

The Science of Beauty

Transcript of public lecture and roundtable discussion on "The Science of Beauty" at the Royal Irish Academy in Dublin on 15 November 2007, as part of Science Week. The panel consisted of:

- *Dr Raniero De Stasio, Scientific Director, L'Oréal UK*
- *Dr Chris Gummer, Sense about Science*
- *Ms Vanessa Hyde, Quality Assurance Director, Shandon Clinic*

The Science of Beauty – part one

Peter Brabazon: "Good evening ladies and gentlemen. My name is Peter Brabazon. I'm the programme director of Discover Science & Engineering and we're responsible for Science Week this week. It's all about being surrounded by science and I think this evening we'll see how the topic 'Science of Beauty' emphasises that even more.

"You're very welcome to this beautiful building, the Royal College of Physicians, and the Corrigan Room. And just to let you know, Corrigan was the president here 350 years ago and this was a gentleman-only club, so what an interesting topic we have here tonight. Today we have fashion shows here and weddings, so times have changed. Not only are we in a very beautiful room, and I must say the restoration work they've done in the last few years is really excellent, beautiful, and that is, of course, exactly what the topic is tonight.

"While I appreciate that the emphasis tonight will be, a lot of the time, on cosmetics – cosmetics perhaps for women – don't forget the men because they're becoming much more conscious of their own looks as well. I think that's probably driven by the women. Interestingly enough, in our own survey of the science in people's lives and the technology in people's lives, a lot of men said that they had hair straighteners. Quite a large proportion, in fact, of the sample group that we used, thirty per cent – it's kind of hard to believe, but there you go, thirty per cent of men have hair straighteners.

"We're very pleased, as Discover Science and Engineering, to be working with Women in Technology and Science. Sadhbh McCarthy and her colleagues here have really done well, and put this all together. Of course it's a key thing from our perspective to talk about the opportunities in science and see – because we're supported by such eminent scientists tonight – what the opportunities of scientists in the beauty industry are. But what we're trying to

emphasise is that there are careers and opportunities for young people and particularly, of course, for women.

"You're fortunate tonight to have a very eminent journalist and broadcaster in Karen Coleman. Karen, interestingly enough, has worked in quite a lot of hostile environments so I'll be listening to see how she keeps looking like that in those hostile environments. She firstly worked in all the former Yugoslav republics, and when you think of places like Kosovo, and broadcasting for the BBC, over a nine-year period, and she always looked good. So, I'll be handing you over to her but just to remind you of course that she has a programme now on Newstalk called The Wide Angle and it would be interesting to see if she mentions us in the future and mentions Science Week. Karen Coleman..."

Karen Coleman: "Thank you. Ladies and gentlemen, you're all very welcome to this very interesting session. I mean, it's been fascinating already talking to our three colleagues who are going to be taking part in this debate tonight and especially during this week's Science Week lecture series. First of all if I can extend my thanks to Sadhbh McCarthy and to Women in Technology and Science and to Discover Science & Engineering for inviting me to chair this debate. I'm delighted to be chairing it, both as a consumer of beauty products and a journalist.

"I was just thinking about an interesting little anecdote about beauty products because I never go anywhere without my lipstick, I always feel a bit naked. Even in war zones, it was the one piece of cosmetics I did bring around with me, glaring red lipstick, which was pretty horrendous sometimes to be looking at it. It's only afterwards, when I looked back at colour photographs of myself afterwards I thought, 'Oh my God, was I wearing that colour lipstick?'

"But I recently interviewed a very renowned Egyptian feminist called Dr Nawal Elsaadawi. She's come under a lot of trouble in Egypt for her very progressive, radical views on feminism. She's been booted out of Egypt because she's condemned the Islamics' treatment of women and she's moved to the US. I thought it would be very interesting to get this woman's views on the veil and the wearing of the veil in Islamic cultures because, as you know, a lot of people would say it's a symbol of repression, while perhaps Islamic women who wear the veil say 'No, no, no, it's not.'

So, we were having this discussion and I was asking for her views. She turned to me and she said, 'You're wearing a veil.' 'Am I?' 'Yes,' she said 'and you're as suppressed as the women who wear veils in Islamic cultures in my view.' And I said, 'What veil am I wearing?' And she said, 'You're wearing lipstick.' And she then went on to say that any woman who wears lipstick or cosmetics of any kind are wearing veils and that we should all be going around completely naked in terms of no cosmetics. And I was just thinking as I was coming in here tonight, can

you imagine if all the women in the world who wear make-up decided to take her advice, and how the people producing the cosmetics would be very troubled by that?

"We do hear a lot about beauty products and I suppose to what extent – and hopefully this will be an area we touch on tonight – the claims made by those who produce these beauty products, to what extent are they true? Claims like 'Anti-aging creams will reduce your wrinkles,' or products that will increase your beauty. And then, of course, there's a lot of scaremongering as well, perhaps some justified, about beauty products. We're worried that, because they carry chemicals, they might not be good for our health, worried that they might be penetrating our skin. There are even scares about could they possibly cause cancer. So I think the topic tonight is a really legitimate one to ask, to question, and I am really delighted to say that we have three fantastic panellists who will each be giving a presentation of about 12 to 14 minutes and then it will be followed by a question and answers session. So please, if there are any questions, do bear them in mind and I will try to get your questions in.

"Now, we have, taking part in the debate tonight, Vanessa Hyde who is a Quality Assurance Manager with Shandon Clinical Trials; Dr Raniero de Stasio, Scientific Director with L'Oréal UK and Ireland; and Dr Chris Gummer, an independent consultant to the cosmetics industry.

"Dr Gummer will be starting first. He has worked for more than twenty years with Procter and Gamble in research and development. He has extensive experience in copy claim and development and claim substantiation with some of the world's leading consumer brands. His experience ranges from fundamental research, hands-on development of data and methods through a copy development and product prudence – new word for me but there you go. But importantly, Chris has extensive experience in working with BACC and the ASA from the position of advertising a product. He is also a widely published and quoted author. So Dr Chris Gummer, perhaps you could take the floor first. Thank you very much."

Chris Gummer: "Thank you very much for the invitation to speak here this evening, it really is a pleasure to be here. Can we have the video please?"

Video: "[Unclear]...so I invest in my skin. I'm always searching for my perfect moisturiser. I've discovered Derma Genesis. All new L'Oréal Paris Derma Genesis has pro-xylane and hydroxyl acid. Everybody's talking about it. It intensely moisturises for younger looking skin and nurtures cells in the top skin layers. Skin feels plumped up, tightened, with a dewy glow. New L'Oréal Paris Derma Genesis. For your free sample visit lorealdermagenesis.co.uk. Because we're worth it."

Gummer: “Well, we are talking about the science behind beauty. That’s how you see beauty come into your households almost every day, whether it’s in magazines or on TV. These are some of the typical examples that you might see in a magazine for anti-ageing or a change in the appearance of wrinkles. In this day and age, there is a lot of scepticism. Have they been Photoshopped? Has there been airbrushing? You can see, especially in the pictures on the right, a big difference between the before and after. They look quite striking but can you really trust them? Well, the answer is yes. And what I want to do is tell you a little bit about the science that goes behind the beauty care industry, and a little bit about my science and why I’ve enjoyed so much being in this industry.

“What we’ve done here is take a couple of the wrinkles before and after and what we’ve done is use very sophisticated computer analysis. We take an image of the skin surface, it’s not a photograph as such. We project a little fringe onto the surface of very fine lines and look at the distortion in those lines, use a computer program, turn them back into an image, and then measure the difference. What you can see in these images, the one on the left, the wrinkle has a lot of red in it which points to being very deep and blue equates to being very shallow. And after treatment here of eight weeks, you can see that the red is gone almost and the blue is increasing. So even in the pictures before, even if you didn’t trust the pictures, if you said, ‘Well, somebody’s adapted the pictures a little bit’, we can actually prove, through some of the most sophisticated image analysis – the same sort of stuff that’s used to look at the far planets of the solar system – that the wrinkles have actually changed in depth.

“It’s often said that beauty products are more myth than science. If that was the case, this would be one of the great stories for the journalists. This would be the biggest collusion of people on the planet. Because every day, I get to work with people from all different disciplines; biologists, chemists, material scientists, fluid technologists, you name it. Even to people in genomics, I couldn’t think of a genomicist. But we’re right at the edge of science and you may have seen on the BBC news the other day that the genetic code for the bug that causes dandruff on your scalp has now been understood and unravelled. We’re getting right to the edge of science.

“So today’s beauty products really are built out of the most outstanding applied science that’s available and by some of the most outstanding scientists on the planet. Men and women across the world are really stretching their science into these products.

