Nanotechnologies use materials on an incredibly small scale so that they take on new properties compared to their larger form. The technology has the potential to transform many of the everyday consumer products that we use and a wide range of products are already on the market including tennis racquets, self-cleaning windows and stain proof clothing.

Nano cosmetics is one area of particular interest as new types of products can be made using nano materials. UV filters used in sunscreens produced in nano form, for example, become clear rather than white when compared to their larger form. However, there’s uncertainty about whether, alongside the changes that bring consumer benefits, some of these materials could present new risks. Materials could be more hazardous and behave differently in the body compared to larger forms.

It isn’t clear yet how and where nano materials are being used in cosmetics. Some products are promoted on this basis, but others using nanotechnology don’t reveal it. There is also uncertainty about how to assess them for safety. While some materials raise little concern, experts advising the Government have highlighted potential risks posed by others, particularly insoluble nano materials.

This latest Which? research takes a closer look at what nano cosmetics are on the market, what information is available about them and whether or not we can be sure they are safe.
WHAT IS NANOTECHNOLOGY?
Nanotechnology manipulates materials at an incredibly small scale. The use of nanotechnology stretches across many sciences from electronics to biology and many product sectors so it is more accurate to refer to nanotechnologies, rather than a single technology.

A nanometre (nm) is a millionth of a millimetre, roughly one eighty thousandth of a human hair. Nano materials have one or more external dimension, or an internal structure, on the nano scale (roughly between 1nm and 100nm) and could show new characteristics.

KEY ISSUES
- Nano materials are now being used in leading cosmetic products, most commonly as chemicals used to give the protection in sunscreens.
- Some nano materials raise little concern; others could present risks because of their new properties.
- EU experts have questioned how the safety can be assessed given important knowledge gaps. But despite this, cosmetic companies are responsible for assessing the safety of most nano materials, rather than an independent body.
- Nano materials used as UV filters in sunscreen products do have to be independently assessed, but we found nano zinc oxide in use, although it has not yet been fully assessed. Nano titanium dioxide is also widely used in sunscreens, although the EU’s scientific committee wants to re-assess its safety when used on sunburnt and other damaged skin.
- One type of nano material we found used in two anti-aging cream products (called ‘fullerenes’) raise particular concerns about potential toxicity if they were able to penetrate the skin.
- There are concerns that nano silver might be toxic, but we found toothpaste and other cosmetic and personal care products marketed as using it on the internet.
- At the moment, consumers can’t tell which products use nano materials.

nanotechnology in cosmetics
Nanotechnology manipulates materials on an incredibly tiny scale so nano materials are used in cosmetics to give them new characteristics. Nanotechnology has the potential to be used in different ways in the cosmetics sector, creating nano materials with different properties and therefore different risks and benefits. The types of nano materials that are used include:

- Sunscreens – UV filters, such as titanium dioxide and zinc oxide, are used in nano form rather than bulk form to make the sunscreen transparent rather than white. It is also claimed that they are more effective when used in nano form.
- Nano emulsions and nanosomes – used to preserve active ingredients, such as vitamins and anti-oxidants, and their lightness and transparency.
- Fullerenes – new types of materials can be produced using nanotechnology, such as carbon fullerenes. It is claimed that these tiny carbon spheres have anti-aging properties.
- Other materials used in nano size – a whole range of materials can be used in nano size in order to give them different properties when compared with their larger form. We found, for example, an ‘energizing’ moisturiser using nano gold and products using nano silver because of its anti-bacterial properties.

WHAT IS ALREADY IN USE?
The extent to which nano materials are being used in cosmetics is unknown. Which? therefore wrote to 67 cosmetics companies, including all of the main brands as well as smaller ones, asking them about their use of nanotechnology, what benefits they thought it brought and how they ensured product safety. We had a very poor response with only 17 getting back to us, and of these, just eight were willing to give us information about how they use nanotechnology. But even the limited number of responses we received indicated the widespread use of nano materials in cosmetics, particularly in sunscreens. The summary table (pages 4 and 5) shows the companies that confirmed they are using nano materials and what they said about safety testing. These are, however, very unlikely to be the only companies that are using nano materials.

As part of our research we also looked to see what type of products were being promoted on the internet and this showed that several other companies are using nano materials. It also indicated that while some of the big brands are restricting their use of nano materials to nano emulsions and UV filters in sunscreens, many smaller companies are using a more diverse range of nano materials.

