

## **BfR Consumer Conference on Nanotechnology in Foods, Cosmetics and Textiles**

Consumer vote on nanotechnology on 20 November 2006

Nanotechnology is seen as an important future technology that is being used in more and more consumer products. The Federal Institute for Risk Assessment (BfR) staged the first nationwide Consumer Conference on Nanotechnology in order to find out what requirements informed consumers want use of this technology to meet. The Conference served as a forum for a group of individuals to acquire broad insight into the opportunities and risks of nanotechnology in a multi-phase process. This consumer vote was publicly handed over to representatives of politics, associations and authorities as the outcome of the Consumer Conference on 20 November 2006.

This consumer vote rounded off an opinion-forming process which spanned several weeks. During this process interested consumers took an in-depth look at nanotechnology. The group mainly focused on the use of nanotechnology in foods, cosmetics and textiles.

The consumer group consisted of 16 individuals selected according to a random principle. Around 6,000 randomly selected people from Berlin and Brandenburg received a written invitation to participate in the "Consumer Conference: Nanotechnology". The participants were drawn from all returns according to socio-demographic criteria (age, gender).

During two internal preparatory weekends the consumer group was given an introduction to this topic. For the public hearing on the final weekend from 18 to 20 November, the consumer group formulated questions on the main areas mentioned above (Annex 2) and selected experts to answer them (Annex 3). After the public hearing the group proceeded to the consumer vote. The vote was presented at the Federal Press Office and handed over to representatives from politics and consumer protection.

The "Consumer Conference: Nanotechnology" was launched as a pilot project by BfR and conducted together with the Independent Institute for Environmental Concerns (UfU) and the Institute for Ecological Economic Research (IÖW). BfR is the first public agency in Germany to test this risk communication instrument with a view to involving consumers in scientific discussions of the assessment of new technologies. The views and recommendations in the consumer vote are not those of BfR or the other organisers involved.

### **Consumer vote on the use of nanotechnology in the areas foods, cosmetics and textiles**

#### **1 Preamble**

"We are a group of people with varying qualifications and occupations who embarked on this process with considerable interest but initially very unclear ideas about nanotechnology and the Consumer Conference. There were fears – sales or alibi event? – but also the hope of achieving something with our opinion as the expression of the people of this country, of raising awareness amongst consumers and calling on politicians, scientists and industry to deal with nanotechnology in a responsible manner.

It very soon became clear to us that many experts are looking at the opportunities presented by nanotechnological applications. That's why we focused more on the risks. Despite the

diverse opinions within the group the discussions were always constructive and the opinion-forming process always resulted in major agreement.

The vote refers to the application areas foods, textiles and cosmetics. Furthermore, numerous other aspects have also been touched on: military applications of nanotechnology, contribution of nanotechnology to solving global environmental problems (e.g. drinking water treatment), the widening technological gap between industrial and developing countries as well as medical applications of nanotechnology. We were not able to examine these in any depth. We do, however, feel there is a need to take a critical look at these questions in future.

## **2 General section**

Nanotechnologies constitute a major challenge for our society. We must deal responsibly with the term "nano". Hence, we are calling for a uniform definition of "nano" and a scientific and legal definition of the terms nanotechnology, nanoparticles and nanomaterials.

The labelling of nanotechnologies is a very important aspect for us. In order to be able to undertake labelling at all, there is an urgent need for the rapid establishment of standards on nanotechnologies and nanoparticles. We refer here to the special sections.

We are concerned that there are scarcely any measurement methods. We note that up to now no limit values have been established for the risk assessment of nanoparticles. In order to be able to carry out an exact control of nanoparticles, we call for new analytical and measurement methods to be developed and standardised by independent bodies. In this way standards for occupational health and safety and for end products could be established and, in the final instance, risks for consumers avoided.

Risk assessments must take into account the entire product life cycle (production, use and disposal).

The production process of nanoparticles, which should be undertaken in a closed system, seems to be safe in Germany. In other countries this (occupational) safety is not guaranteed. Companies that use nanotechnologies at their production sites abroad or in cheap wage countries should be required to offer their employees the greatest possible protection. The majority of the group, as responsible consumers, wanted to see the establishment of uniformly high safety standards around the world.

In research on nanotechnologies far more weight should be attributed to risk research. The share of public funds for risk research must be considerably increased. This research should be conducted above all by independent, state research institutes.

Very little information on nanotechnologies is available to the public at large. In order to allow consumers to make up their own minds about nanoproducts of industry, comprehensive information must be available on the advantages and disadvantages. Only then can we expect consumers to adopt a positive attitude towards nanotechnologies. Topics which should be dealt with in the media are: What is nano? What products are there, what methods, the pros and cons, benefits of the products? The information should be provided via the mass media during prime time also quoting the information source.