“When I started to put this brief talk together, I looked back over my career and thought ‘Where have I worked and who have I worked with?’ And I suddenly realised that I’ve worked with people all across the globe. And I don’t know if you’ve ever been to an interview, when you were much younger, and they say to you ‘Well, what do you want to do?’ And I said, ‘I want to

get promoted and I want to travel the world.' And as I look back, I've been very lucky because I've achieved both of those. The most important one was to travel the world and work with some of the best scientists available.

"Just to take a couple of these pictures – the top left is Besançon in France, one of the old cities, superb dermatologist working on hair there. Over to the far right, one of the other old cities, Aachen in Germany, one of the premier fibre science labs in the world working on hair there. And working in California, working on drug development and penetration of ingredients into the skin. And they're working with dermatologists out in Sydney and Melbourne. If any scientist wants to come into this industry, there's a place which is full of science and full of opportunities.

"And I thought I'd just put together this map, because it amused me. This gave me an idea of how far we've gone across the world with the sole aim of bringing back the science from people that don't necessarily work in the beauty care industry. From people who are maybe petrochemical experts, they're experts in free radicals in the oil industry but what we wanted was their expertise in chemistry to solve some of our problems in the beauty industry. So we've been everywhere and we've talked to everybody so that's the nature of the science in these products.

"So, isn't it just stick it all in a pot and stir it up? Is it really that simple? Well, I won't go through all of these but this is just a very brief list of some of the techniques that are used every day. And this is not just techniques, some of them unpronounceable: time of flight secondary ion mass spectrometry, TOF-SIMS for short; viscoelastometry; electron microtic infra red spectroscopy. I work with them every day. The interesting thing is that you will see all of these techniques every day. These are the things that go behind what you might just think is a simple pot of cream. Really sophisticated science, right at the edge of science as well.

"What do some of these things look like? Top left is a TOF-SIMS machine, costs about a million euros. Sometimes you have to have one just to do the job. The one next to it, top middle, is a corneometer. That's how we measure the moisture content of the skin and it only costs us €1,000 but it's a really important instrument. That one, bottom left corner, looks like a coffee machine but it's actually a rayometer. That tells us all about the way the product behaves on your skin; how it slips and how it sheers and if it sticks and whether it smoothes. So we really need all of these things.

"Then we push the science really out to its edge with computational molecular modelling. Instead of going to find the molecules, we make them up in the computer. We think 'What if?', 'I wonder how?', 'Suppose we put this on a molecule...' and we ask the computer a whole load

of questions, 'Would it spread on the skin?', 'Would it penetrate?', 'Is it safe?' And most of the molecules we look at these days, we actually generate in the computer and they actually never see the light of day because they just won't do quite what we want them to do.

"So why is it all so complicated? Well, that's the ingredient list of one of the world's leading creams. I won't say which one, you can go and find all the different ones in the chemist and work out which one it is. But you can imagine trying to mix all these things together, and I always liken this to a soufflé. A soufflé is very few ingredients, very difficult to make. My son, at seventeen, can make the most brilliant soufflés; I can't in the same kitchen. There's something special about what he does, same ingredients. When you add all of these ingredients together, a lot of them don't like each other. Some are solid. Some are liquid. It's just trying to put them all together at the same time. And then sometimes when you take a solid which you need another liquid to disperse they then don't like a third one so you need another ingredient. Each of these ingredients has very special properties to either put the product together or make it feel a certain way or deliver a certain ingredient to you.

"And the little picture down the bottom is just looking into one of these products. The little pearls you see there are actually liquid crystals. Now liquid crystals are a little bit like solid crystals that you would see in a diamond or a sapphire on your ring, but these are actually made of liquid. And we need the structure and the chemistry to hold them together. They're layer upon layer of different liquids to form these wonderful crystals and they deliver ingredients in special ways.

Gummer: "What I'd like to say about my product is something like this: 'Makes yourself younger. Makes you richer.' Wouldn't it be wonderful if I could say all of that? Well, the answer is I can't. Because it doesn't matter what I say, because it matters to you, it matters to the regulators, it matters to the competitors. To you it matters because if I say the wrong things and you don't believe me, I've lost your trust and you'll never buy the product again. I can't over-claim. It won't make you thirty years younger, that's for sure.

"The regulators keep a very strong eye on what we do. And the competitors know the science just as well as each other so if you over-claim in one particular area, your competitors will tell you you're over-claiming and go straight to the regulators. So everybody's watching each other and there's very powerful rules out there. And one of them is the BACC. The same thing happens over here. I do some consulting for the BACC. All TV and radio copy, advertising, is pre-cleared before it goes on air. That means the script is sent in, they make sure it follows all the advertising code and then any claims that are in there, any data that's in there, is sent out to a group of consultants to make sure it's actually right. And this dialogue goes on between

them until the claim is accepted and proved properly. So everything you see on TV, everything you hear on the radio, has been pre-agreed by people to make sure it's absolutely honest.

"Now, in the rare occasion that things go wrong, that something slips out, there's another group out there called the ASA, the Advertising Standards Authority. You may be aware that Ryanair have gotten into a lot of trouble with these people. The Advertising Standards Authority, curiously, on their site say, 'Welcome to the Advertising Standards Authority.' You don't want to be anywhere near them. If you're there you're in trouble generally. But it's another regulator that's keeping an eye on you. And by and large, although it hits the news and they publish everything, by and large the cosmetic industry does not get into trouble with the Advertising Standards. They see a tiny, tiny number of complaints and the number of complaints upheld is extremely small. It's only a few tens over a whole year.

"So, if only you knew some of the science that went on behind the beauty... If there's a budding scientist out there I'd say 'Get into the beauty industry. It's a fabulous place to be.' There are a whole range of very talented scientists, they're not in it because it's the beauty industry, they're in it because of the quality of the science that's done. They're in it because of the problems they're trying to solve, which are right at the edge of science and are really, really challenging. They like coming up with solutions. And their solutions in their minds are fantastic in their science, but what their solutions really do is bring products to you, bringing the science of beauty into your homes. Thank you."

The Science of Beauty – part two

Karen Coleman: "I'd like to welcome now to the stage Dr Raniero de Stasio. He's the scientific director with L'Oréal UK and Ireland. Dr de Stasio graduated in biology from the University of Rome in 1985 and then he went on to receive a doctorate in microbiology and virology from the Indiana University. He's worked in the cosmetics sector since 1989, with particular interest in the regulatory, safety and technical aspects of the industry. So if you could please welcome Dr Raniero de Stasio."

Raniero de Stasio: "Thank you very much. Thank you to the organisers for inviting me and thank you everyone for being here tonight. What I've selected is a few slides which, hopefully, will convince you that cosmetics are not just cosmetics.

"L'Oréal as a company completely revolves around research. I'll give you a few facts and figures later. It was founded by a scientist, a chemist in particular and until the 1980s was actually run by scientists, which is a very unusual thing for companies to be run by scientists,

apart from the California Silicon Valley kind of companies. And even after the 1980s when the business people took over the world, as I always joke about, science is still extremely important at L'Oréal. When we, the scientists at L'Oréal, speak, the business people will listen to us. "This is an early picture of Dr Eugène Schueller, who founded the company in 1909 and he had a discovery, the whole company is born, if you like, because of a discovery he made in 1907. He patented phenylenediamine colourants to colour hair dyes. Phenylenediamine was already known for about twenty or thirty years but it wasn't used in hair colourants. So Dr Schueller had this idea, he started making colorants in his kitchen, packaging them in his bedroom, and training the hairdressers in his living room in a one bedroom flat in the centre of Paris. And that's a true story, and not very different from what we do today except that we don't make them in the kitchen any more. But we still invite hairdressers to learn what to do in our lounges, in our academies as we call them.

"A long time has gone since then. As I said, the company was incorporated in 1909 so in 2009 we will celebrate our centenary, so I expect some big celebrations on 5 June 2009. We are now the number one cosmetic company in the world. From just a haircare company we moved into all areas of cosmetics from skincare, suncare, cosmetics, make-up and what we call cosmetics-acti, which is a little closer to medicines but not quite medicines. Some people in the room would know La Roche Posée for example, which is one of our brands, which sells very well in Ireland in the pharmacies.

"So let me give you some facts and figures from L'Oréal. I apologise in advance if they are a bit dry. We invest 3.4 per cent of our turnover every year. Our turnover, being the first cosmetic leader in the world, is fairly large, so the investment is five hundred and thirty-two million, which is very significant. These figures are for 2006, of course. We will have new figures, bigger figures, for 2007 fortunately. We have almost 3,000 people working in science. Three thousand scientists - 65 per cent women, you'll be pleased to know. In 2006 we had almost 600 patents. And we also believe not just in doing research at home but we have 100 active collaborations with outside institutions, academia etc. And apart from the patents, we've had 80 publications just last year in peer review journals.