Nano emulsions and sunscreens

The eight companies that told us they used nano materials were all using them in sunscreens. In addition, L’Oréal and Korres told us that they use nano emulsions.

Unilever, Korres and The Green People were open about which of their products were using nano ingredients, although Korres was the only one we found that referred openly to its use of nano ingredients on its Red Vine hair sun protection product and on its website.

Other companies who responded to our survey weren’t specific about which products contained nano materials. L’Oréal, for example, did not give us details of products although it told us that there are benefits from using nano materials (see table). Boots did not clarify whether all of its Soltan sunscreen products are made with nano materials or just some.

Nano products online

A wider range of products using nano materials are available for UK consumers to buy on the internet. We found products which were marketed on the basis of the nano materials they used in sunscreens. ZinClear from Rosacea Care, for example, says that it “uses nanotechnology to produce particles so tiny that there is virtually no light scatter and thus no whitening”. This also suggests that nano materials are used in a much wider range of sunscreen products than the response to our survey showed. As a general rule, if titanium dioxide is listed in the ingredients list, and the sunscreen is clear, it will be nano.

We found two brands that advertised their use of carbon fullerenes:

- Dr Brandt’s Lineless Cream says it contains fullerenes described as “radical sponges that stop the action of UVA and UVB by absorbing free radicals”.
- N.V. Perricone M.D. Cosmeceuticals’ Men’s Skin Fitness Shave Cream and Men’s Skin Fitness Total Facial Repair describe fullerene technology as “a powerful new delivery system, exclusive to the Perricone line”. At the time of writing, N.V. Perricone M.D. told us that it plans to discontinue these products from its product line, but did not confirm when it would do so.

Other products making nano claims include:

- Agera Nano Eye Lift claims it “provides the delicate eye area with the latest in anti-ageing skin care technology”.
- Bionova Tennis Player Sun & Wind Protection for Dry Skin claims it “enhances facial skin resistance against harmful sun radiation, using specially developed nanocomplex of naturally existing UV Chromophores & UV Protectants”. Bionova also offer tailored skin care products using nanotechnology.
- Chantecaille Nano Gold Energizing Cream claims that “nanoparticles of 24-karat gold are bound to moisturising, anti-oxidant and anti-inflammatory silk microfibre”.
- Leores Hypoallergenic Anti-Wrinkle Nano-Booster claims it “creates a silica nanoparticles network, which straightens and reinforces the skin matrix to protect the skin and improve appearance…” and that “the nano particles scavenge free radicals and toxins”. It also produces a Neck & Decollete Hypoallergenic Anti-Wrinkle Nano Formula.
- Purelogical Instant Lip Plumper claims to be based on “the breakthrough MVS LIPS™ nano-technology”.
- Rosactive Biomixyl treatment claims to be “an advanced anti-wrinkle collagen treatment that stimulates the natural collagen production without using external collagen. Based on nano proteins”.
- Salcura Zeoderm Skin Repair System claims that “Zeoderm+ is a unique blend of nanominerals and vital nutrients, suitable for adults and children who may be prone to dry and irritated skin symptoms like eczema, psoriasis, dermatitis and skin allergies”.
- StrV ectin-NE Hand Kit claims that its “thermo-active NanoExfoliating technology delivers substantial dermabrasive properties without causing lasting redness or damaging the skin”.
- Tracie Martyn Shakti Resculpting Body Cream claims to be “using nano-technology to deliver natural black currant lipids deep into the skin for moisturization…”.

We also found cosmetic and personal care products advertised online as containing colloidal silver’, which is on the nano scale. These included shampoos, lip balms and soap.
Companies that responded to our survey: what they said

