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How safe is your sun cream? The new science of tanning

Whether you slap on factor 50 or believe that it's toxic, there's a lot you need to learn about suntan lotion. By Anna Maxted

Swimming in a chlorinated pool can turn sun cream "toxic", increasing the risk of cancer, scientists warn. That's just one of the worrying headlines reporting a study from scientists at Lomonosov Moscow State University, which found that avobenzone — "the most popular UV filter in the world" — reacts with UV rays and chlorine to break down into "toxic and dangerous" products. According to the science website phys.org, this can cause "dysfunction of the liver and kidneys, along with nervous system disorders".

This would probably give pause to even the most diligent SPF 30 devotee heading off to the Med (where there's a heatwave: 37C in Sicily). Then this year's sunscreen report from the Environmental Working Group (EWG) claimed that retinyl palmitate, a form of vitamin A used in sun lotion, "may speed the development of skin tumours and lesions when applied to the skin in the presence of sunlight".

Meanwhile, Cancer Research UK warns that even being sunburnt every two years can triple our risk of melanoma skin cancer. Most of the 100,000 new cases of skin cancer diagnosed here each year are, says the British Association of Dermatologists, thought to be the result of too much sun exposure, and most could be prevented if sun cream was applied

properly (or, indeed, at all). So is sunscreen safe, or should we be wary?

The EWG's report references animal studies, including one in which hairless mice were exposed to UV light every day for a year. It adds that the European Scientific Committee on Consumer Safety (SCCS) — which regulates the ingredients permitted in UK sun creams — reviewed the study and concluded that, while it "may indicate" the ingredients are photocarcinogenic, it was hard to relate the finding to humans because of the differences in skin sensitivity between people and rodents.

"Yes, retinyl palmitate was found to cause cancer in rats," says Dr Sharad Paul, a skin cancer surgeon, skincare expert and the author of *Skin: a Biography*, "but the problem in saying that will happen in humans is that rats are very UV-sensitive and get cancers easily within weeks of UV exposure."

Besides, says consultant dermatological surgeon Dr Walyat Hussain, "you always have to take