"So we have this little anecdote. Every year we compete with Renault, which is one of the most innovative car companies, whether you like Renault or not. We compete with them on who files the most patents and one year L'Oréal is first, one year Renault is first. We don't mind because they're not competing with us anyway. At least, we don't make cosmetics for cars yet.

"This is, briefly, where our research centres are. We've got sixteen laboratories in the world, research centres, and then thirteen evaluation centres. We've got ten in France, of course, it's our home country, Paris and the area around Paris, but we've got other centres as well. And I'll show you one, actually in the south of France, later, when we talk about Episkin. And one thing

that I wanted to say is that there are a couple of centres, for example the hair research centre in Chicago that does mainly research on African hair, perhaps unique in the world, doing research on a particular kind of hair. In 2005 we opened a new centre near Shanghai, in a town called Pudong, and that does, primarily, research on Asian skin. So we do very different kind of research from the classical.

"And that brings me to my next slide which is our mission in research. We want to - and seen like that it seems very simple but it's actually more complex - the most complex thing is that we want to increase knowledge in the area of hair and skin. If you think about it, there aren't many institutions that actually do research on healthy hair and skin. Yes, maybe from a cosmetic viewpoint, the hair is not necessarily always healthy, it is not necessarily always as healthy as we would like it to be, but most of the research that happens in universities and academics, in academic centres in hospitals, is actually done on pathological conditions. Virtually nobody as big as L'Oréal does research on healthy skin and hair. That's one very important point.

"The second objective that we have is evaluating product safety. Very simply, if a product isn't almost guaranteed to be safe, it won't go out the door. But the other thing we've actually done, we've pioneered a concept called cosmeti-vigilance. Cosmeti-vigilance means monitoring what happens when the products are launched out the door, after they are in the market. And although cosmetics are very safe, because of the very large volumes that we have, we still see a little bit of consumers that don't necessarily like - they have unexpected, undesired effects. We can monitor those. We can change the products and make them even more compatible with skin and hair.

"And finally product efficacy. As Chris said brilliantly before, claims need to be supported. Very recently we reviewed our internal code of ethics and we have stated again that untruthful claims will simply not exist at L'Oréal. We have to be sincere. We have to be honest and truthful.

"Let me say a few words on where research happens, which fields. Actually this little target is slightly unbalanced because, if you wish, there are three cakes. There is one that is not on this picture which is the fundamental upstream research. So one third of the half a billion euro, over half a billion euro that we spend actually goes into fundamental research that has nothing to do with hair or skin. That's how convinced we are that science is important to L'Oréal. The second third goes into advanced research, which is primarily to improve the knowledge of hair and skin, as we said before. And the last part, it's only one third of our budget, goes to applied research which actually gets our products out the door. And it happens in those three main areas of makeup colour, skincare and haircare, including colorants of course.

"Now, I don't have time to talk about all three but I've selected two examples in skin which is perhaps the most interesting, definitely from a biological viewpoint. The first example that I'd like to talk about is a new ingredient which we heard Penelope talking about, even though in her beautiful Spanish accent you may have missed the word but I'll tell you in a minute. The second example is episkin, which is in vitro reconstructed skin through tissue engineering.

"So the first discovery is pro-xylane. It's a new ingredient. It's an anti-ageing ingredient which is now in our products and it's positioned a little bit like a new motor of anti-ageing in a lot of our products. I'll show you in a minute also what products you can find it in. I've been asked to do a little bit of marketing, I'm sorry. The insight that we started from is the fact that the skin, as you see on this diagram, underneath the, I'm not sure if I have a pointer, let me just walk towards it. In this area of the skin, in that area of the skin you have a very complex extra-cellular matrix. So they aren't cells, they are actually fibres of collagen elasticine. And these fibres contain a gel that has a lot of water trapped into it. This water is trapped by a very complex sugar called hydroxyl acid. Galactosamine glycans is the class of sugars. Hydroxyl acid is the most important one. What happens is, the more water is trapped in this gel the bouncier and the more supple the skin is, the skin appears. In younger skin there is more water trapped into the gel, in older skin there is more water free to actually [unclear]. So the water content doesn't necessarily change. It's how much is actually trapped into the gel.

"The second insight that we had is that the synthesis of hydroxyl acid happens primed by a natural sugar called xylos. What we've done is we've taken a naturally modified xylos which we discovered doing those experiments similar to what Chris Gummer was telling us before, that this modified sugar primed synthesis of hydroxyl acid even better and actually reconstitutes the gel that you need to have. So even in artificially aged skin in the lab, we could actually see the skin goes back to being young, at least from this gel viewpoint. And then in our clinicals we proved that it has an effect on anti-wrinkle, in elasticity, in hydration and all the other nice things.

"And the other nice thing about pro-xylane that we're proud of is the fact that it's a very green molecule. It comes in renewable Western European beech trees. Through one single step the wood pulp is reduced into xylos and then in the second step is complexed with an amino acid called serine, and that's the active ingredient. That's what pro-xylane is. As I said it's very green, biodegradable, non bioaccumulable and non ecotoxic, we've done all the environmental tests and we're very proud of its green properties.

"So these are the products you will find pro-xylane in. The first is a Lancôme product called Lancôme Absolue. The second is Biotherme. The third is Vichy and the most important one

that you've seen the advert for is Derma Genesis from our flagship brand which is L'Oréal Paris Dermo Expertise. That's all for the marketing, I won't say any more.

"The second example I wanted to talk about, is Episkin, which is another area we're very proud of. This is about the reconstituting skin in vitro, in a Petri dish if you wish. It's a thirty-year-old idea which came from people who are severely burned, who have basically been in accidents, fire accidents or car accidents or whatever. The idea was that if we could rebuild the skin in vitro, these people could be helped. Two scientists working in L'Oréal sat in 1979 making an actual skin in vitro. I showed you the diagram before. They actually had the bottom layer, the dermis, and the epidermis actually growing in a Petri dish. As time went by they started putting back more and more elements, very importantly melanocytes which are the pigment cells of the skin, which are very important for testing. And that culminated in 1997 with actually making a kit in vitro. The picture you see here on the screen is the actual Petri dish of the kit you can buy. It's actually available commercially. It is a commercial operation besides being a very important intellectual exercise.

"The most important thing is that in 1998 it was first validated as an alternative to animal testing so for safety of cosmetic products, skin corrosion could be tested in vitro instead of on an animal. Then we kept doing a lot of research and more recently, in fact this year, in April 2007, a second skin evaluation permit, skin irritation, which is much more important than even corrosion because cosmetics are not corrosive, of course. Irritation though, it can happen. You need to check the products are non irritant and now we can do it in vitro, in fact we have to do it in vitro because the law says when there is an alternative, nobody is allowed to do any animal testing.

"Now that, so much for safety and for an alternative to animals, the very important this is that this is also good for efficacy testing. To give you an example, because of the melanocytes we can actually test the efficacy of sunscreens in vitro. So instead of running tests on hundreds of thousands of people, we can actually first screen whether our filters work in the lab and then move on to and test them on people for efficacy. I've got a slide here which I'm going to run just to show you how the kit actually looks and works but I'm going to skip very quickly on it because I want to go onto my last slide which is a different – it's For Women in Science.

"Our commitment to science is beyond research and development. It is also about promoting the role of women in science. In 1998, L'Oréal and Unesco came together and launched the initiative called For Women in Science under the motto that 'The world needs science... [Video].'

"By the end of next year, 700 female scientists worldwide will have received awards from For Women in Science. Awards are open to all women in all fields of life and material sciences, completely disconnected with beauty again. We don't need to have application just for hair, skin and other things. In fact most of the awards go for science that is completely unrelated to the fields.

"At the international level every year, five top scientists are awarded this title. They are leading, pre-eminent female scientists at the top of their career and they won the fight because it's one in each continent. Then at the national level, 60 countries worldwide will award awards. We are very proud to announce that for 2008, Ireland and the UK will have a For Women in Science awards. Four awards of £15,000 will be awarded for 2008. And applications are open from January. This is more than a cash award of course. It's very important that women who receive it can use it however they want, for childcare if they want. It's really designed to allow them to go into the next level of research to do whatever they want to do next or if they're coming back from maternity leave or whatever is important to them to allow them to do their research. And it's more than a cash award because it actually puts them in a network of scientists. It gives them a prestigious award that will help them with their career. And with that I am finished so I want to say thank you very much."

