mr Roberts: On many products we have European-wide systems. If you look at chemicals generally, for example, we have just introduced a major new regulation, which is European-wide, to identify the risks around chemicals generally. If I may, I will explain how I think that relates to nano which is why I think some of the comments the European Parliament rapporteur has been making are perhaps misfounded. REACH regulates substances other than those which are regulated by other regimes such as the food regime, the pesticide regime or the pharmaceuticals regime. Nanoparticles are substances so they therefore fall within the scope of the general European regulation. The question that we need to work through is how we should apply that regime in the circumstances of nanomaterials. The first question you have to ask is whether a nanomaterial is the same substance as a larger material or not. We are quite clear across Europe, both the Commission and the Member States, that if someone is producing a nanomaterial then the risk assessments they have to do under REACH would have to deal with the risks which might be associated with the nanomaterial. There are still big issues which we have to deal with because the testing regime associated with chemicals was designed for chemicals rather than nanotechnology. It may pick up many of the risks but it may not pick up all of the risks and therefore we do need to review how the tests are done to see whether there are new risks or new tests which need to be added to the suite to make sure we do capture the risks. We may also need to deal with some of the issues such as the fact that for registration under REACH there is a threshold of one tonne before a manufacturer has to go to Europe. For most chemicals that is fine; for nanomaterials a tonne may be rather a

lot. It does not necessarily mean that nanomaterials are exempt, because if a manufacturer produces, for example, bulk titanium oxide and nano titanium dioxide, then they have to register the whole of their production, so the nanomaterial would be included. The principles which underlie general regulation of chemicals, similarly pharmaceuticals or pesticides, that you have to provide information, that you have to provide information through the supply chain so they can be used safely and the regulator has the opportunity to restrict the manufacturing use if there are proven risks, apply to both bulk materials and nanomaterials in the same way. The way I would see the regulatory regime going forward is amendment of some of the detail to make sure the tests are sufficiently comprehensive and any criteria in terms of thresholds and so on may need to be adapted to reflect nano. However, the principles that we use for regulation of chemicals, of foods, of pesticides should apply to nano in the same way they apply to the products generally.

Q58 Lord Haskel: That is very helpful. Do you think that will be adopted throughout Europe? REACH is a European system so we are working on this together and whatever rules we come up with will apply throughout the market; it will be part of REACH.

Mr Roberts: It will be part of the REACH system.

Q59 Chairman: Just to be clear, in this report to which Lord Haskel is referring from the Committee on the Environment, Public Health and Food Safety, the European Parliament says in paragraph E "… in the context of REACH, it has so far not even been possible to agree on guidance on the identification of nanomaterials, leaving important decisions in the context of registration to economic operators". I am assuming translated into English that means that nanomaterials could slip through the net under REACH. Are you saying that is wrong, that this committee are wrong?

Mr Roberts: It is more subtle than that. Some guidance was published by the European Commission after agreement with Member States a couple of weeks ago about how far we have got in terms of the application of REACH to nanomaterial. I can happily provide a copy of that, if that would be helpful; that analyses the issue in rather more detail. What it says is that if the nanomaterial is a new substance, if, for example, it is a fullerene, then it is clearly a substance on its own and REACH would apply to that substance. If it is the same as a bulk form, then it is probably the same substance as the bulk form but the chemical assessments and the safety data sheets would have to reflect any particular risks that arise in the nanomaterial and in terms of classification and labelling, the hazard symbols which are put on products, if the nanoform has different risks, then it might merit a different hazard symbol to the same chemical in bulk form. The draft report from the rapporteur is an over-simplification of a rather more complex situation.

Q60 Chairman: This report is pretty hard hitting in general and I wondered whether you think that the European Parliament committee is kind of over-egging it when they say, for example, the committee "Considers it highly misleading for the Commission to state, in the absence of any nanospecific provisions in Community law, that current legislation covers in principle the relevant risks relating to nanomaterials". That seems almost directly contradictory to what Dr Wadge has said a few moments ago and I could quote from other paragraphs. This is much more critical of the European regime than you appear to have been. Could you enlighten us as to whether the committee has got it wrong or whether you have got it wrong?

Mr Roberts: If I may make one procedural point, this is a proposal from the rapporteur; it has not yet been endorsed by the committee. My understanding is that the committee is considering it today and then the European Parliament will vote on it in the next week or so. My view is that some of the statements in the report are absolutely right and some of the

statements in the draft are wrong. The one you have just indicated is one I would not agree with.