<table>
<thead>
<tr>
<th>COMPANY</th>
<th>USING NANO?</th>
<th>WHY?</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVON</td>
<td>A limited number of ingredients composed primarily of either titanium dioxide or zinc oxide (not specified).</td>
<td>They are both more transparent and more efficiently absorb UV-radiation.</td>
</tr>
<tr>
<td>BEIERSDORF (NIVEA)</td>
<td>Titanium dioxide and zinc oxide are used in a range of sunscreen products (not specified).</td>
<td>They are ‘highly effective’ UV filters, which play an important role in the prevention of skin damage and skin cancer induced by exposure to UV-rays.</td>
</tr>
<tr>
<td>THE BODY SHOP</td>
<td>Titanium dioxide and zinc oxide at the nano scale have been included as sunscreens in some The Body Shop products.</td>
<td>They are used for their capacity to neutralise UV light thus protecting human skin against adverse effects of UV radiation, including skin cancer.</td>
</tr>
<tr>
<td>BOOTS</td>
<td>Boots say that nanotechnology (as distinct from nano particles) is currently not relevant for cosmetic materials as they are not aware of any current applications. They do use raw materials at nano scale – e.g. titanium dioxide and zinc oxide in sunscreens.</td>
<td>They are used as sunscreens. Boots does not consider its current use of materials that approach the nano size range as being of health concern to their customers.</td>
</tr>
<tr>
<td>THE GREEN PEOPLE</td>
<td>Nano titanium dioxide is used in Green People Sun Lotions SPF 8, SPF 15, SPF 22 and Organic Children Sun Lotions SPF 25 Lavender &amp; No Scent versions.</td>
<td>It acts as a photo-stable filter effective against UVA and UVB radiation.</td>
</tr>
<tr>
<td>KORRES</td>
<td>Nano zinc oxide and titanium dioxide are used in products claiming SPF protection and containing natural sun filters: Wild Rose Cream, Watercress Cream, Pomegranate Cream (with SPF), Thyme Honey Cream, Evening Primrose Night Cream, Honeysuckle Hand Cream, Face Sunscreen SPF 30 and 20, Sunscreen SPF 15, Spray Sunscreen SPF 25, Kids Sunscreen SPF 30, Eye Cream Chestnut and Ruscus, Red Vine Hair Sunscreen (which also contains a cationic nano emulsion).</td>
<td>The sun filters provide effective UV protection and improved transparency. The nano emulsion in the hair sunscreen is more effective because of the positively charged carrier system.</td>
</tr>
<tr>
<td>L’OREAL</td>
<td>L’Oréal implied that they use titanium dioxide as a sunscreen and also use nano emulsions, but did not give any specific details.</td>
<td>Nano emulsions (preparations containing oil and water droplets reduced to nanometric size) in cosmetics increase the content of nutritious oils while preserving transparency and lightness of the formulas. Titanium dioxide is renowned for its capacity to absorb UV light.</td>
</tr>
<tr>
<td>UNILEVER</td>
<td>Use ultrafine titanium dioxide and zinc oxide in Pond’s RegenerActiv Day Treatment face cream and Pond’s RegenerActiv Eye Contour face cream.</td>
<td>Both materials are used for their capacity to reflect and scatter UV light to provide a sunscreen benefit on skin (titanium dioxide) or to protect the integrity of the product (zinc oxide).</td>
</tr>
</tbody>
</table>
COMPANY INFORMATION ABOUT SAFETY

Individually and fully evaluated by Avon’s scientists before being permitted for use in cosmetic products, including the potential to be absorbed through the skin. Their scientists concluded they can be used safely. They also cite that both materials are specifically approved for use as sunscreen active ingredients by the US Food and Drug Administration.

Beiersdorf told us that the safety of both nano pigments has been confirmed and independently verified by various scientific and governmental authorities. They cite that comprehensive data is available which demonstrates that these nanoscale particles are not able to penetrate through the skin barrier and confirms that they are safe for use in cosmetics.

The Body Shop reviews all materials for safety, and ask ingredient suppliers for safety data of the individual raw materials used. They take both the potential human and environmental impact of all the products that they sell very seriously, and all formulations developed for The Body Shop are subject to careful evaluation by independent external safety assessors.

Boots review all the properties of the material and its intended use to satisfy that it does not put consumers or the environment at potential risk. If they cannot satisfy this, or obtain sufficient data to make a decision, they take a precautionary approach and do not use the material. They do not assume, that a nano material is inherently unsafe, just as they do not assume that a naturally occurring material is safe.

The Green People have extensively researched the use of nano titanium dioxide, and believe the silicate-coated rutile form they use is safe and effective. They also cite than titanium dioxide is approved for use as a sunscreen agent in the Cosmetic Products (Safety) Regulations up to 25%, regardless of primary particle size, and that all their sun lotions contain less than this.

