MARCO MELGRATI

NUTRITION

Edible skin care

Eating well could be the best defence for our skin. But which vitamins and nutrients will yield the healthiest glow?

BY SARAH DEWEERDT

Biochemist Margreet Vissers shares a common enemy with skincare companies: the highly unstable free radicals that damage cells and attack DNA. Her latest work, however, which looks at the effects of vitamin C on skin health, is not focused on developing new creams or lotions. "I've been known to say to cosmetic companies, 'you know you'd probably be better off eating your product than rubbing it on,'" says Vissers, who heads the Centre for Free Radical Research at the University of Otago in Christchurch, New Zealand.

Such a comment reflects a growing awareness of the role of nutrition in skin health. Skin is the largest organ in the body, comprising about 10–15% of body weight. It helps protect the body from dangers such as ultraviolet rays, pollution and infections, and it constantly renews itself — the outermost layer, the epidermis, remakes itself every month. All of that requires a constant flow of energy and nutrients.

To scientists such as Vissers, it's clear that the skin needs to be fed with nutrients such as vitamin C from within. Although our skin is exposed to the outside world, it's relatively inaccessible for external nutrients, says John Casey, who was vice-president for bioscience research at Unilever in London for ten years. Pollutants in the environment can make their way through (see page S89), but, says Casey, who is now retired, "nutrients important to fuel and feed the skin are entirely different". Essential compounds, such as vitamins, sugars, peptides and minerals, are often large and water soluble. "Things that you apply from a topical will not pass that barrier. They will not get down to the living layers of the skin," he says

A growing body of research, on everything from anti-ageing strategies to cancer risk, suggests that diet might be key to skin health. However, the practical details are unclear. The best diet advice for ensuring healthy skin aligns with general guidelines: eat a varied diet full of fruits, vegetables and other unprocessed food. Now, researchers must translate their findings into specific advice about which nutrients, in which quantities and combinations, will ensure skin health. So far it is proving a difficult proposition.

ALPHABET SOUP

Vissers has been studying the role of vitamin C in immune function, mood, mental health and even cancer for more than a decade. Now, she's beginning to investigate links between vitamin C consumption and the levels found in the bloodstream and the skin. "The skin goes to great lengths to take up vitamin C," Vissers says. She compares it to a vital link in a long chain. "It influences so many processes that without it, many things are going to falter." Vitamin C is necessary for protection against sun damage in the epidermis, where it mops up free radicals produced by UV rays. It may also be involved in the maturation of keratinocytes, the cells that make up the epidermis.

In the thick inner dermis, vitamin C is needed to produce and maintain collagen, the spongy protein that gives skin its underlying structure and plump appearance. It also increases proliferation and migration of fibroblasts, the cells responsible for collagen production, and regulates signalling pathways related to inflammation, aiding wound healing.

People with diets that lack vitamin C can be at risk of scurvy, a condition that can result in exceedingly dry, brown-tinged skin, excessive bruising and slow-healing wounds (S86). But until now, scientists had little information about the link between dietary and skin vitamin C in healthy individuals. Vissers and her team have unpublished data showing that the amount of vitamin C a person eats maps directly onto the vitamin C content in their skin. Therefore, "you can boost vitamin C in compartments of the skin by improving your diet," Vissers says.

Vissers isn't alone in probing the links between nutrition and the skin. Many studies have focused on the goal of keeping skin

looking youthful — plump, dewy, firm and unwrinkled. Scattered studies of cells in the laboratory, animal models and a few human trials also support roles for a variety of nutrients in preventing skin ageing. These include vitamins, not just C, but also vitamin D and E; carotenoids, such as β-carotene, lutein and lycopene; and plant-based chemicals found in foods that range from soya and turmeric to chocolate and green tea.

But despite researchers' mechanistic knowledge of how compounds such as vitamins and minerals might work, scientists still don't know much about the optimal intake to stave off skin ageing. One observational study[1], which included more than 4,000 women in the United States aged 40–74, suggested that a diet rich in vitamin C and linoleic acid (an omega-6 fatty acid found in nuts, seeds and vegetable oils) is associated with younger-looking skin. Another study[2], this one of 716 women in Japan, suggested green and yellow vegetables might be the best choice.