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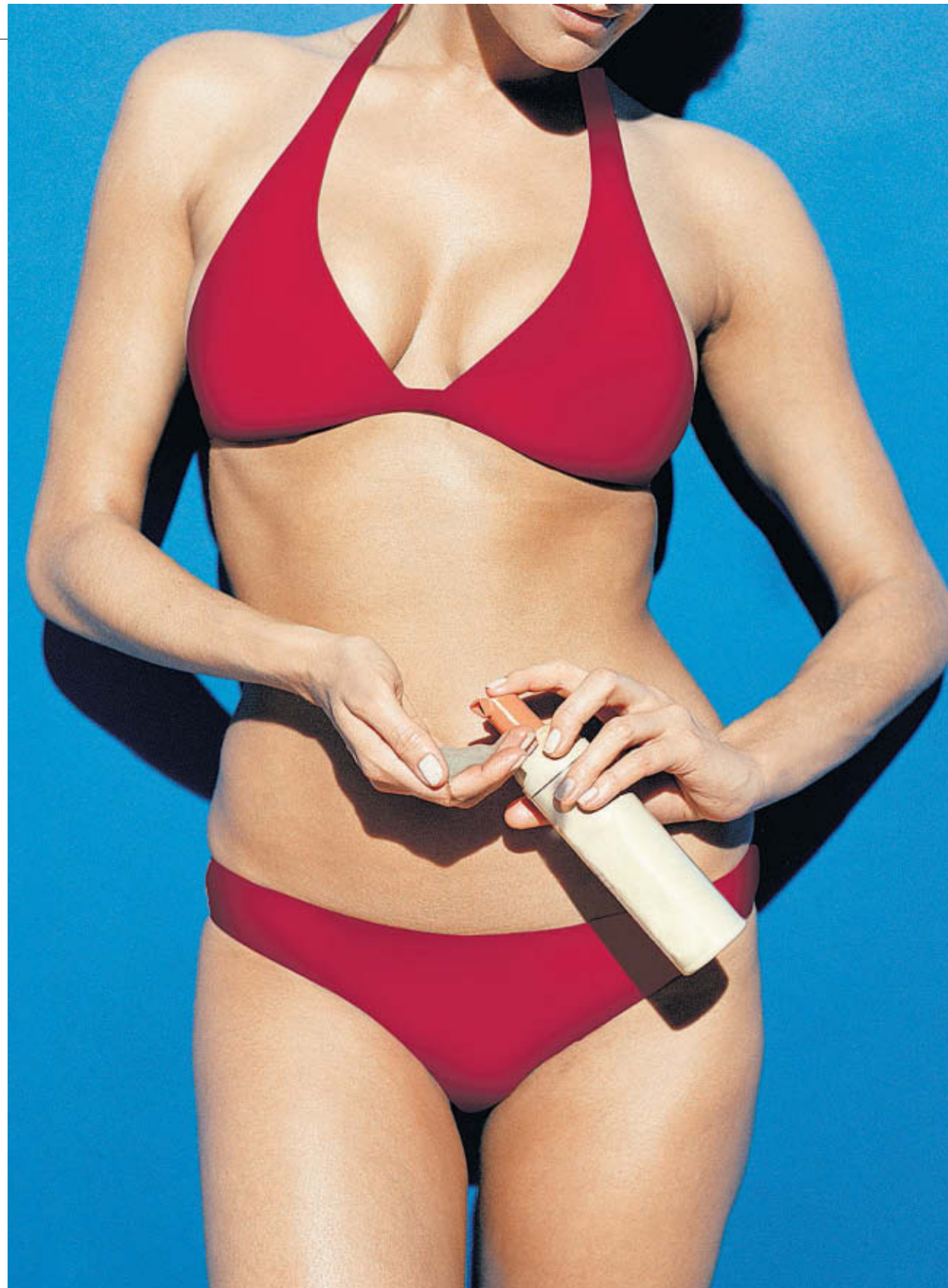
scientific experiments done in a laboratory with a big pinch of salt regarding how that actually translates into what happens in real life.

"The gold standard for any recommendation is a randomised controlled trial" — in which a group of people using a treatment are compared with a similar group not using the treatment. "As clinicians, that is what we're basing our recommendations to patients on.

"The risk of cancer from getting burnt still far outweighs something like this," he adds. "[The Russian report] is one study, and more research will be needed to verify whether the findings are accurate, and if they're applicable to everyday life."

Chemicals being absorbed into the system is another concern surrounding sun cream. Some brands boast "microencapsulation", in which ingredients are covered with a gel or coating to cause chemicals to diffuse slowly. Zelens Daily Defence Sunscreen SPF 30, £55, is one such. The brand's website explains: "Encapsulated filters have a low chemical load since the encapsulation process prevents direct skin contact (encapsulated organic filters remain on top of the skin surface) resulting in a reduced dermal uptake and low allergy potential."

There has been concern that if sun creams don't have microencapsulation our skin is in danger of being



DAVID WARD/GALLERY STOCK

What's your skin type?

Dr Sharad Paul says that to calculate your safe sun exposure, with or without the use of sunscreen, first know your skin type on the Fitzpatrick scale, which estimates the response of different skin types to UV light.

For instance, type 1 (always burns, never tans) can be exposed to the sun for 67 minutes divided by the UV index (ie the amount of ultraviolet radiation reaching your area). So if the UV index is ten (very high, pretend you're in Barbados), that's about six minutes. Dr Paul says: "Using a sunscreen with an SPF rating of 15 would theoretically increase this to 6 multiplied by 15, or 90 minutes."