Coleman: "Thank you very much."

[The Science of Beauty – part three](#)

Karen Coleman: "And our final panellist before we open it out to the floor is Vanessa Hyde. Vanessa is a quality assurance manager with Shandon Clinical Trials. She is a trained scientist and has a background in basic and clinical sciences including ten years' experience in quality management and clinical trials with emphasis on GCP. She's constantly in touch with leading authorities in her field and responsibility."

Vanessa Hyde: "Good evening ladies and gentlemen. Our last two speakers have touched briefly on the science that goes into products before they actually come to market. I work for a company called Shandon Clinical Trials Ltd. We are based in Cork and we actually perform clinical trials on the end product. Our trials would include trials on cosmetics. We also do pharmaceutical, medicinal product trials.

"Our industry is highly regulated. In Ireland the Irish Medicines Board is the regulatory body which oversees clinical trials. For those who don't know what clinical trials are, that means the testing of products on human subjects to see if they are effective and if they are safe. So as I

said before – there's a lot of information on my slides, I'd rather you listened and I'll just use them as a prompt for myself and if anyone would like them I can email them to them afterwards.

"What I'm going to touch on basically is: what are the definitions of a cosmetic product as regards the law in Ireland and the regulations? What are your rights as a consumer? What is a cosmetic? What isn't a cosmetic? These types of things, because I think this will inform you before we have our discussion and give you a contrast to what's gone before. I'll also touch briefly on what a nanosome is, what nanotechnologies are, because those words have been bandied around in the media quite a lot. I'll also talk about functional foods, or super foods, because they also fall into the health and beauty care arena.

"First of all, a definition of a cosmetic: a cosmetic is something that is applied externally, in other words to the skin, the hair, the nails, the teeth, the oral cavity. It's not something that's swallowed or taken internally, that's very important to remember. The second thing is the function of a cosmetic. Legally and as regards the regulations, it's limited to the following things: to reduce body odours, to protect, to keep something in good condition, to change the appearance and clean and perfume. Anything else, it's not a cosmetic. So what is it? It's a medicinal product or else it's a food. I won't mention foods now, we don't have enough time.

"If something is presented as restoring, correcting or modifying a physiological function, or something that changes an immunological function or a metabolic action, then it is by definition a medicine. This is very important because if something is presented as having those properties, even if it doesn't have those properties, then it is a medicine. So if a cosmetic makes a claim that falls within any of those categories, then it is treated by the regulators as a medicine and would have to get marketing authorisation as a medicinal product. That's why label claims are so important and the wording in cosmetics adverts is a very, very important and sensitive area.

"The regulations in Ireland are governed by four important EU guidelines. The law in Ireland is Statutory Instrument 265, I won't go into it. That's the actual law in Ireland on cosmetics. Then the directive that governs cosmetics in the EU is Directive 768 and that directive was written so that there'd be harmonisation over the EU and that would enable cosmetic products to move from one country to the other, because if each country was complying with the same directive then countries could ensure that if they imported a product, it would be up to the same standards that their own country had for cosmetic regulation. However, the directive is implemented by each individual body in each country. In Ireland, the cosmetic directive is implemented by the Department of Health and Children.

"The objective of this directive is to safeguard public health, but unfortunately it was written in 1976 and as a result, there have been over 48 amendments. It becomes really difficult and

complicated to understand because of all these different amendments and there's been a lot of discussion amongst the different countries in the EU. There was a consultation process in March of this year and every country and every member state and interested body was allowed to give comments and as a result, in 2010 there will be a new EU cosmetic directive, incorporating all the amendments and all the comments from the different countries. As I said before, every national competent body is responsible for implementing this directive.

"What's very important to know about cosmetics is that they are regulated once they are on the market, not before. The responsibility lays firmly on the shoulders of the manufacturers or the company that have imported the product. As long as your product has known ingredients, you can put anything onto the market. It's then up to you to ensure that you're not open to claims. So each manufacturer takes very good care to protect themselves from claims by doing safety and tolerability testing beforehand. If a product goes onto the market and there are safety concerns, it will be pulled from the market by the Department of Health or the Irish Medicines Board and there will be fines imposed...

"The scope of the directive on cosmetics, those are the examples, a huge number of products fall into cosmetics, most of them people will presume are cosmetics but there are some things that people don't always think of. Toothpaste is a cosmetic, hair dyes, hair bleaches, after-bath products. A whole lot of products fall into this directive.

"When is a product not a cosmetic? As I mentioned before, if the intended purpose is either therapeutic or prophylactic then it's a medicinal product. If the site of action is different to the site of application, for example something that's applied and rubbed into the skin for joint pain, that can't be a cosmetic because it's actually working at a different level to where it's applied. If it's ingested it can't be a cosmetic, it's either a tablet – it's either a medicinal product or a food.

"OK, nanotechnologies. The word nanosome, or liposomes, is used quite often in the advertising media referring to products. This basically is referring to very, very, very small structures that can move across small membranes in the body. It's become a - it's a L'Oréal patented product – a nanosome. These are used as a delivery product for controlled release of their active ingredients. The FDA [Food and Drug Administration in the US] are busy looking at this whole area because up until this point there's been no safety data collected on possible effects, safety effects, of the small particle size. However, they're not envisaging any problems because if you look at any drug, any drug will eventually, during its absorption, end up being very small and they're not expecting the safety profile to be any different for the very small particles that are used. They're used in sunscreens as well.

"Cosmeceutical. Now this is an amalgamation of the words 'pharmaceutical' and 'cosmetic'. It's used quite often by manufacturers to support their claims, to make their products sound as if it's, you know, subconsciously it reads that it will have pharmaceutical properties. This word

has no legal basis. In law the FDA doesn't accept it. The Irish Medicines Board doesn't accept it. But there is a huge area of borderline products. What's a cosmetic and what's a medicine? And each member state of the EU gets to look at the product on a case by case basis. Some countries will err on the side of 'It is functioning as a medicine therefore it should go as a medicine,' whereas other EU countries say 'No, that's more like a cosmetic'. It's a huge area because as Raniero mentioned, the whole science of beauty is becoming more and more complicated and as a result products are actually having medicinal properties as regards the definition. However, no-one wants to make medicinal claims because then they have to be regulated, which means clinical trials: a lot of money has to be pre-authorised; if it's an American product it has to be approved by the FDA before it goes to market, otherwise here it will be the Irish Medicines Board or whatever other EU member state you were in. The word itself doesn't actually have any legal basis.

"Advertising, as was mentioned, the authority in Ireland is the Advertising Standards Authority and that's a self-regulating body looking at making sure that any adverts are ethical, they tell the truth, they're honest, they don't make any anti-competitive statements and are generally a good business. It's a self-regulating industry and it works very well, especially in the cosmetics area.

"Labelling of products and the Consumer Protection Act. These are linked. A new Consumer Protection Act came into being earlier this year and [among areas that it covered] was that cosmetic manufacturers had to include certain details on their products and these include that they had to have the contact details of the manufacturer. Unbelievably this wasn't always on all products but now a consumer has to be able to have a point of contact for their products, like with medicinal products.

"Also, they need to include the composition of their product, all the details from the highest concentration of the ingredient down to the lowest. There was an issue with manufacturers not wanting to give away 'state secrets', however, they're going to have to give the specific amount, they can give a range for example: this particular ingredient is available in this product from 0.01 per cent to, you know, they can give a range; they don't have to give the specifics if they don't want to give away the actual composition of the product. The FDA in America are slightly different in that on application manufacturers can get permission to leave off certain secret ingredients if they feel that if they bring those ingredients to the fore, the competitors will steal their composition.

"I just want to mention something briefly about functional foods because that's also a beauty issue. This is a Japanese concept. In the 1980s healthcare was costing so much in Japan they were looking for a way to reduce costs and in doing so they were looking at foods as a way of decreasing the risk of disease and promoting health. The type of foods we're talking

about are probiotic yogurts, margarines for lowering cholesterol, there are a lot of new ones coming out, super foods, for example blueberries, cranberry juice, all of those are mentioned in the media at the moment. However, EU legislation prevents any foodstuff being labelled as preventing disease, so if there is any medicinal claim on a foodstuff it then moves into the arena of being a medicinal product. Foods are governed in Ireland by the Food Safety Authority of Ireland and they regulate all label claims.