Dr Wadge: John put that extremely well. I have nothing further to add to that.

Q61 Lord Crickhowell: I happen to chair another committee's examination of REACH's report on food so I pricked up my ears when you started talking about REACH. I think it is probable that if there need to be changes they will take quite a time. My experience of these things is that they take a long time to change right across Europe because everyone wants a say and the industries want a say. How long do you think it will take to sort out the regulatory changes to make them sensible?

Mr Roberts: I have a lot of sympathy with that point. It is going to take four or five years for the European system to work through the issues and then for the legislative process to be completed. From the UK Government's point of view we have been urging the Commission to make fast progress on these issues. My Secretary of State did write to the Commissioner last year stressing the importance of addressing nano issues comprehensively and urgently.

Q62 Lord Methuen: Can we go back to pesticides? Often these pesticides use surfactants at the nanoscale but they do not currently use engineered nanoparticles although there are products, "smart nanoscale pesticides" in development. Does Defra have a policy in place to deal with such products once they leave the research and development phase and enter the marketplace? I also include in this things like fertilisers which presumably will use the same things and things which are used by animal feedstuffs.

Mr Roberts: I can answer that question in respect of pesticides although I am afraid I do not have the information with me today on fertilisers and feedstuffs so I would need to respond to that separately if I may. There is a European regime in place which deals with the authorisation of pesticides which operates at two levels. The active ingredient has to be

agreed at the European level as having passed the tests included in the relevant annex. Secondly, individual products are approved for use in the UK and the Pesticide Safety Directorate does that on behalf of my department. The advice I have had from them is that they would regard a pesticide containing a nanomaterial as a new product requiring a specific authorisation. So if a company changed the formulation of a pesticide to include, for example, an encapsulated active ingredient instead of one in solution, then that would require a new approval and a safety case would have to be made for the use of that product before it was authorised.

Q63 Lord Methuen: You will obviously risk assess these products. Is there sufficient information to understand fully their impact on the food chain and the environment? This goes for the other products which I mentioned.

Mr Roberts: That question is hypothetical to an extent until we get a case because it would depend on the nature of the case. We would do the normal test that we would do and we would look at all the scientific evidence that is available. It is a system of positive approval, so they have to make the case that it is safe rather than that it can be used in the absence of any evidence to the contrary. They would have to make a case and the Advisory Committee on Pesticides would give us the scientific view about the case that had been made.

Q64 Lord Methuen: You would get the equivalent for fertilisers presumably.

Mr Roberts: I am afraid I am not familiar with the authorisation procedure for fertilisers so I would need to take advice.

Q65 Lord Methuen: There must be something similar in place.

Mr Roberts: The regime on pesticides is clearly tougher because pesticides are necessarily toxic to something. There is therefore a system of positive approval. Fertilisers generally are

more benign substances so I am not sure they are tested to quite the same rigorous extent as pesticides but I will need to take advice on that and come back to you.

Q66 Chairman: May I follow up a little bit on Lord Methuen's question? You said that the risk assessment would be done by the Advisory Committee on Pesticides.

Mr Roberts: They would review the evidence submitted by industry.

Q67 Chairman: Does that Committee have on it anybody who is an expert in nanotechnology?

Mr Roberts: I will need to look at the list. To be honest, I doubt it, but it is clearly an issue we would need to look at. The issues we would need to understand would be environment and fate, how the nanomaterial moves through the environment, followed by toxicology and eco-toxicology from exposure of humans or animals or plants or eco-systems as a result of that application. If we did not have that expertise, then we would need to look elsewhere for it. We have it, for example, on the Advisory Committee on Hazardous Substances and if necessary we would make a link between the Advisory Committee on Pesticides and the Advisory Committee on Hazardous Substances.

Dr Wadge: There are eco-toxicologist and toxicologists on the Advisory Committee on Pesticides but as I understand it the point you are making is whether they have specific expertise in the toxicology of nanoparticles, I doubt that. It would not preclude the opportunity to bring that expertise in to those particular committees.

Q68 Chairman: May I also ask the same question, whilst we are engaged in conversation, about the Advisory Committee on Novel Foods and Processes? If a nanofood product were to come through for approval with the UK competent authority, is there expertise in this area on that Committee?

Dr Wadge: No is the answer. Is there access to toxicological advice? The answer is yes. There is quite a lot of history of seeking advice from the Committee on Toxicity and I have included in the evidence some of the reviews which the committees have done on nanotechnology so far and the recommendations that they are making around the risk assessments. If there were very specific points on nanotechnology that required additional expertise, we would refer that to the Committee on Toxicity and they would take advice as necessary.