Korres said there are a few recent papers according to which the reasonable safety limit referenced most is 20 nanometres – anything below 20 nanometres is not classified necessarily as low/high risk, but as a precaution 20+ nanometres is considered a safer choice. They have only used nanotechnologies where necessary for product efficacy, and only at sizes between 60 and 100 nanometres, 3-5 times above the ‘universally accepted safety barrier’ of 20 nanometres. They establish product safety through safety assessment of the final products, and technical information and Material Safety Data Sheets (MSDS) from the manufacturer of the raw materials.

L'Oréal told us they use nano materials that have been proven to be safe, citing that: public health agencies worldwide acknowledge nano emulsions do not cross the skin barrier; and nano pigments such as titanium dioxide, are inert and also non-toxic. For precautionary reasons they do not market products containing nano tubes or fullerenes, or use nano materials in aerosols, where information about safety is either incomplete or shows the possibility of side effects. They have developed an experimental model of eco-toxicity that makes it possible to test nano materials under conditions approaching the real world.

Unilever use nano materials on the basis of their proven benefit and their safety profile, which has been built up over many years of use. All materials used in their products are in full compliance with the Cosmetics Directive. Numerous studies have concluded that nano pigments, such as titanium dioxide and zinc oxide do not cross the skin barrier, even where the skin has deteriorated, e.g. acne or psoriasis. Studies by the US Food and Drug Administration and in Europe have demonstrated that even where titanium dioxide nano pigments are injected into the blood stream, no adverse effects are observed.
Other possible uses

The products mentioned reflect what we managed to find out from the limited number of cosmetic company responses to our survey and what we found on sale or available on websites. The situation is confusing because some products actively promote their products on the basis of their ‘nano’ characteristics, while other products that use nanotechnology do not refer to it on the label. This is also complicated because there isn’t any international agreement on how you define nano materials.

The Government doesn’t even know which products use nanotechnology, cosmetics or otherwise. In September 2006, the Government launched a voluntary reporting scheme for engineered nano materials to find out what was, or could be, on the market, to guide the development of regulations. But this has had a very limited response with just 12 responses in two years and is now under review.

A US institute, the US Woodrow Wilson Center for Scholars, has voluntarily put together a list of over 800 consumer products that are believed to be produced using nanotechnology, based on claims that are made about the products. This list includes everything from toys and clothes to iPods and also includes a number of cosmetic products from leading brands.

This indicates that a much broader range of companies are using nano materials in their products globally, such as:

- **Breast cream:** St Herb Nano Breast Cream claims it is a combination of “nanotechnology and the timeless Thai herb, Pueraria Mirifica” and that nanosomes “expands the cellular substructure and development of the lobules and alveoli of the breasts”, with increased size from one to three cups.
- **Hair care:** RBC Life Science’s Nanoceuticals Citrus Mint Shampoo and Conditioner are made with NanoClustersTM, “nanoclusters to give your hair a healthy shine”.
- **Make-up:** Serge Lutens Blusher’s Nano Dispersion technology “creates an extremely fine and light powder with extraordinary properties: excellent elasticity, extreme softness and light diffusion”.
- **Moisturisers/anti-wrinkle creams:** Lancôme Hydra Zen Cream with “nano-encapsulated Triceramides... renew skin’s healthy look”, L’Oréal Revitalift Double Lifting anti-wrinkle cream is their “first double-action cream that instantly re-tautens the skin and reduces the appearance of wrinkles”, and contains Nanosomes of Pro-Retinol A.
- **Toothpaste:** Sangi’s Apagard claims to be the world’s first ‘remineralizing’ toothpaste, promoting oral health by supporting natural healing, using “nanoparticle hydroxyapatite”, “the same substance as our teeth”; Ace Silver Plus Nano silver toothpaste is manufactured and available in Korea.

Some nano materials raise more safety concerns than others. The EU Scientific Committee on Consumer Products (SCCP) is responsible for advising the European Commission on cosmetic safety. In February 2008 it looked specifically at the issues raised by nano materials, and concluded that there are major data gaps in the assessment of exposure and uptake of nano particles through the skin, inhalation, oral ingestion and eye contact, for example, if nano particles are used in hairsprays, perfumes, lipsticks, make up or toothpastes.

The Committee split nano particles into two groups: soluble nano particles which disintegrate when they are applied (such as the nano emulsions, liposomes and nanosomes) and insoluble ones (such as titanium dioxide and fullerenes).