As a general guide, the skin types 1-6 are as follows:

Type 1 Always burns, never tans (like the typical Celtic redhead or platinum blonde)
Maximum time in the sun 67 minutes/UV index

Type 2 Burns easily, tans with difficulty (usually blonde and blue-eyed)
Maximum time in the sun 100 minutes/UV index

Type 3 Sometimes burns, tans easily (usually brown-black-haired and brown-eyed)
Maximum time in the sun 200 minutes/UV index

Type 4 Rarely burns, tans easily (Mediterranean, Spanish or lighter Indian skin)
Maximum time in the sun 300 minutes/UV index

Type 5 Burns very rarely, tans very easily (Mediterranean, Indian or lighter black skin)
Maximum time in the sun 400 minutes/UV index

Type 6 Never tans or burns (deeply pigmented black skin)
Maximum time in the sun 500 minutes/UV index

She emphasises that in the UK sun protection products are classed as cosmetics, and so are subject to rigorous safety legislation. Safety assessments, Dr Meredith says, "cover all potential risks".

Titanium dioxide and zinc oxide have been scrutinised by the SCCS and concluded to be safe. The CTPA has a rather withering statement on its website: "The skin is a barrier, not a sieve; it is effective against penetration."

Dr Hussain is also aware of the worry that nanoparticles could get into your bloodstream, but says "we simply do not have evidence that suggests they are dangerous."

There has also been concern that chemicals such as oxybenzone, a UVA filter in some sun creams, can cause hormone or endocrine disruption, meaning it could interfere with the body's hormone system causing adverse developmental, reproductive, neurological, or immune effects.

Dr Meredith notes that EC regulators are aware of these claims, but says: "If there was any substance to such allegations, the ingredients in question would be reviewed and either prohibited or restricted."

There isn't an ingredient that consultant dermatologists or skin cancer doctors will tell you they would never use, but experts have their preferences. Dr Paul likes to err on the side of natural. "We are balancing risk — chemical v UV damage."

He says scientific opinion remains divided on oxybenzone, though he is developing his own brand of

I personally would not use anything with bergamot in

sunscreen and has chosen not to include it. Whereas Dr Hussain notes that "all of the data [regarding oxybenzone] is based on animal models, and we don't have enough hard human data".

Some of us are sensitive to certain chemicals in sunscreen, however. Both Dr Hussain and Dr Paul mention PABA (para-aminobenzoic acid), effective against UVB, as causing allergies in some people. Dr Paul says: "I'd definitely avoid PABA-containing sun blocks." Dr Hussain adds: "Some people may develop a contact allergy to PABA." A lot of creams now are marketed as PABA-free.

However, do be wary of vitamin-enriched, natural-sounding sun cream. Dr Paul says: "Many manufacturers use antioxidants, ie either botanicals or vitamins. But some botanicals such as bergamot are well known to cause pigmentation or dermatitis. From a pure sun protection point of view these afford no benefit, although they're supposed to help repair UV damage, so I would avoid sunscreens containing bergamot."

Overall, Dr Hussain urges perspective. "One of the biggest problems we have is that people are simply not putting on sunscreen full stop." He advises fretting less about the minutiae.

"For the vast majority of people, the risk-to-benefit ratio is greatly in favour of using sunscreen."

How to choose the right sunscreen

When to use SPF

Check the UV index. On a cloudy August day at lunchtime, London, York or Edinburgh might have a UV index of three or four. This is moderate, but the Met Office advises sunscreen. Although up to 80 per cent of UV can penetrate cloud, in Britain the UV index doesn't exceed eight, and seven is rare. On a scorching summer afternoon in Barcelona, however, the UV index will reach nine.

"Generally, you need a shot glass measure applied all over your body, and you should reapply every two to three hours," Dr Paul says.

The British Association of Dermatologists (BAD) advises that we apply sunscreen up to 30 minutes before going outside, so our skin has time to absorb it: six full teaspoons, according to BAD, which says applying half of this can reduce protection by up to two thirds.

"Water resistant" relates to a product's ability to retain sun protective properties after two 20-minute bouts of splashing in water. Towelling yourself dry can remove up to 85 per cent of protection.