Q69 Baroness Neuberger: You have already mentioned the issue of public engagement and this being a key area. What future plans do the Government have to engage with the public, or conduct research on public perceptions on the use of nanotechnologies in the food sector? We would like to know who is going to carry it out and how it is going to be coordinated across Government.

Dr Axford: I could give a general view. Recently, in January of this year, there was a renewed ministerial commitment on nanotechnology overall. They gave seven key commitments overall but one of those was to develop the programme of dialogue around nanotechnology involving all key players. That includes, for example, academia, industry, non-governmental organisations and of course, critically, the public. That is part and parcel of the strategy to which I alluded earlier being put forward by the ministerial committee. We therefore, through a number of mechanisms, for example DIUS are responsible for a programme of activity called the Sciencewise Programme, which is all about getting better evidence of what the public thinks or finding a way of engaging the public in a constructive way on key issues. That is a process which can be applied on nanotechnology. There have already been two major goes at talking to the public about nanotechnology within the last two or three years. When it comes to the specifics of what is actually done on food that would have to be something Andrew would be able to talk about and what would be done in relation

to food. I do not know what level of detail you would like to know about the general way that Government go about some of their work in other areas.

Q70 Baroness Neuberger: It is not particularly so much about how the Government work. We know a little bit about the general public understanding of science-type work. It is really perhaps some of the methodologies you are going to use for this actual engagement. For instance, there is very good evidence that with quite complex areas of nanotechnology, in the food sector would be a good example, things like citizens' juries may be very useful. It would be very interesting to know, given that this is part of the strategy, what Government are intending to do.

Dr Axford: Certainly on nanotechnology as a whole and even more so on food in particular it is a little bit early to say exactly which techniques we would use. Given what we have heard this morning about the problems almost of definition, we need to know what we need to achieve through any engagement process. Are we worried about the toxicological impacts? Are we looking at the commercial benefits? Until we know where nanotechnology is exploited in the commercial sector, it is very hard to know what to talk to the public about. It is very hard to engage them at the fundamental science level where a lot of it still is. We heard earlier that a number of these technologies are still often in the lab.

Dr Wadge: The Food Standards Agency absolutely stands ready to engage in public debate and, taking the lead from Lord Krebs who was our first chairman who really set a very high standard of public engagement on science, that is something we are very keen to follow. We do have a number of mechanisms in place. Perhaps I can talk about what we did on cloned animals a couple of years ago as an example of the type of engagement that we might do in relation to emerging technologies more generally. We commissioned work in 2007-2008 which took the form of reconvened workshops. We brought members of the general public together, we had a range of experts from all different parts of the debate, talking about their

work and we reconvened the group after they had gone away to think about it and they had an opportunity to ask questions[2]. It worked very well in terms of eliciting a rather broad consensus as to what the general public's concerns were. They were less concerned, interestingly, with how the technology and the science worked and their focus was much more on the why and the consequences and the benefits from the technology. That is perhaps not surprising, given what we learned from the GM debate which got very polarised. What we would want to do through citizens' juries, and we have a number of citizens' forums available which we regularly use and debate a range of issues that are topical for us, is to make sure that we are not simply finding out what the people on the extremes of public opinion think but actually what the general public feel once they have had a chance to be really informed about a technology. We do have the methodology available and we stand ready to engage in that debate.

Q71 Baroness Neuberger: You have already raised the GM issue and obviously some of that was extremely uncomfortable in many ways. Presumably one of the things you are saying therefore is that the engagement with the public will happen relatively early in order to avoid that kind of extreme view. I am not sure whether you are saying that.

Dr Wadge: If we do not, then it seems to me then that we have failed to learn one of the key lessons. It is important that there is an engagement and recognition of the role of everybody, not just Government but food businesses a well, to engage and talk about the types of technology and make sure that there is a general understanding and acceptance of technology.

Q72 Baroness O'Neill of Bengarve: This is a question which also bears on public engagement but it really arises out of the DIUS submission which very usefully brought together evidence from a number of different countries. Brazil is quite startling and of course

[2] "This answer is not entirely correct. The Participants were in fact presented with information about the technology by the research company and not by a range of outside experts".

lies outwith the three big groups that we have discussed and one meets ready-to-eat edible bioplastic coating and pallet sensors for quality control apparently aimed at increasing the quality of Brazilian wine. Then there is a statement that Brazil does not seem to have any dedicated regulatory framework for nanotechnology research. There is a big player with a lot of research and there is free trade and it is quite complex to keep out products which do not meet certain standards. Do either DIUS or Defra or the Food Standards Agency have a reaction to the Brazilian evidence?