They thought that conventional approaches to assessing risk could possibly be adequate for determining whether the first group were safe or not, but that this would not be the case for the insoluble particles, where the number of particles, their surface area and size distribution would all be important. The concern would be, for example, that a nano particle could penetrate the skin and ultimately be transferred and circulated through the body. The Committee recommended that, given the different issues that could arise, each nano material should be evaluated on a case by case basis.

Questions about the safety of some nano materials used in cosmetics are not new. In 2004, the UK’s Royal Society and Royal Academy of Engineering first raised concerns about the safety of nano cosmetics in a report on nanotechnologies that was commissioned by the Government. They recommended that ingredients in the form of nano particles undergo a full safety assessment by the relevant scientific advisory body before they are permitted for use in cosmetic products. They also called for manufacturers to publish details of the methodologies used in assessing the safety of their products containing nano particles and that the ingredients lists of consumer products identified their use. But this hasn't happened.

Safety controls
Most people assume that if something is on the market it will have been checked for safety. This was certainly the view of our Nano Citizens’ Panel (see page 11). The safety of nano materials falls under the EU’s Cosmetics Directive which is currently under review and will be replaced by a new Regulation. There is a legal responsibility for manufacturers to put only safe products on the market. There does not, however, have to be any independent assessment to confirm this before they go on the market, other than in the case of materials used as UV filters in sunscreens.

The companies that responded to our survey told us that safety was a concern for them. Their trade body, the European Cosmetics Association (COLIPA) assured us that safety is the number one priority of the cosmetics industry and that it “can reassure experts and consumers that all cosmetic products are subject to rigorous safety testing and evaluation”. Our survey showed the difference in approach adopted by different companies. While some told us that they have conducted their own risk assessments, others rely on safety data sheets provided by their suppliers. Some companies have clearly set boundaries for where they will and will not use the technology. For example, L’Oréal told us that it would not use fullerenes, nano tubes or nano particles in aerosols. But some companies do use these type of nano materials – as well as others that raise safety questions. Enforcement of the legislation is the responsibility of local trading standards departments but they are only likely to follow up an issue once a concern has been raised about a product already on the market.

Sunscreen safety
The Cosmetics Directive sets down a limited list of UV filters that are permitted to be used in sunscreens. These have been independently assessed as safe by the EU’s Scientific Committee on Consumer Products (SCCP). However, there remains uncertainty about how to assess the safety of substances in nano form as there are gaps in basic research.

Titanium dioxide has been approved for use as a UV filter in all sizes at a maximum concentration of 2.5 per cent, but the SCCP has raised some concerns about its safety when used on damaged skin (for example, skin that is sunburnt). Although there seems to be a reasonable amount of agreement by experts that these nano particles would not be able to get through healthy skin because they would still be too big to squeeze through the gaps in the barrier that the skin presents, it isn’t clear whether they could pass through the skin if it

“Most people assume that if something is on the market it will have been checked for safety.”


is damaged. Some studies suggest that nano particles are unable to get through the damaged skin of psoriasis sufferers, but there is an absence of information for sun-burnt skin. Nano titanium dioxide was assessed for use in sunscreens in 2000, but the Committee has called for additional information from the cosmetics industry to demonstrate that there is no penetration through abnormal skin.

Zinc oxide, on the other hand, has only been assessed as safe for use in its bulk form, although several companies told us that they use it in nano form. The SCCP (or Scientific Committee on Cosmetics and Non-food Products intended for Consumers, as it was previously called) did start to consider the safety of nano zinc oxide in June 2003, but requested more information from manufacturers to enable a proper safety evaluation.

In its most recent opinion published earlier this year, the SCCP called for a re-evaluation of nano titanium dioxide and zinc oxide used in sunscreens, particularly in relation to damaged skin and to assess the effects of mechanical action from rubbing in the lotion or flexing the skin. It also called for the data that industry submits to demonstrate safety to be publicly available.

**INADEQUATE SAFEGUARDS**

These concerns about products currently on the market show the weakness of current safety controls. Companies have a responsibility to ensure that only safe products are sold, but our research highlights confusion over how this is applied and enforced in practice. If the independent scientific committee (the SCCP) responsible for assessing the safety of cosmetic ingredients has raised concerns about how to assess the safety of these products, it is difficult to see how these companies can assure their safety with confidence.