"There are various helpful websites which actually have a lot of frequently answered questions on them: the Department of Health and Children; the Food Safety Authority of Ireland; the Irish Medicines Board will just say that they don't regulate cosmetics but then explain what a medicinal product is and they'll link you to the Department of Health; Colipa is the European federation of perfumes, toiletries and cosmetics, I don't know where the word Colipa comes from, but they are very, very helpful on that website to tell you exactly what your rights are, what the regulations are in Europe, what has to be on a label.

"And just in closing, one thing that I'd like to say about labels; unfortunately labels have to mention ingredients in the chemical name, which to most people, even to myself as a scientist, if somebody puts their hand up and says 'What's...?' and they mention some ingredient, unless I work with that ingredient, I won't know. So I think if people are really interested in what is in their makeup, you can buy a Dictionary of Cosmetic Ingredients in Eason's or Waterstone's, and it's a very thick book and it will tell you straight away what's an emollient, what's surfactant, what's sodium lauryl sulphate which you see in nearly every hand cream. It will tell you what those are in simple terms straight away because a lot of the same ingredients are used again and again so you'll know straight away if you learn what the eight basic ingredients are. Compare the ingredients on two bottles, look at the prices, and look at label claims. Label claims have to be supported by clinical research. We can make an informed decision that way. Thanks very much."

Coleman: "So I was just going to put one or two questions to the panellists before we open it out to your own questions. One thing that struck me that was interesting about your presentation, Vanessa, is that cosmetic regulation is not required until the product is on the market so, I suppose, there is this huge issue about safety and the safety of a product, especially when chemicals are used in the product. Raniero de Stasio, maybe you could answer this question, say from L'Oréal's products: how do you know, how do I know, if I put L'Oréal moisturiser on my face, you know, foundation or whatever, that I'm not poisoning myself by doing so?"

Raniero de Stasio: "Well, very simply, as Vanessa said very eloquently, it's our responsibility to make sure that every single ingredient and the product as a whole do not harm anybody. You've shown us article one of the [unclear] that says what a cosmetic is. Article two says,

basically, in very simple layman's terms, cosmetics shall cause no harm. And if they do, our managing director will go to jail, as simple as that."

Coleman: "But how do we know that? It may be years before we know, for example, that a product potentially could be poisonous. What level of testing do you carry out to ensure that your products, under no circumstances, will damage the person who's going to buy them and use them?"

De Stasio: "Every single ingredient is either tested or there are tests on file, data in the literature, data available, to ensure absolutely, beyond doubt, that the product will not harm anyone. Under conditions of use, of course. If people, for example, drink or eat it or do something that is not foreseeable... The products have to be safe under normal conditions of use and foreseeable conditions of use. So, for example, if I know that a particular kind of consumer will use a rinse-off conditioner and leave it in their hair for hours, maybe permanently, then I should actually test it for safety as a leave-in product. We do do those tests when we know that products are prone to be used in a slightly different way from what we recommend."

Coleman: "And maybe just for you, Chris Gummer, the skin, I believe, is the largest organ in the body and it absorbs, it's an absorbent organ on our body; what happens, for example, with the likes of tanning lotions? Because I know as a journalist, a broadcaster, it's something that would come up on my show. Because effectively it looks like you're colouring your skin, again how do we know that these tanning lotions are safe for us?"

Chris Gummer: "As Raniero said, we've tested the ingredients so we know a lot about the chemistry behind the ingredients. The other thing is, the skin is the largest organ on the body, but its sole function in life is to keep everything out. One of our big problems is actually trying to get stuff into the skin, to make it do what we want it to do. So there's this constant dilemma between the formulators, who are trying to deliver ingredients, and between the skin, which is trying to keep everything out. That's its sole function in life really, to keep all your bits in and all of the world outside. And most of our products actually work in a very, very superficial capacity in the skin. We're talking about less than 1mm into the skin. So we're not driving it very deep. And even your tanning lotions are working in the very superficial layers of the skin. So, as I said, it's a constant dilemma, you're trying to push stuff in, the skin's trying to push stuff out and stop it going in. And the only time that you really notice that things are going into your skin to any great degree is after about an hour and a half in the bath and it's absorbed a lot of water. It takes being immersed in hot water for that length of time, and even then, within a few hours you're back to normal and you've pushed it all out again."

Coleman: "What about the tanning lotions? I mean, L'Oréal has a variety of products like tanning lotions."

De Stasio: "As Chris said, tanning lotions affect the very superficial layer of the skin. They will change the colour – most of the cells on the very superficial layers are actually dead. The ones that you are colouring are the ones that are dead and they're going to be shed anyway because the skin actually grows from the inside out and you shed literally thousands, hundreds of thousands of cells, every day as part of the normal exfoliation process, which we can accelerate with exfoliators. That's why the scrubs and the exfoliators are very popular. Even when you have a natural tan, you lose it very quickly the more you scrub your skin, the more showers you take, just because the natural process is to get rid of those cells."

Coleman: "But are you actually putting a dye on your skin?"

De Stasio: "No, it's actually not a dye. It's a chemical called DHA, dihydroxyacetone, which has been known for decades. I'm not sure when it was discovered. And it does a very similar reaction – I know it sounds like a joke – but it's a very similar reaction to your toast, when you toast your toast in the morning. Toast goes from white to brown. It's called melanin reaction. And that's what happens to the skin, to the protein in the skin. Very, very safe. It's as safe as eating a slice of toast."

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Karen Coleman: "Again, I just think, how safe really are these products? How do we know that the system of self-regulation actually works? Isn't there always the opportunity for one of the producers of cosmetics to take a chance?"

Vanessa Hyde: "That's sort of a two-part question, but the first part – what I didn't mention was that even though you don't need marketing approval to put a product on the market, there is a notification system. In Ireland you notify the Department of Health, 'This is my product. I'm putting it onto the market,' and you have to provide what is going onto the label. In accordance with the directive, there is certain guidance as to exactly what must be on your label. So they are notified of the product and what will be on your label. In other words, it's not quite approval but they know exactly what will be on the label."

Raniero de Stasio: "Including all the ingredients."

Hyde: "Exactly. So once the product is up on the shelves, then obviously regulators will see and if there is any label claim that contravenes the directive or some ingredients missing...For

example, there's a new label regulation for products that are over three years old, that last more than three years, they now have to have a little – you might have seen it on some products, if people are using products that last a long time – it's a little cosmetic bottle and it's what's called a, it's not a use by date, what is it?"

De Stasio: "Period after opening."

Hyde: "Period after opening date. So in other words people know, 'OK I opened it on such and such a date,' and it will tell you exactly how long the product will last. Some people may go, 'I can just keep using this product ad infinitum.' And that's a regulation as well.

"But as regards people chancing their arm, that does happen. I know at Shandon Clinic, a while back, we were running a clinical trial on a – I can't mention any names but some of you would have read about it in the media – we actually ran the trial in our clinic in Manchester on a product that was reported to be for eczema in children and was a herbal product devised by an Irishman. It went on to the market and, of course, worked very well. And then the product was analysed and it was full of steroids. So people had been giving their children steroids. So that man went to jail. So, you know, it does happen but not very often and especially in the cosmetics industry."

Coleman: "And what about deodorants? Because again they're part of the cosmetics industry, they're labelled as such. A lot of concerns again, and there are plenty of claims that deodorants don't cause cancers, but with the increase in breast cancer people are always very concerned about could possibly a deodorant cause breast cancer? What again is the regulation and the testing for a product like that?"

Hyde: "We've done some deodorant testing in the past for safety and tolerability but that, obviously, is post application and short-term use. The same could be said for long-term use of medication for chronic illnesses, you know, medicines. Even with all the stringent four-phase testing that goes into a medicinal product, not until you have the post-marketing surveillance which meant that you had a large number of people using that medication, will you find out that one in, for example, ten million, suffer a very serious adverse event. And the second thing with cosmetics, there's only so much testing you can do, you know, beforehand."

Coleman: "Chris, did you want to come in on that?"

Chris Gummer: "I think the deodorants one is quite interesting because I think this is one where there is something of an urban myth. And the simple rationale from the people who are pushing this, that you get cancer from deodorants, is they're applied under the armpit, it's very close to the breast, therefore there must be some association. When we look into the science behind the studies that were done, they're extremely poor and they won't stand scrutiny, to the point where nobody would pass them for publication. And then, if we look at the chemistry

that's going on there as well, we find that the chemistry doesn't stand up. But most importantly, what's not been looked at is the number of women with breast cancer who either don't use deodorants or don't have the ingredient that's been labelled, which is parabens. And also they've not looked at the number of women who use deodorant that don't have breast cancer, which is by far the excess. So when you start to look through all of the science, it just doesn't stand up. There's two other simple bits of information..."