Mr Roberts: I am not familiar with the Brazilian situation but I can talk about the attempts at regulation of nanotechnology on the global level, if that would be helpful.

Q73 Baroness O'Neill of Bengarve: That would be.

Mr Roberts: If I may take one step back and look at chemicals, broadly speaking there are very few global rules restricting chemicals. The only ones which are restricted at the global level are 12 persistent organic pollutants which include substances like DDT and PCBs. Attempts for a broader regulatory framework for chemicals generally have not been possible to agree politically until recently. A big attempt to have a strategic approach to international chemicals management in order to deliver the WSSD, the World Summit on Sustainable Development objectives on chemicals had to be on a voluntary approach because some countries, not least the United States, opposed global regulation. The global community has attempted to regulate chemicals such as mercury for the last decade and in fact we had a breakthrough last month and there is now agreement to have international regulation of mercury emissions and that reflected a change in the approach of the United States and countries such as China and India were quite reluctant but in the end came along. In terms of nanotechnologies, we will be discussing that at the SAICM, the Strategic Approach for International Chemical Management meeting, which takes place in Geneva in May, where it has been identified as an emerging issue. We will be raising awareness there. It would be

wrong to say there is scope for international global regulation of nanotechnology in the immediate term. We are trying to raise awareness of the issues in countries, not only those producing nanotechnologies but those which may also import products containing nanotechnologies and therefore have to deal with waste streams that may require specialist handling; at least raise awareness, spread the science and begin to get cooperative action going.

Q74 Baroness Neuberger: May I move on to the question of labelling and consumer information? Again this is mainly for the FSA. You said in one of your additional reports that there is a need for consultation on declaring the use of nanoparticle ingredients or additives in food products but in your main evidence you say that you do not have information on whether UK consumers would value information on the use of nanotechnologies in food and what sort of information would meet the necessary criteria. What are the Government doing to obtain the information about what the public feels about that?

Dr Wadge: We need to address that through the deliberative research with consumer forums, once we are a bit closer to products being on the market. At the moment it is a little bit difficult to do it in a vacuum in a way. Consumers need to know what specific products we are talking about that are now about to come onto the market and how that might benefit them or benefit others. Certainly that is how we would carry out that research, through our citizens' forums, to really gauge a sense of what information they would find useful and whether particular types of labelling would actually be helpful to them. At this stage, it is still a little bit too early to say.

Q75 Baroness Neuberger: I completely take the argument about it being early and therefore very hypothetical, but I just wonder whether there is not an argument for at least beginning that discussion, simply to make it clear that there will be transparency in this area.

Dr Wadge: Certainly we will be starting the process of talking about nanotechnologies with our citizens' forums in the autumn this year. I can ensure, given this conversation, that the question of labelling and information is included in those sorts of discussions.

Q76 Lord Methuen: Mine is an unrelated question. Mr Roberts mentioned these 19 tasks of priority research projects and five taskforces and he also mentioned 14 nanomaterials which were under investigation. It would be useful if we had details of what those were.

Mr Roberts: Certainly.

Q77 Earl of Selborne: I want to go back to the process of public dialogue, public engagement. I think everyone recognises and admits that the GM debate was a bit of a disaster quite frankly, because of the polarisation to which you referred. What are the lessons learned from the GM debate, even if they are only negative ones, as to how this debate should be structured?

Dr Wadge: That is a very big question, is it not? I am not sure that necessarily everything from the GM debate translates and transfers to this particular issue. Having said that, there clearly are some very important lessons and the first is to engage with the public at an early stage to ensure that a range of debate and dialogue takes place around the types of technologies which are being used or might be used in producing food and what the implications are for consumers of those different types of technology. Early engagement and bringing together scientists and the general public and groups such as the Food Standards Agency can play a facilitative role in encouraging that sort of debate to raise awareness to

begin with of the sorts of issues and then specifically to tease out some of the very specific questions around acceptability and requirements for information and labelling and so forth.