The Federal Institute for Risk Assessment and other social stakeholders should extend their activities to a dialogue with the general public and to risk communication with consumers.

We suggest measuring the impact of the consumer vote in the near future and organising a follow-up meeting.

### **3 Special section: Foods**

We believe that the use of nanotechnologies in foods is a very delicate area. The development of the new products for the market calls for industry to show a highly responsible attitude. We regret the fact that no representatives of the food industry were on hand to respond to our questions. This meant that questions concerning food for infants and children remained unanswered.

We welcome the fact that nanotechnologies create opportunities which will offer benefits to consumers particularly in respect of food safety, whether it be re-examining the cooling chain or unmasking perished food. We wonder about the need for foods that can change their properties by pressing a button, e.g. taste. In the final instance, it is the consumer who decides whether these products will be successful on the market or not.

It is reassuring that the statutory provisions on the obligation to obtain a permit of foods are very stiff in the European Union. When known substances are used in the nanoscale range, they may have completely new and different chemical and physical properties from the ones they had in their conventional format.

Only a minimal share of the current funding of research into nanotechnologies is spent on risk research in the EU and Germany. That is very unsatisfactory.

#### **3.1 Recommendations/Demands**

We are of the opinion that research must be undertaken into the really important topics of nanotechnology in the food area (e.g. improved drinking water treatment, quality control and assurance, smart packaging and shelf life) and corresponding products.

We call for mandatory labelling for "nano" so that consumers firstly have freedom of choice and secondly we can avoid them being misled. We believe that mandatory labelling is particularly important in the food sector as here substances can be directly taken up in the body.

We need an approval procedure for nanoscale substances in foods and their packaging. In this context we call for already approved substances (silicon dioxide, titanium dioxide, aluminium silicates...) to be re-examined (additional tests) when they are used in the nanoscale range.

### **4 Special section: Cosmetics**

New technologies are being used in the field of cosmetics concerning processes and specific substances (nanotechnologies, nanoparticles). One of the advantages they offer is, for instance, limited use of nano-structured material whilst achieving the same major effect. There are many examples for this application: day creams with UV protection, toothpastes, active substances in hair products. What is particularly interesting is that sunscreens can only achieve SPFs of more than 15 by using nanoparticles. In today's world with a higher incidence of skin cancer, this is a particularly welcome application.

#### **4.1 Health risks**

There has not yet been comprehensive examination of the risks apart from the three common substances titanium dioxide, zinc oxide, silicon dioxide. All the same, health risks cannot be ruled out. This is probably less true of creams than of sprays. Nanoparticles may reach the blood stream where they may have an oxidative impact and, by extension, affect the heart, brain, other internal organs and the embryo. We call for further studies on the health impact.

#### 4.2 Ecological aspects

Since nanoparticles used most also occur in larger volumes in nature, we are not of the opinion that this leads to any major ecological problems. However, any new substances which do not occur in nature are a cause for concern viewed from where we stand today. We fear that particles of this kind could reach the food chain via rivers. Until we know more about this, we recommend that these new ingredients should be dramatically reduced and their release into nature avoided as far as possible. We recommend early (proactive) risk assessment.

Interaction with other chemical elements cannot be ruled out in various scenarios. Nanoparticles may trigger chemical reactions in the environment and, if used in the wrong place, lead to risks for organisms. Research into the ecological risks and interactions when using cosmetics must be stepped up.

#### 4.3 Consumer information

So far there has been no standardisation of nanotechnologies or nanoparticles. Hence we recommend rapidly drawing up guidelines. On this basis we call for mandatory labelling. The labelling should be comprehensible to consumers. The Federal Institute for Risk Assessment should draw up proposals for the legislator. Until then we call for the particle size to be indicated alongside the substances in all cosmetic applications.

### 5 Special part: Textiles

The questions raised by us were answered in detail by the experts. This meant that many prejudices could be overcome. It became clear to us that, in principle, every nanotechnological effect can be transferred to textiles. We are now more convinced than ever that the advantages of nanotechnologies for textiles far outweigh the risks.

#### 5.1 Production

It was reassuring for us to hear that the experts say that nanoparticles for textiles are produced in closed systems and that, therefore, their release into the environment is largely prevented.

One new finding for us is that up to now no pure nanofibres could be produced industrially. Only existing textile fibres can be finished with nanoparticles either by weaving them into the threads or by applying a coating to the surface.

We welcome the statement that any further processing of textiles produced using nanotechnology can be done on conventional machines using the same amount of energy. We, therefore, expect that the products produced in this way will not be far more expensive.