**Independent safety assessment**

Proposals for a new Cosmetics Regulation are intended to address the issues raised by nano materials. But Which? is concerned that they are still too weak. The European Commission is proposing a similar approach to that already in place, with only minor changes. Responsibility would still lie with a person within the cosmetics company to sign off the safety of a nano material, rather than an independent body. However, the company would be required to notify the European Commission if it was using a nano material. The idea is that this would enable enforcement bodies to take follow-up action if they wished to.

The UK Government has described this as a proportionate and flexible approach that would enable the Commission to maintain a list of cosmetic products containing nano particles, and facilitate prompt action in the event of a particular nano particle being identified as harmful. We would like safety to be assured before products go on sale, rather than leaving it for action to be taken after a problem has been identified and consumers have been put at risk.

Even if we have tighter regulations within Europe, some of the products that are available now, or could come along in the future, will be available over the internet from different countries where regulation may be different. International co-operation is therefore essential. The Organisation for Economic Co-operation and Development (OECD) is looking at the safety of 14 nano materials that have been developed, including fullerenes, zinc oxide and titanium dioxide. This is an important exercise, but it does not deal with the uncertainty over these products in the short term, as coming to an international agreement is likely to take several years.

Given the novel properties of nano materials and the uncertainties about how to assess their safety, Which? believes that they should be independently assessed before they can be used in cosmetic products. The new EU Regulation should include an annex of permitted nano materials that can be used in cosmetics based on a positive safety assessment by the relevant independent expert committee (currently the SCCP). If they aren’t on the list, they shouldn’t be used. This will distinguish between those nano materials for which there is little concern, compared to those where their novel properties raise new risks that make them unsuitable for use. We believe this approach would be proportionate as responsible companies should already be in a position to demonstrate the safety of their products under current requirements.

We are also concerned that our research has revealed the availability of cosmetic products containing nano materials that the SCCP, as well as other leading experts, have raised concerns about. This highlights the need for effective enforcement of the current requirement to ensure that products are safe. If there are questions about the safety of a nano material being used in a cosmetic product, it should not be used until its safety has been independently assessed and confirmed.

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We asked three leading experts to give their opinions on the responses we received from the cosmetic companies and the other products we found marketed as using nano materials:

- **Professor Richard Jones** is a Professor of Physics at the University of Sheffield and the Engineering and Physical Sciences Research Council’s (EPSRC) Senior Strategic Advisor for Nanotechnology.
- **Professor Vicki Stone** is a Professor of Toxicology at Napier University and focuses on the potential toxicity of nano particles.
- **Professor Ken Donaldson** is a Professor of Respiratory Toxicology at Edinburgh University.

Of the nano materials that we know are already in use, some raise far more concern than others. Their main conclusions were that:

- A number of companies are already using nano materials, particularly in sunscreens (titanium dioxide and zinc oxide). Professor Richard Jones commented: “The survey is striking in the way it reveals very widespread use of nanotechnologies in cosmetics, especially in the form of nanoscale titanium dioxide.”
- Companies are defining nanotechnology differently, which highlights the need for more clarity about the different types of nanotechnology coming into use, and the specific and separate issues they may raise.
- Companies are taking different approaches to the required safety assessment. Professor Vicki Stone commented that: “There appears to be various levels of rigour of safety assessment across the sector varying from in-house safety testing to relying on safety data sheets.” Professor Ken Donaldson commented that: “Skin has evolved to keep things out but nano particles in cosmetics might be small enough to penetrate.”
- Nano emulsions, such as those including vitamins, were not generally thought to be likely to cause concern.
- Nano-sized titanium dioxide was not likely to penetrate the skin and therefore be of concern for people with healthy skin, although further research was still needed.
- There was, however, concern about the lack of evidence on the risk if nano titanium dioxide was applied to damaged skin, such as sunburnt skin.
- Some companies did not seem to appreciate that long-term use of titanium dioxide and zinc oxide in bulk form did not necessarily mean that nano forms would also be safe.
- Particular concern about the use of fullerenes in anti-aging products given uncertainty about their potential toxicity as well as scepticism about their anti-aging claims. Professor Richard Jones expressed concern that while these claims are not wholly implausible, in that such properties can be demonstrated in the test tube, he is “not aware of research that demonstrates such activity in these type of products still less a convincing demonstration that this leads to significant benefits. On the other hand, there is considerable uncertainty about the potential toxicity of fullerenes.”
- Further concern was expressed at the idea of using nano silver in toothpaste. Professor Vicki Stone commented that: “This is by far the product of most concern. Silver has the potential to be relatively toxic to cells. The nanoform appears to be more toxic. These forms of use are likely to lead to exposure from absorption inside the mouth or by ingestion. In addition, our mouth contains a number of ‘friendly’ bacteria, and over-use of substances which kill the friendly bacteria (a property of nano silver) are associated with opportunistic infections. This has not been demonstrated for silver nanoparticles used in the mouth, but it is something which needs to be tested.”
“There does not have to be any independent assessment.”