Coleman: "This is the science behind the claims being made?"

Gummer: "No, this is the science behind the people that are making the claims that deodorants cause cancer. They've really not gone into it very well. The ingredient they're targeting, parabens, has been looked at under the microscope many, many times. What you find is that parabens occurs in nature anyway, and as soon as it's in the body it's broken down extremely quickly. Virtually every cell in the body has the ability to deal with parabens."

De Stasio: "It's probably in the skin already as the moment you put it on the skin, it immediately starts breaking down."

Gummer: "It's always talked about, you know, lymph nodes under the arm contributing to cancer. In fact that's a drainage system away from the breast. It's not taking it from the armpit to the breast; the whole thing is draining away in the opposite direction. So the science just doesn't stand up and it's really not been done very well."

De Stasio: "The other funny thing is that parabens as a preservative is not used very widely so they're extremely safe again. And they're not good for use in deodorants because of the way the formulation is put together. They're not the preservatives of choice for deodorants. So that's the other big point where the science does not stand up."

Coleman: "What about these claims about anti-ageing, anti-wrinkling creams? We know that we can spend an absolute fortune, spend hundreds on moisturisers that claim to take twenty years off you and to take every line off your face. I mean, realistically, is there any such thing as a cream that can reduce your wrinkles?"

De Stasio: "Who do you want to answer this?"

Coleman: "You first, because you have plenty of products that claim these things."

De Stasio: "The very short answer is yes. There is a cream that does that. And actually I'm glad that Chris showed, his very first slide on reducing the signs of wrinkles using sophisticated techniques, is the most [unclear] that we have. Actually you can reduce wrinkles. You can't completely reverse the process of ageing yet, we're working on that. You know, in a few years

we'll get there. But you can definitely reduce the appearance of wrinkles and you can definitely measure how much you reduce them. The ingredient that I talked about does that by making the skin more elastic, more supple, for example, if you want to talk about my cream.

"But the most important thing really, to have less wrinkles, is keeping the skin extremely moisturised. That's the basic point, keeping the skin in good condition, good health. If you do nothing else, you just use a moisturiser every day, that alone will make you age a lot later. The second most important thing is sunscreens. Exposure to the sun bakes the skin, as simple as that [unclear]. It produces a lot of nasty chemicals, dozens of nasty chemicals, which we should really worry about, the ones produced by UV rays on the skin, the very famous [unclear]. We have ingredients that stop [unclear] but most of all we have ingredients to stop the UV rays from getting to the skin and damaging the cells. Those are the two things really that damage the skin. And smoking, the third one is smoking."

Coleman: "Smoking, yes. Now, I'm sure you have questions that you'd like to put to the panellists. We have several roving mics so..."

Audience member: "You mentioned the use of, I think it was in vitro, a sort of experiment or whatever. I think it was a procedure, was it to produce episkin? And you mentioned using – gosh I'm going to have to look at my own writing here – the umbilical cord blood. Now, I was curious as to where you get that, for various reasons where that would be obtained."

De Stasio: "I mentioned that because it was a very important step, I forgot the date now when it happened, back in the '80s, because in the very first models, skin was actually not growing in the Petri dishes. It was surviving there very happily but it wasn't expanding. And it's very important that you actually, somehow push the growth, otherwise you don't do very much for the poor people that have been burned. The idea is having auto-grafts so that you can take a small piece of their skin from a healthy part of the body, then grow it, and I think there is an anecdote, not sure where I've seen this but from two square centimetres you can grow two square metres worth of skin, which will cover a large part of somebody who had a severe burn. If you can keep them alive until you can grow enough, then you can graft all that skin back on to them, and hopefully they will survive. Those are victims that would be destined to die to be honest. So that was the high science. The umbilical cord was the first thing, umbilical cord blood, was the first thing that actually allowed the skins to take off, sorry – the tissue in vitro in the Petri dishes to take off and actually grow. And that's why I mentioned it."

Coleman: "Umbilical cord blood?"

De Stasio: "Yes."

Coleman: "And how did you get that? Which I think is really the question you want answered."

De Stasio: "From the umbilical cord. It's a by-product of – you need it..."

Coleman: "Who gave you permission?"

De Stasio: "Yes, donors, obviously after birth. You don't take it from pregnant mothers."

Coleman: "With the parents', with parental permission?"

De Stasio: "Absolutely. Absolutely, yes."

Coleman: "OK, thank you. Other questions? Lady down here this side of the floor? Just a mic down over here. Can you see me? OK. Would you mind standing up because it's a little bit difficult to see with the glare?"

Audience member: "I'm wondering; do you get what you pay for with regard to beauty products? Even in relation, say, to the different brands that L'Oréal market, for example Vichy compared to Lancôme. Is more expensive better?"

Coleman: "You're talking to a L'Oréal man here of course now. Do you get what you pay for?"

De Stasio: "You get what you pay for. The example that I quoted is important because it tells you about – I was having this conversation just before because I had the same question, among us, what's the difference between the various brands? Lancôme is the most expensive one, Vichy is probably less expensive, then the L'Oréal Paris brand, Derma Genesis, is the one that is more mass market but still at a high level of performance. And with the pro-xylane molecule, what we've done is we've actually launched this as a motor – I didn't accidentally call it a motor of anti-ageing.

"It's very similar to the car industry, if you think about a very sophisticated car group like Porsche and Volkswagen, they launch their super new ceramic brakes on the Porsche Carrera GT and then they will gradually trickle them down to the Golf and then to the Passat and to the more affordable models. That's exactly what we've done with pro-xylane. It was launched about a year and a half ago on Lancôme and it was exclusive to Lancôme for about a year. And now it's coming to other brands as well, like Vichy. So people that buy Lancôme do get an exclusivity because they would get the forefront of our research. So, yes, you do get more value for your money. And, of course, you get the reassurance of a big brand name and all the research I mentioned that we do."

Coleman: "So you're paying for research. To what extent, if you buy a bottle of Lancôme and it may cost a couple of hundred euro or whatever it is -"

De Stasio: "Much less than that. Let's not exaggerate."

Coleman: "OK. Are you paying for the fancy marketing or the sense that it's an exclusive product? Can you really justify the difference in price from the top end and the bottom end?"

De Stasio: "If I can use the car analogy again, the Porsche Carrera will still bring you from A to B and very rarely you can go at 250 k an hour. In fact, you can't because it's illegal anyway. You can only go on the racetrack with that. So it's for people that want to spoil themselves because they want the Porsche of cosmetics -"

Coleman: "Because they're worth it."

De Stasio: "- and they will buy Lancôme."

Coleman: "Vanessa?"

Hyde: "Well, as you were saying, I would just like to say that the amount of money that goes into research and development has to be made back by the manufacturer before the patent runs out and everybody else is using that same ingredient in their product. As a result, when a new ingredient, an active ingredient, comes onto the market, it's going to be more expensive, especially if it's very effective. And eventually it will trickle down into every product and meanwhile L'Oréal would have found something new and even more advanced. The same would apply to other top-end products, it just depends whether you're worth it or, you know? Cosmetics are a very aspirational industry anyway. Some people have enough self-esteem, if you want to go down that route, to not spend money; other people have the money and feel that they want to spend it. The claims have to be backed up by the research, otherwise the companies would just be opening themselves to lawsuits. So that's whether you feel that you're worth it or you have the money but eventually the ingredients will trickle down into the products."

Coleman: "Yes. OK. Chris?"

Gummer: "Just to give some context of time of developing some of these products – the last product I worked on when I was working for P&G, we were working on a new molecule and it took us four years to actually get that molecule into the products that we wanted and work the way we wanted and make the formulations stay together and keep all the attributes of that molecule. So this is not a quick process and if you can imagine four years of keeping an industry running and the people behind it and the science we're doing, it's an extremely expensive process which has to come back through small bottles of cream or jars of shampoos."

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Karen Coleman: "I still can't get your second question."

[Muffled words from audience]

"Oh, does it degrade? OK. OK, who wants to take either one of those questions on?"

Vanessa Hyde: "The degradation of ingredients – you'll normally have a – as I mentioned before you'll have either an expiry date on the actual product, or for products that last longer you'll have – what's the terminology?"

Raniero de Stasio: "Period after opening."

Hyde: "Period after opening, PAO, and they'll give you a length of time."

De Stasio: "You'll find a little jar, an open jar, which looks like a little open jar, on each individual pack now, unless it's a single-use product, any pack that is open and then has to be used again in a certain number of months, you need to put this symbol down by law, and it will say 6m, for example, if it is used within six months. It is very important for products like mascara which, obviously, contaminate very easily because, although we keep our eyes very clean, you still have bacteria, spores, moulds and things flying around. So you pick them up in your mascara brush and then put it back in. So very often mascara will be labelled three months or six months in general. So, yes, you should throw it away, unfortunately, if you are not able to use it within that time you should throw it away, particularly mascara. It gives you a pretty nasty eye infection otherwise."