We also welcome the fact that various standards (e.g. Öko-Tex 100) are to be extended by including limit values (less than 100 nm as the critical range) for the assessment of nanopar-

ticles. We, as consumers, call for the labelling of nano finished fabrics (e.g. Hohensteiner quality label) by manufacturers.

## 5.2 Use

After the hearing we are of the opinion that the use of nanotechnologies to improve the functionality of textiles, which is gaining ground in many areas of life (e.g. industrial safety, sports clothing, clothing with an antibacterial finish and UV protection) is important. It is our belief that this development constitutes a step towards more quality of life.

We believe that nano finished fabrics with high user value are a good thing. The improvements to textile properties should be proven to be lasting (little or no abrasion and relative resistance to washing). If this can be guaranteed, then our concerns about the health risks for users and contamination of the environment have largely been allayed.

## 5.3 Disposal/recycling

Our fears that nano finished fabrics would have to be classified as hazardous waste were not confirmed. They can be recycled or thermally utilised using conventional methods.

There are still questions about the mass landfilling of nano finished fabrics (possible impairment of water and soil). Here we believe there is a need for research and action prior to their market introduction in order to avoid any damage to humans and the environment from the very outset. If pure nanomaterials are manufactured or there is mass use of materials finished with nanoparticles, then the recycling systems must be upgraded to keep pace with these technological developments. "

## **Annex 1 – The consumer group**

The consumer group consisted of 16 people: seven women and nine men aged between 20 and 72. The participants came from rural as well as big-city and small-town regions from the federal states of Brandenburg and Berlin. The following occupational groups were represented: qualified high school teacher (pensioner), farmer (early pensioner), management clerk, self-employed person (EDP, telecommunications), land conservation engineer (unemployed), teacher (pensioner), dental technician, chemistry student, manager (nature conservation), detective (pensioner), master motor mechanic, financial accountant, employee, textile engineer (pensioner).

The consumer group was selected according to a random principle. To this end 6,000 randomly selected people from Berlin and Brandenburg were sent a written invitation to participate in the "Consumer Conference: Nanotechnology". The participants were drawn from all returns according to socio-demographic criteria (age, gender).

## Annex 2 – Questions for the experts

The following questions are the outcome of two internal preparatory weekends. They were formulated by the consumer group and discussed with the invited experts during the public hearing within the framework of the final conference from 17 to 20 November 2006.

### 1 Questions about nanotechnological applications in foods

#### Introductory questions

- What opportunities/future visions do you see in the food sector? Could we, for instance, create new nanofoods?
- What advantages does nanotechnology offer in respect of high quality food products and does the use of nano in foods benefit us at all?
- To what extent is it proven that nano-modified foods/food supplements can offer health benefits?

#### Baby/child area

- Are there plans to use nanotechnologically processed foods in the baby-child segment? Are there special, stricter guidelines?
- Can consumption of nanofoods influence the quality of human milk? To what extent has research been conducted into whether human milk can transmit nanoparticles?

#### Guidelines and labelling

- How are consumers informed about nanotechnology in foods, e.g. via (general) mandatory labelling of nanofoods?
- To what extent is an organic product still organic when, for instance, its packaging contains nanoparticles?
- What constraints must be upheld and which yardsticks must be met before a nano-modified food can be placed on the market?

#### Packaging

- How far advanced is research and the implementation of "smart" packaging, e.g. to extend shelf life?
- Can nanoparticles detach themselves from these new packages and for instance reach foods and during the disposal phase?
- To what extent has research been conducted into what happens to nanoparticles in various disposal paths?

#### Risks

- What risks are linked to production, to consumption? What research findings have been obtained so far?
- How long can nanoparticles (e.g. nano-encapsulated pesticides) remain in the environment?
- Can nanoparticles of this kind reach the (human) body?

#### Ingredients

- Which nano-modified substances should be used in foods and how are these substances modified or produced?

#### Preservation

- Can nanotechnology replace conventional preservation options in food technology?
- Can the shelf life of foods/raw products (processed/unprocessed) be extended through nanotechnology? If so, by how long?

## 2 Questions about nanotechnological applications in cosmetics

#### Health risks

- What are the health risks (damage to the body)?
- When can nanoparticles reach the body or blood?
- With what degree of certainty can one say that nanoparticles do not reach the blood stream and organs or that they are not mutagenic?
- How great is the health risk associated with sprays which may also be inhaled?
- Do nanoparticles penetrate the skin? (Contradiction: on the one hand nanoparticles are easily taken up by the skin, on the other hand they clump and then tend not to be taken up). How can health risks be ruled out during the production process?
- Are organic nanoparticles safer?