However, such studies are inconsistent: in the US study, women who consumed lower levels of fats had younger looking skin, whereas in the Japanese study this was true for those who ate more.

The result is a cacophony of claims that can be difficult for consumers to sort through.

One of the most rigorous evaluations of nutritional supplementation to fight ageing came in 2014, when Casey and his colleagues at Unilever developed a nutritional supplement and tested it in a randomized controlled trial[3]. The supplement combined five ingredients, each of which had promising anti-ageing properties.

Their Strength Within Anti-Wrinkle Supplement included antioxidants (vitamins C and E), as well as lycopene, which absorbs UV light and soaks up free radicals. It also contained soya isoflavones that Casey says boost collagen production, at least in culture. The final ingredient was a fish-oil supplement, rich in omega-3 fatty acids that upregulate collagen synthesis and have anti-inflammatory properties.

At the end of a 14-week study in 159 women, those who took the supplement daily had reduced wrinkle depth and skin that contained more freshly synthesized collagen compared with the control group. With these data in hand, a Unilever subsidiary called Dove Spa launched the supplement in 2011. But there was little marketing effort, Casey says, and two years, later the pills were removed from the market when the subsidiary was sold. It has since been relaunched by Ioma, a cosmetics company in Paris, as Collagen Renew.

SUN SIGNS

Emerging evidence suggests that nutrition may help to prevent melanoma. Multiple studies point to vitamin D as a potential defence against this aggressive skin cancer, which results from exposure to UV light.

In vitro studies have shown that vitamin D dampens proliferation in melanoma cell lines[4]. And epidemiological studies have found that people with more advanced melanomas tend to have lower levels of vitamin D in their blood than those with less advanced tumours[5].

ANNA LAWRENCE

Tissue samples are processed for vitamin C analysis at the University of Otago in New Zealand.

Eggs, meats, mushrooms and fortified dairy products all contain vitamin D. But when bathed in sunlight, skin can make the vitamin itself. Researchers have long known that a little bit of sun exposure is healthy for the body for a variety of reasons, although too much can prove harmful. But now they're finding that moderate sun exposure might protect against the very harm that excessive exposure causes. "Sunlight and vitamin D could be really important for melanoma outcomes," says Michael Kimlin, a cancer-prevention researcher at the University of the Sunshine Coast in Brisbane, Australia.

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Kimlin and his team showed[5] that people with melanoma and low vitamin D levels were more likely to have thicker tumours, which generally have a worse prognosis. By measuring vitamin D levels at diagnosis, the team was able to exclude the possibility that low vitamin D levels were due to people with more severe melanomas being more diligent at staying out of the sun in the wake of their diagnosis.

But it's still unclear whether the vitamin itself is the protective factor. Levels of vitamin D in the blood could be a marker for another protective effect of sunlight, or some other sunlight-influenced nutrient altogether.

For people with average skin-cancer risk, these findings don't change the commonsense advice to wear sunscreen and get outside. People rarely apply enough sunscreen for it interfere with the body's ability to make vitamin D. "Time and time again our studies in Australia show the people who sun-protect the most actually have the highest levels of vitamin D," because they also tend to be more active and spend more time outside, he says.

But for those with a high melanoma risk, or those who have already been diagnosed, this line of research suggests that oral vitamin D supplementation could be a good strategy. A randomized trial of vitamin D supplementation in high-risk individuals might be worthwhile, Kimlin says. Several large randomized trials are already underway to investigate whether this strategy could help prevent other forms of cancer. But preliminary results suggest that even though vitamin D levels have been linked to cancer protection in epidemiological studies, supplements might have little effect. "When you start taking nutrients out on their own, and you start to look at anticancer properties, it doesn't necessarily replicate what we see in the observational studies," Kimlin says.

Vitamin D supplements are so ubiquitous that it's difficult for researchers to gauge their anti-cancer effect. And differences in individual biology can obscure patterns. Kimlin's ongoing research aims to determine how differences in the vitamin D receptor gene affect melanoma risk. But whether researchers are talking about wrinkles or melanoma, the sticking point is the same: the leap from general healthy lifestyle advice to specific recommendations about a particular nutrient remains a challenge, and not one that will be solved anytime soon. ■

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