A new Which? survey has highlighted that many people remain unaware of nanotechnology and know little about how it is being used. 45% of adults had heard of nanotechnology, but even those who had heard of it were unclear about what it is, as, when consumers were asked what was the first thing they thought of when they heard the word ‘nanotechnology’, most mentions referred to ‘small things’ or electronics. Only 5% of those aware of nanotechnology spontaneously thought that it was being used to develop cosmetic and skincare products.

When asked about controls over these products, there was a lot of uncertainty reflecting people’s lack of understanding of the issue. Around two in three adults said that they would assume that any cosmetics or skincare products using nanotechnology are independently assessed as safe before going on sale. Those aware of nanotechnology were more likely to agree with this. A similar number (67%) also told us that they would expect cosmetics or skincare products using nanotechnology to be clearly labelled.

The Which? Citizens’ Panel

At the end of 2007, Which? held a ‘Nano Citizens’ Panel’ to try and find out how people viewed the use of nanotechnologies in different consumer products (cosmetics, foods, medicines and general consumer products such as electronic goods and sports equipment) once they had heard a range of views from different experts. It was carried out by Opinion Leader and overseen by a steering group made up of experts with a range of interests.

Fourteen people from a range of backgrounds, broadly selected to reflect the general public met over three days in Birmingham to consider the issues raised by nano consumer products. Panellists were generally excited about the potential that nanotechnologies offer, particularly for health and medicine, and were keen to move ahead with developing them. However, they also recognised the need to have adequate controls covering the risks.

Specifically in relation to the use of nano cosmetics:

- Panellists were fairly positive. Although some, particularly men, felt that the potential safety risks meant that they would be unlikely to try a product that they knew had been developed using nanotechnologies, many thought that they would be more likely to use a nano product as it was something new.
- People thought that the use of nanotechnologies could mean more choice and products that work more effectively.
- Positive reactions tended to assume that products were safe and panellists expected that anything coming on to the market would have been tested for safety. “You don’t doubt anything you pick up off the shelf.”
- The people participating were worried that doubts had been expressed about the suitability of safety tests for nano materials. Although they accepted that the cosmetics industry felt products were safe, and were to some extent reassured by this, they were slightly cynical over whether this meant that products actually were safe. “You do not allow anything onto the market without safety tests.”
- Many people said that they would apply common sense when selecting products and in weighing up whether to use nano ones. But there was also concern about how you could actually do this given that: most products are not labelled; most consumers would not have the same level of information as the Panellists; and there was uncertainty about whether safety tests are adequate for nano materials. “I was quite pleased initially that there was so much rules and regulation already but some of it doesn’t apply as nano is a new technology.”
- There was concern about the independence of the safety assessors if they work for the company. Panellists stressed the need for independent safety assessments and called for regulations to be applied internationally to protect consumers in a globalised market.
- There was also concern that the use of the term nano could be a marketing tool, resulting in higher prices but not necessarily delivering any extra benefits. “It will become a buzz word that won’t actually mean anything.”
- The people involved wanted products containing free nano particles, as used in cosmetics, labelled. Panellists acknowledged that this could cause some confusion and concern, but thought it was unethical not to inform people. To avoid confusion, they wanted labelling to be done in tandem with broader information about nanotechnologies.
It is clear that nanotechnology has the potential to bring benefits to cosmetics as well as other consumer products, but there are some safety concerns and it is unclear where nano materials are being used. While companies fail to be open about how they are using the technology now and what they could be doing in the future, it is impossible for consumers to make informed choices.

