The Science of Beauty – part five

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 loosing 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, lanosomes have been mentioned. Lanosomes 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."