Coleman: "And what about the first question; if you, for example, buy a fancy jar of cream that promises to reduce your wrinkles and you use it for several months and then you stop using it, will you reverse the good things?"

De Stasio: "Not completely. You have stopped the clock for several months, first of all, so you delay your normal ageing. Also there is a regression phase. We sometimes do monitor cream for studies like that and normally for a month or so you still have the cumulative benefits of what you've accumulated as benefits in the skin using the product. Obviously at one point you will lose the benefit, it's best to keep using the product if you're happy with it."

Coleman: "Chris, did you want to come in there?"

Chris Gummer: "Yes. You've got to imagine the process of ageing as a slippery slope. We're all going down it. We're all going to look older, I'm sorry. Gravity is going to take over. It's just a question of how quickly you want to go down that slope. And every time you intervene with a product, cosmetic products or even perhaps medicinal products, you level out that slope a little bit more. So you can keep the slope much flatter for a long period of time by using the products. If you don't do anything, and you put yourself out in the sun a lot, allow the skin to get dry during winter, that slope is just going to go down really, really fast. Once you're on that slope, you can't turn it back up the other way to any great degree at the moment, unless you're using some great medicinal products but while you're on that slope what you can do is slow it down and make yourself appear much younger than your chronological age."

"Some years ago I was involved in a study which was comparing women from north America with women from Texas. We did a big study where lots of women were photographed, their hair was pulled back so you really just saw their face, and it was a case of getting a whole panel of people to guess their age. And as we went through all of this it became extremely clear that the women in north America were younger, appeared younger than their chronological age than women from Texas, and it was all down to sun exposure. That was one of the first big studies that really confirmed that doing something about sun exposure would really affect your apparent age but it doesn't affect your chronological age. So if you're on that slope, it's just a question of how fast you want to go down it."

Coleman: "OK. Yes?"

Audience member: "Hi. What age should you start using products at, and if you use them too young how bad can they be on your skin?"

De Stasio: "Should I start?"

Coleman: "Yes."

De Stasio: "For the research we've done on pro-xylane we've actually studied when you start losing elasticity and, sadly, it starts when you're fifteen. When you're fifteen you start losing skin elasticity at five per cent a year until – oh, I mean five per cent every five years. So the skin, obviously, of a much older person is much less elastic. Now, I'm not saying that all teenagers should start using products, also when you're a teenager you want to be carefree and not pay to be stuck with lots of beauty products and regimes but it's a good idea, definitely start protecting against sunburn immediately, as a child in fact, as soon as you're born."

Coleman: "And can I just ask you a question which hasn't come up yet, which is about hair colourants? More and more women in particular, and indeed a lot of men are using, I notice, are using hair colorants. What about bleach, for example? Can you really say that putting bleach on your hair is good for your hair?"

De Stasio: "Chris is a big expert in this. I'll take the first shot though. Hair is actually dead so -"

Coleman: "But can it not seep into your body though? In any way at all?"

De Stasio: "The bleach that you use on your hair is actually hydrogen peroxide which is an extremely safe chemical when used at the concentrations allowed in cosmetics, which is up to six per cent, I think, or twelve per cent. in the highest bleach concentrations. You obviously use it for highlights, for example, without it touching the scalp. And even if it touches the scalp, hydrogen peroxide is a safe chemical, it doesn't actually do much to the skin for a few minutes. Obviously if you left it there – you need to wash it off. And it doesn't get absorbed at all. So what you're doing really is changing the colour of the hair strand which is the dead part of the hair. The live part of the hair is inside the scalp, in the head."

Coleman: "OK."

Gummer: "Well, the great part about it is that hair constantly regrows itself. And it's growing from the bottom like grass. You can imagine if grass grew from the top like most other plants and you grazed it once or cut it once, that's it, it would never grow again. But, like hair, it grows from the bottom, you can grow it as long as you choose, colour it, bleach it, do whatever you like. If you get it wrong, chop it off, start again. I know it's not as easy as that but that's the principle."

"Are bleaches bad for your hair? Yes, they damage your hair. They have to, to do the process they're trying to do, to change the colour. They have to get inside the fibre and change the colour and in doing that they do some damage. Every woman knows that if they bleach their hair it feels different. Even if it's a very gentle bleach, severe bleach, it feels different. You have to use conditioners all the time if you've bleached your hair, that's just the simple rule."

Coleman: "But from a safety point of view you're saying that in no way do they pose any safety, health issue for those who use these colourants?"

Gummer: "Used properly, used in the right conditions, there are no -"

Hyde: "You might have an allergy, but any good hairdresser would do a patch test. Now that's just the surface, the skin. You might have a reaction to the bleach or the hair dye and some people are particularly sensitive... but the same could happen with a cream or you notice, 'Oh that cream gives me a rash.' There's always a small percentage of people that do react to these things and that's accounted for in the testing. But as regards bleach and hair dye, it's no different from any other product. Some people might have a slight rash – they'd find that out if they did a small patch test before the hairdresser tries a new product."

Gummer: "Can I just mention one thing?"

Coleman: "Yes."

Gummer: "We've got our eye on people in the audience too. One of the things that have come up recently is henna tattoos, people travelling abroad, getting henna tattoos. Henna tattoos should be brown, and relatively light brown. What's happening abroad is that they're using one of the ingredients in hair dyes, called PPD, to make the tattoos much darker and last longer. What that essentially does is put this ingredient into your skin and it runs the risk of, firstly irritation, and secondly sensitisation. So anyone going abroad, if they're going to have henna tattoos, make sure it's from a reputable place and if they're extremely dark stay well away from them. This is a risky business."

Audience member: "I'd like to get back to wrinkles if I may. I'd like to ask about Botox. It hasn't been mentioned this evening. I'm not sure if it's a cosmetic or if it's medicinal but particularly any opinions you have on Botox. My understanding is that once you start, you're hooked and we could be looking at a twenty-year period, and I don't think there is any science or studies to suggest what the results, maybe, of using Botox are after twenty years. So any opinions, views, would be greatly received."

Coleman: "OK, Vanessa. Because we've spoken about this before."

Hyde: "Well, Botox is a medicinal product to be regulated by the Irish Medicines Board. We haven't done any trials on Botox, and maybe I'm a bit young, but from a personal point of view I wouldn't be interested in that. Just from a personal point of view I wouldn't want to have Botox injected into me."

Coleman: "It is a poison, isn't it?"

Hyde: "Yes, but not in the concentrations where it's injected. Because it's not a cosmetic, it's a medicinal product; I wouldn't have a lot of experience. Maybe Chris will..."

Gummer: "It's essentially a system of paralysing the muscles. That's its function. What I did see the other day as I was doing the literature searches I regularly do, are the first papers starting to talk about the long-term complications of Botox. Now, I've not had a chance to really review the literature or see the quality of the data there, but it's interesting that Botox has been around a pretty long time now and the first papers in the scientific literature are beginning to pop up saying there are going to be long-term problems with this ingredient."

Coleman: "And do we know what the problems are?"

Gummer: "I think it was talking about immuno-compromised areas of the skin. As soon as that's mentioned, that really says to me, let's get a lot of research done very quickly because if people are heading down that path it's really quite risky."

Coleman: "But it also shows that it was put out there as a product and it's being used by so many, particularly women, these days, that it again perhaps reflects the industry and how many products are being put out there, or something like this. And I take the point that it's in the medical field, which have not been properly tested long-term so that we know the long-term effects of using it."

Gummer: "I think part of that is because it's a medicine, or a medicinal product – there's a subtle difference between trusting an industry and trusting the major manufacturers. And going along to a clinic of unknown repute where you believe somebody in a white coat, that seems to make people trust them much more without asking enough questions. If somebody was going to stick a needle in me and paralyse the muscles of my face, I'd want to know a lot about it first. But people are taking it on faith. There are even Botox parties now. And that I just find very scary. That's total misuse of a product. Whereas here is an industry [cosmetics] that has to look at use and misuse before they consider letting the product out of the door. I think we're really dealing with two different groups."

Hyde: "It's only registered to be administered by a doctor, but it is being administered by beauticians."