The Government has a voluntary reporting scheme, but has had very few responses. This should, therefore, be made mandatory so that it is clear where nano materials are being used and the issues that they raise can be properly assessed.

Which? research suggests that consumers are open to the benefits nano cosmetics can bring (see the Which? Citizens’ Panel). But it needs to be ensured that the claims made aren’t misleading consumers. The sunscreen issue illustrates the potential confusion over the possible benefits as well as the risks. Some companies told us that they use nano materials because they are more effective, as well as being clear. But, as many of them don’t tell you whether or not they are using them, consumers can’t choose for themselves whether they think it is a worthwhile benefit. These benefits also need to be considered in relation to the alternatives on offer.

Professor Richard Jones told us, for example, that “The benefits of using sunscreen to protect against the harmful effects of ultra-violet radiation are clear and uncontroversial, and it is against these benefits that any uncertainties of a particular type of sunscreen need to be measured. It is certainly not the case that alternative active ingredients for sunscreens, based on small organic molecules, are entirely above suspicion”.

This reinforces the urgent need to independently examine the risks and benefits raised by the use of nano materials in sunscreens and draw some conclusions about whether consumers should restrict their use of these products or use more of them. While uncertainties remain and the scientific committee awaits further information from the manufacturers on the effects of nano titanium dioxide on damaged skin and on nano zinc oxide more generally, consumers are being left in the dark while unknowingly using products that contain them.

Our research shows that consumers would like cosmetic products to indicate if they contain nano materials – but they recognise that information about nano ingredients is only going to be useful if it is backed up by broader public information about nanotechnologies. As our research suggests a reluctance by cosmetic companies to do this on a voluntary basis, it should be made a requirement within the new Cosmetics Regulation.

“*It is clear that nanotechnology has the potential to bring a lot of benefits – to cosmetics as well as other consumer products.*”

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**Consumer Information**

It is clear that nanotechnology has the potential to bring benefits to cosmetics as well as other consumer products, but there are some safety concerns and it is unclear where nano materials are being used. While companies fail to be open about how they are using the technology now and what they could be doing in the future, it is impossible for consumers to make informed choices.

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**Calling for Action**

- The Government should require companies to report their use of manufactured nano materials.
- Potentially unsafe products should be removed from sale.
- An independent expert group should be established to advise the Government on the risks and benefits of nano sunscreens.
- The new EU Cosmetics Regulation should include a positive list of manufactured nano materials that are permitted to be used in cosmetic products based on an independent safety assessment.
- Clear information should be provided to consumers about the use of nano materials in cosmetic products, as well as nanotechnology more broadly.

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[8] Which? commissioned a Citizens’ Panel with 14 members of the public, which sat for three days from 29 November – 1 December 2007, aiming to inform members of the public about, and gauge their views on nanotechnologies.
Which?'s 10 Point Action Plan sets out the key actions that we want taken to ensure that consumers can take advantage of the benefits nanotechnologies offer consumer products without being put at unnecessary risk:

- **CO-ORDINATION:** The Government should establish a strategic stakeholder group to ensure there is effective input from all sectors of society and that the necessary measures are implemented and progress monitored.

- **DEFINITIONS:** International agreement is needed on definitions for nanotechnologies.

- **PRODUCTS:** The Government and EU need to understanding what products are already on the market, in the pipeline or at the research stage and identifying those likely to raise most concerns based on current understanding.

- **RESEARCH:** The Government and EU need to ensure that uncertainties around the environmental and health risks presented by some manufactured nano materials are urgently addressed – and ensure that research to enable this is funded.

- **ASSESSMENT:** The Government and EU must providing clarity over how the safety of nano materials should be assessed given the current knowledge gaps.

- **PRECAUTION:** The precautionary principle should be applied to products where there are potential risks, but where it is not currently possible to assess their safety, so that consumers are not put at risk.

- **TRANSPARENCY:** Government and industry should be open about the uncertainties that some nano materials may raise, the research underpinning safety assessments as well as claims about potential benefits.

- **REGULATION:** The EU needs to address the loopholes in regulations so that nano materials are included and there is clear guidance on how the regulations apply.

- **INFORMATION:** The Government must ensure consumers, industry and regulators have clear information about where nano materials are being used and that any claims they make are true.

- **ENGAGEMENT:** The public should be involved in meaningful discussions, at all levels, about the development of the technology, priority applications and any no-go areas.