Q78 Lord O'Neill of Clackmannan: Perhaps I should declare an interest as Chairman of the Nuclear Industries Association. A consultation was conducted by DTI which subsequently fell in the courts and they had to undergo the same process in a rather modified fashion to secure acceptability. Really what I just want to say is that the GM consultation was not the classic example we would want to follow but there are other failures as well. There is the potential pitfall of the litigious opponents and some of the people who are already on the fringes of the debate, having a higher bar of standards, wanting to pull more things into nanotechnology than perhaps the current definitions will allow. These are the kinds of people who might well be standing in the wings with lawyers ready to require judicial review. I merely make this additional cautionary point that the unfortunate experience of GM is as nothing compared to some of the subsequent failures of the Government's consultative processes which were expensive both in time and money to correct.

Dr Wadge: Yes.

Q79 Lord Crickhowell: As we approach the end of the session, I am extremely grateful that I have a very much clearer idea of what the Food Standards Agency and Defra are about and what is going on. The big gap I have at the end of this session is in understanding what the Government are really doing to close the big gaps we have in scientific knowledge. I have a big gap in my impression of what drive is being put, what money is being put behind the research programmes, behind what the universities are doing. I just do not have an impression that there is as much effort going in to really stimulating the research that is needed as I think there should be.

Dr Axford: We can respond to that in a broad sense. Looking at nanotechnology overall, setting aside the food specific for the moment, across the research councils there is something like £50 million across all programmes generally in the area of nanotechnology and a further £50 million in the specific cross-council programme on nanotechnology projects. There is actually a lot of investment going on in the broad area of nanotechnology.

Lord Crickhowell: May I ask then – I really do have a black hole here – what is actually going on here? I am afraid you have not given me any clear picture at all in your answers to questions; even that last answer does not. We really do need a pretty detailed report from your department as to what they are doing, what the programmes are, what money is being spent where and what you hope to achieve by it.

Chairman: Particularly in the area of risk assessment which is what concerns us rather than, say, development of new TV screens or something like that. If you could help us with a bit more detailed information on that area.

Q80 Baroness Neuberger: I have just been left with a sense of unease on the public engagement side. It is partly in your response to the Earl of Selborne when talking about the lessons learned from GM. One of the things you have been saying is that it is a bit too early. At the same time your response on GM is that we should have got in there earlier. I do not feel very comfortable that thinking has been developed very carefully. I have always taken the view personally that it is better to get in earlier. All the evidence about public engagement in other areas, say in the health services, shows that to be the case. I know you say this is starting in the autumn. Is there not some argument, given that we are doing this inquiry now, for ratcheting up at least the advance warnings of what you are going to be doing in the autumn?

Mr Roberts: Of course, we did do some work on social engagement in the period 2004 to 2006-07, which was the first wave, which included citizens' juries and a number of

engagement exercises. A number of other people have also done them, such as *Which* who ran a jury last year and we have access to those results. The second phase of work which has been described will build on the first phase of work which was done three years ago.

Q81 Baroness Neuberger: I understand that. I still think there is a time issue.

Dr Wadge: It is useful to clarify what I meant around that in the sense that I do not think it is too early to start the engagement; far from it. We need to learn the lessons and start the engagement. I meant in relation to specific products and the types of information that people might require in relation to that.

Baroness Neuberger: I accept that.

Q82 Lord Haskel: On this question of research and all the work you are doing, does that fall in at all with the money which the Government are putting into resuscitating the economy? Is that part of that?

Dr Axford: The money we have talked about so far is money which was allocated in the last spending review, to the research councils for example. Not any new money, no new stimulus potentially.

Q83 Lord Haskel: It is not going to be part of stimulating the economy.

Dr Axford: We do not have any idea about that.

Q84 Chairman: We shall learn after the Budget. Do you have any other comments you wish to add? I should like to thank you very much for giving us nearly two hours of very interesting conversation but there may be things that you would like to add at this point.

Dr Wadge: No, nothing. Thank you for the opportunity.

Dr Axford: No thank you.

Q85 Chairman: There will be a transcript of these proceedings which will be sent to you for corrections so you will have a chance to make sure the written record accurately represents what you have said. We have asked you for some written material and the Committee Clerk, Antony Willott, will follow that up. Equally, if you have any points you think of that you would like to submit to us in writing, we should very much welcome that. Finally, I should like to ask, if you were advising us on recommendations we should produce at the end of our deliberations, whether you have any particular thoughts.

Dr Wadge: Other than a large increase in the budget of the Food Standards Agency … I think you have touched on an area of concern in relation to risk assessment and the capacity we have in relation to toxicological expertise and that is a concern that I have more broadly than simply around nanotechnology and I am involved in discussions with other chief scientists around that particular point. It is something that this very specific issue of nanotechnology does raise from my perspective.

Chairman: Thank you. Would others like to add anything? Thank you very much indeed.