De Stasio: "From a biological viewpoint, Botox in its very high concentrated form is a pretty nasty poison. It comes from the bacteria called botulinum, which is associated to very severe food poisoning which, fortunately, is not very common these days. But it does kill people. So it's actually a story that I like a lot because it shows that, used safely, a poison will not kill people. So if it's injected and it stays localised, the body will eventually get rid of it. In fact, the paralysed muscles will start working again anyway after. That's why they have to keep reinjecting.

"Now, I'm not talking about the long term. I guess the question the lady asked was what happens after twenty years of use. I don't think anybody knows, because I don't think it has been used for twenty years yet. It's a little bit like laser surgery on eyes. Nobody knows what the long-term – do we know what happens after fifty years? No, because the technology's too new. So, from one point of view we need to do more studies. Not 'we' because actually we're not interested in that – we as the scientists in general, we the humankind needs to do more studies. On the other hand there is a certain amount of risk that you are going to take.

"As a biological model I like it because it allows me to explain 'It's the dose that makes the poison'. Even water can kill people. You drink enough water and fast enough, you could actually kill yourself from electrolytic shock. So there isn't such a thing as the perfect, safe chemical – or the perfect ingredient – you just need to use them sensibly and responsibly."

Coleman: "OK, I think – yes, lady here."

Audience member: "Sorry, can I just ask: which is the most effective on your skin, a face wash or a face mask?"

Gummer: "I think it really depends what you're trying to do with it. Face masks are often a way of getting ingredients delivered into the skin very intensely. You have a period where it tightens the skin and makes it very smooth and soft. Face washes are often for cleansing the skin, removing grease and oil and more pore cleaning of the skin. So they're different products and they're used in different ways. And all of these different products form different parts of your skincare regime. When you start very young and as you grow older you'll put a different balance on what you use and when you use it."

Coleman: "OK, lady in the back, yes?"

Audience member: "Just on what you were saying on the business of the nanoparticles, you're bypassing the normal outer protective layer presumably when you get into nanotechnology. It's really on the same lines. How long have we been using nanotechnology? And what is the potential for anaphylactic shock or possible problems, reactions or skin reactions, allergic shock because we're going to a different sort of level now?"

Coleman: "OK so, is everybody clear about the question there? If I'm correct on what you said, because nanotechnology is a new technology, and again, I suppose, going back to the Botox example, we may be seeing side effects now. To what extent can we be sure that we're not going to see side effects of nanotechnology in the future? Am I right? Is that principally...?"

Audience member: "Have there been any incidents, has anybody, you know...?"

Coleman: "Any incidents of side effects? OK, who's the expert in nanotechnology?"

De Stasio: "Two or three things on nanotechnologies, I'll try and be quick. First of all, nanosomes have been mentioned. Nanosomes are little nanoscale liposomes, so they are little droplets of fat basically, which dissolve immediately, as soon as they contact the skin. They basically assimilate with the skin. The only reason we use them, we've patented them and we started using the name, because obviously it's a very sexy name from an advertising point of view. Unfortunately the marketers do creep in occasionally. It's a good way to deliver some substances which are not easy to deliver into the skin, vitamins for example, a very good example. So you can have vitamin E which is difficult to deliver, into a nanosome, or vitamin A as well and they deliver very well into the skin. They dissolve so that's not an issue.

"The other form of nanotechnology which is used quite widely in cosmetic products is nanoparticles of zinc or titanium dioxide, in sunscreens. If you make these particles of minerals

small enough at the nano level, they reflect the light better and they also become transparent which is obviously good when we put sunscreens on. We don't want to look like ghosts, or white. Titanium dioxide, which is the most common ingredient, it is the same ingredient that is in paint, by the way, and it's perfectly safe. That's why, when you're painting your wall white and you splash paint, wherever you splash it, nothing really happens, right? That's because it's safe. It's one of the most abundant minerals and easily to take. But at nano, in the nano form it reflects light and it's a very effective sunscreen.

"The reason why it's not – first of all, it doesn't penetrate the skin. We've done very, very extensive studies with this, we've studied this for years and it's accepted by every regulatory body around the world, including the FDA. They actually agree that it doesn't penetrate the skin. The other point that needs to be made, and it's very important, is you make these particles in the manufacturing plant or in the lab, wherever you are making them, and then you put them in a product, they actually clamp together. They're actually never present at the nano level. So even if we said at nano level they penetrate, they actually do not exist in the product at nano level. They need to be made that way to reflect the light better. So that to me is the most compelling evidence that there isn't an issue over these products."

Coleman: "But it does then suggest questions over the claims that you're making about their effectiveness as well. Because the claim is that it goes deeper into the skin, isn't it?"

De Stasio: "Not the sunscreens. They need them to work."

Coleman: "But what about pro-xylane then? The beautiful Penelope..."

De Stasio: "It's not a nano – totally different technology."

Coleman: "OK. Chris, did you want to come in on the nanotechnology?"

Gummer: "Yes. One of the things about the research that's done in the industry is that it's not a case that if you look at a product and then stop, or look at an ingredient and then stop. The

research carries on. But if the industry's not looking at it, another academic is always looking at it and you're always kind of trying to keep up with the pace.

"So, if you take something like titanium dioxide, which has been around for a very long time, there's a lot of background on it, a lot of safety. I was at a meeting on Monday and Tuesday with the Cosmetic Toiletry and Perfumery Association and they were talking about a whole new round of research to double-check. And they keep checking and keep looking. So it's not a case of, 'Put it out there, walk away'. We keep monitoring, we've got surveillance going on all the time and deep research.

"The thing that's always curious to me about nanotechnology though is we've been in nanotechnology forever. All the molecules that we use that are in solution are in the nano scale. So nanoparticles are just another very small ingredient and a different way of presenting it. But we've been in the very small world forever, so this new term of 'nano', which has tremendous implications in -"

Audience member: "[Unclear]...to the same extent in these new products now."

Coleman: "It's really difficult to hear you without the mic."

Audience member: "I just feel that maybe we're not actually pushing them in through the skin in the same – I know what you're talking about that it's been around for ever as you say. But I think what we're doing with these new products may be more recent."

Coleman: "Or more advanced is it? Because -"

Audience member: "I'm thinking like, your nervous system absorbs metal and if you're going to – most metals are toxic, say, to the brain. So I'm just thinking, in years to come will we be getting a bunch of senile dementias from perhaps some types of products where we're shoving metal further through our protective layer, further than normally we would absorb it, in the nano world as it were. It's work in progress I mean."

Coleman: "OK. No, it's a good point, I mean, where are the guarantees that in twenty years' time we're not going to see an increase in Alzheimer's, for example, because of the use of cosmetics and nanotechnology now?"

Gummer: "Can I put my hand on my heart and say it's a one hundred per cent guarantee? No. Can I put my hand on my heart and say the best science we have available is checking every possible avenue every time and keeps checking it and wants to know where those ingredients are going, because it's important we know where they're going to do all of the safety assessments? I can guarantee that's happening all of the time. And we're checking. So it's getting that balance of making sure we're looking after ourselves."

De Stasio: "The other thing that I'd like people to think about on nanotechnology – it's an extremely vast research area. You can make completely new-to-the-world materials. It's a new material science basically. Saying 'I'm worried about nanotechnology,' is a bit like saying, 'I'm worried about nuclear medicine because it's the same technology as making nuclear bombs'. Yes, in theory. You have to study nuclear physics to make nuclear bombs, but nuclear medicine is very important to cure people with cancer."

"So there are actually some nanotechnologies that we have chosen not to use. Nanotubes, for example, are tubes of carbon which are used in material science. They are not present in cosmetics. Nobody that I know of uses them, and the safety is not known. So we decide on that one, because safety is not known. Not only we don't take the risk, we don't even consider them as ingredients. There is another molecule called fullerene, or buckyballs, they are sixty atoms of carbon put in a ball which are very useful again in material science, they make these famous self-cleaning glasses. It doesn't exist in cosmetics. The stuff for which we don't know the safety, we will not use."

Coleman: "OK, we're going to have to leave it there because I'm conscious that we've come to the end of our session and I know that a lot of you still have questions to put to the panellists but unfortunately we've run out of time. You may be able to grab them at the end of the session as well but if you can give a big round of applause please, to our three panellists."

"I think it's fascinating and we could have gone on and on but thank you very much to Dr Chris Gummer, to Dr Raniero de Stasio, to Vanessa Hyde. And if I could say a big thanks again to Peter Brabazon of Discover Science & Engineering, of course, responsible for running these really great science week lecture series and, of course, to Sadhbh McCarthy, and to Women in Technology and Science. And Peter was saying as well, if you do want to find out about any more of the lectures that are taking place in the country over the next week, you can log on to ScienceWeek.ie and you can get more information. Thank you very much for all the questions."