Sand and snow's reflective properties magnify the sun's effects by up to 17 per cent and 85 per cent respectively. Water increases it by 5 per cent, although sea spray can magnify it by up to 25 per cent.

It's better to reapply SPF30 every couple of hours than get complacent on SPF50. "It gives a false sense of security," Dr Paul says. It's also worth noting that when *Which?* tested a selection of "once a day" sunscreens, after six to eight hours their SPF had decreased by 74 per cent.

Which cream is best for you?

Dr Paul says the most important factor is that "it protects against UVA and UVB". If you are vague on your ultraviolets, think of "A as for ageing; UVA causes wrinkling and is implicated in melanoma skin cancers. B is for burning; UVB causes sunburn and tanning in brown skin types and is implicated in non-melanoma skin cancers."

He notes that "sunscreens generally have a filter, either zinc or titanium — they filter out UVA and UVB, when formulated properly — and a UV absorber, chemicals that absorb UV and so prevent skin from being damaged further."

The SPF only relates to a sunscreen's ability to filter UVB rays. In the UK and Europe, the UVA logo (UVA inside a circle) indicates that a sunscreen's level of UVA protection is at least the recommended minimum, one third of its UVB protection.

There's also the UVA star system. But beware; the number of stars, from zero to five, indicates the ratio between the level of UVB and UVA protection — meaning that, as the BAD warns, a sun cream with a low SPF could have "a high level of stars, not because it is providing lots of UVA protection, but because the ratio between UVA and UVB protection is about the same". To play it safe, go for SPF30, and four or five stars. Look for a broad spectrum sunscreen.

Higher SPF levels do not provide an incrementally higher UV filtering effect. An SPF of 15 filters out 93 per cent of UV rays (experts don't advise using SPF below 15), SPF30 filters out 97 per cent, and SPF50, 98 per cent.

Don't leave the bottle out in the sun. Sunscreens expire often 12 to 18 months after being opened, although, if kept in a cool dry place, "most sunscreens will be good for two to three years after manufacture", Dr Paul says. However, if your sunscreen bottle has sweltered on the beach or car dashboard, its chemicals degrade faster.

penetrated by what one report calls "potentially harmful" nanoparticles — particles of tiny size that occur in nature, but that can also be manufactured or processed to, say, make your glasses scratch-resistant, your oven self-cleaning, or your sunscreen less gunky.

Nanoparticles are sometimes present in sun lotions because no one loves that thick, white paste. Dr Paul says: "Zinc oxide and titanium dioxide are well-known UV filters. One disadvantage with zinc — the safest, in my view, as it occurs naturally in the body — and to a lesser degree titanium, is that their particle sizes are large, and so formulating them into a sunscreen makes it thick and white, and therefore less appealing."

So, manufacturers began using nanoparticles to make sun creams more loveable — in nano-form, zinc particles are too small to be visibly white. Yet with these small particles comes the concern that they could enter normal cells and cause toxicity. While noting that some scientists believe that there's further research to be done in assessing the risks of

nanomaterials, Dr Paul, author of *The Genetics of Health*, says that he favours "more natural and less small-particle" sunscreen, but adds that "a recent review suggests that nanomaterials are unlikely to cause harm".

Indeed, a scientific review published by the Australian Department of Health on the safety of titanium dioxide and zinc oxide nanoparticles in sunscreens concludes that the majority of studies have shown that both titanium dioxide and zinc oxide nanoparticles "either do not penetrate or minimally penetrate the stratum corneum [outermost layer of skin] and underlying layers of skin. This suggests that systemic absorption, hence toxicity, is highly unlikely".

Nano or no, experts insist that sun cream is one of the safest products on the market. The Cosmetic, Toiletry and Perfumery Association (CTPA), a UK trade association, engages with UK and EC authorities to advise its member UK firms on how to apply EU cosmetics law. Its director of science, Dr Emma Meredith, says: "If an ingredient is not safe, it would be banned; it is as simple as that."

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