#### Ecological aspects

- What are the ecological risks (degradation in nature)?
- Is research being conducted into the possible consequential damage resulting from the input of nanoparticles into the environment and nature and, if so, by whom?
- Are nanotechnologically treated substances recyclable? Can nano ensure environmentally friendly rotting?
- Is research being conducted into the interaction between nanocosmetics and other nanoproducts?
- Can nanoparticles trigger dangerous chemical reactions? (during production, in consumers)

#### Consumer information

- Why are consumers not being informed about nanotechnology in products?
- What mandatory labelling is being planned for nano?
- Who should monitor compliance with the mandatory labelling of nanoproducts and who should inform consumers? Should nanoproducts in the cosmetics area carry warnings until it has been proven that they are completely safe? (see cigarette packs)

#### General

- Are there internationally standardised measurement methods to detect nanoparticles?
- What's the point of using nano in cosmetics?



### 3 Questions concerning nanotechnological applications in textiles

#### Production

- Are specific properties of nanotextiles achieved through the material or the structure of the nanoparticles?
- Aside from the coating of conventional materials, can nanotextiles be woven completely from nanoelements?
- Is there need for weaving at all in order to obtain nanofibres?
- What other ways are there of producing nanofibres?
- How much energy is used in the production of nanotextiles and what are the costs?
- How will this impact on the consumer?
- Can nanotextiles meet the ÖKOTEX100 Standard?
- How is the purchaser informed about the presence of nanoparticles in the textile (easily comprehensible mandatory labelling)?
- What links do you see between the technological developments of nanotextiles and the genetic manipulation of fibre plants?

#### Use

- What improved use properties do nanotextiles offer compared with conventional textiles? (Examples: industrial safety, fire protection, sports clothing, daily clothing)
- How is the safety of nanotextiles guaranteed for the wearer, particularly for children?
- Are nanoparticles lost during the use of textiles (abrasion) or during cleaning? What happens to the nanoparticles washed out during cleaning in the sewage treatment plant?
- Are there specific detergents for nanotextiles? Can standard detergents be used?

#### Disposal/recycling

- Can nano textiles be recycled?
- What happens to nanoparticles during the disposal of textiles?
- Do nanotextiles have to be considered as hazardous waste?

## Annex 3 – Experts question

The following experts were questioned during the public hearing on the three main areas.

### 1 Foods

- Dr. Wolfgang Luther, VDI Technologiezentrum GmbH
- Prof. Dr. Harald Krug, Forschungszentrum Karlsruhe, Department for Molecular Environmental Toxicology
- Monika Büning, Federation of German Consumer Organisations
- RA Kurt-Dietrich Rathke, main area food law
- Prof. Dr. Horst-Christian Langowski, Technical University Munich, Science Centre Weihenstephan for Food, Land Use and the Environment
- Dr. Petra Schaper-Rinkel, Free University Berlin, Otto Suhr Institute for Political Science

### 2 Cosmetics

- Dr. Wolfgang G. Kreyling, GSF National Research Center for Environment and Health
- Prof. Dr. Dr. Jürgen Lademann, Humboldt University Berlin, Charité, Clinic for Dermatology, Venerology and Allergology
- Sabine Plitzko, Federal Institute for Occupational Safety and Health
- Prof. Dr. Harald Krug, Research Centre Karlsruhe, Department for Molecular Environmental Toxicology
- Monika Büning, Federation of German Consumer Organisations
- Dr. Astrid Droß, Federal Office of Consumer Protection and Food Safety

### 3 Textiles

- Dr. Jan Beringer, International Textile Research Centre Hohensteiner Institute
- Monika Büning, Federation of German Consumer Organisations
- Dr. Raymond Mathis, Active Textiles Cognis Deutschland GmbH & Co.KG
- Natalie Eckelt, Bund für Umwelt und Naturschutz Deutschland, co-ordination of the standardisation work of the environmental associations

## Annex 4 – Project details

Project term: April 2006 - January 2007  
Principal: Federal Institute for Risk Assessment (BfR), Berlin  
Contractor: Independent Institute for Environmental Concerns (UfU) and Institute for Ecological Economic Research (IÖW)  
Final conference: 17-20 November 2006

### Scientific Advisory Committee

The consumer conference was accompanied by an independent, scientific advisory committee. It was made up of four scientists who have comprehensive knowledge about the nanotechnology debate and are also proven experts in the field of risk management and risk communication. The Committee advised the project organisers on contents and methodological questions.

- Prof. Dr. Arnim von Gleich (Technology Design and Development Department, Bremen University)
- Prof. Dr. Armin Grunwald (Director of the Institute for Technology Assessment and Systems Analysis (ITAS), Karlsruhe)
- Prof. Dr. Harald Heinrichs (Junior Professor at the Institute for Environmental Communication, Lüneburg University)
- Dr. Hans Kastenholz (Technology and Society Department, EMPA, St. Gallen, Switzerland)