

# Seaweeds, Chirality and a Recovery Complex

by rebecca james gadberry

### Seaweeds and algae



**Q** Why are so many skin care products now featuring seaweeds and algae? Don't manufacturers know that iodine is a common allergen and can't be used by people with acne? By including these ingredients in a large selection of products, they really limit the amount of people who can use them. The physician I work with has decided we won't offer any products with seaweeds or algae. It's just too expensive, complicated and difficult to stock two lines, one for people who can use iodine and one for those who can't.

**A** New areas of biological research are identifying an array of previously unknown benefits to many of the 10,000-plus members of the seaweed family, which make up the macroalgae segment of saltwater-grown algae. No longer are these algae relegated to simply slimming, toning, detoxifying and hydrating. A large variety are being added to skin and body care for such tasks as long-term moisturizing, exfoliation, DNA-repair, environmental protection from smog and tobacco smoke, oily skin and acne control, and the reduction of swelling, redness, itching and other signs of inflammation.

Carrageen, a gel-like polysaccharide gum from such red algae as *Chondrus crispus* and *Abnfeltia concinna*, has been used for years to thicken creams, lotions, ice cream, salad dressings, yogurt and toothpaste. Recently, investigators started looking at its relationship to the immune system. Their findings have inspired research into the ability of carrageen to provide HIV-resistance to exposed individuals.



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Other seaweeds, including the brown algae species *Laminaria* and *Sargassum*, are being investigated for their treatment of cancers, cholesterol-control and weight reduction. Based upon what is found, even more uses for algae in salon and spa products can be expected.

Some algae contain iodine; most do not. Kelps (*Laminariales*) and wracks (*Fucales*), both members of the brown seaweed family, can contain more than one million times the levels of iodine found in their seawater environments, while spirulina, a member of what was once known as blue-green algae but now is identified as the cyanobacteria group, might not contain any iodine at all. New processing techniques also allow manufacturers to lessen or remove iodine from seaweeds, making it difficult for spa owners and their clients to know which products contain iodine and which don't.

Adding to the confusion is the fact that United States' ingredient labels can list the algae or seaweed ingredient by "algae," "seaweed," "kelp" or, in many cases, but not all, can list the plant's common name or its Latin binomial name. This means the ingredient list can state the common names "algae extract," "seaweed extract," "kelp extract" or the Latin binomial "*Laminaria Digitata extract*" when listing this commonly used kelp. If more than one algae extract is used, the manufacturer has the option of listing "algae extract" just once, or several times, or listing each seaweed with its Latin binomial name. You also might find different forms of the algae listed, such as "algae extract" and "algae peptides." These names would refer to at least two different ingredients.

More aggravating is the fact that ingredients do not need to be listed on a professional-use-only product, although many companies selling to the professional market do provide at least a partial ingredient list. So you may not be aware that a product contains a possible iodine-containing ingredient.

*The bottom line is this:* Algae and seaweeds are being used more extensively, and this use will grow because they provide unique and valuable benefits to a variety of skin and body care. So you shouldn't ban all products containing these plants from your product repertoire. However, since you can't tell if a product contains iodine simply by reviewing the ingredient list, you've got to ask your manufacturer about whether the algae they use contains iodine. If they don't know, they can contact their seaweed supplier for this data. Don't reserve your questions about iodine content to algae. Also ask about algin and alginates that are derived from kelps and wracks, carrageen, agar, muds, silts, salts, reconstituted seawaters and anything else that comes from the sea.

## Chirality



**Q** A manufacturer recently told me that the only way an ingredient can affect the skin is if it's "chirally correct." What does this mean? And why is this the first manufacturer to tell me this? Do other manufacturers not make products with "chirally correct" ingredients, so they want to hide the fact that their products don't really work?

**A** Chirality is a geometric phenomenon that occurs when two figures are identical in every way; with the exception that they are mirror images of one another. In the



late 1800s, when chirality first became a popular subject for scientists in Europe, the mathematician and children's storyteller Lewis Carroll explored the world's mirrored nature in his classic tale *Alice Through the Looking Glass*. Tweedledee and Tweedledum, the mirror-image twins in Carroll's tale, are perfect examples of chirality at play.

Chiral (ki-rul) is derived from *chaire*, the Greek word for hand, because the hands are mirror images of one another. Each hand is basically the same in form and function, having four fingers and a thumb spreading out from a central palm, but because of their left and right orientations, they are mirror images rather than exact matches. As a result, they cannot be superimposed upon one another, which is another characteristic of chirality. If you slip on a pair of gloves, the left glove fits only the left hand and vice versa. Hands are chiral, as are the gloves.

Although taken for granted in modern technology, allowing such seemingly mystical inventions as compact discs to store information, computer monitors to display images and mood rings to detect the body's temperature, chiral chemistry actually was born in 1848 at the bottom of a wine glass. While studying for his doctorate, Louis Pasteur, the man who introduced the germ theory of disease, discovered that crystals of tartaric acid, found in the dregs of red wine, appear to be the same in every respect—chemical makeup, freezing point, pH, solubility—with the seemingly minor exception that when light was shone through the crystals, sometimes it bent in one direction, sometimes another, and sometimes it didn't bend at all. After analyzing the crystals under a microscope, Pasteur realized the molecules that bent light in two separate directions were mirror-image twins of the same chemical, while the crystals that didn't bend light were made up of both twins.

Now, more than 150 years later, it's known that 90% of the molecules that make up life are chiral. Plants and animals produce chiral molecules in only one form, sometimes referred to as their optically pure state. If the molecule bends light to the left it is termed the "L" form; if light bends to the right, it is the "D" form. These chiral partners are called *isomers*. Simple sugars naturally occur only in the "D" form, while amino acids—the building blocks of proteins including DNA, hormones and enzymes—are almost all produced in the "L" form.

Sometimes the two forms yield interesting oddities. Carvone, a molecule found in some plants, gives spearmint its minty scent when turned one way. Turn it the other, and you have the scent of caraway. You can smell both because nerve endings in your nose also are chiral, receiving each mirror image just as gloves receive your hands.

Similar receptor sites are found on cell membranes. Resembling three-dimensional "locks" on the door to your house, thousands of receptors coat each cell, waiting to receive the mirror image molecular "key" that will fit into the lock and turn-on the desired biological response. Introduce

the molecule with the correct chemical makeup, but turn it the wrong way, and the molecule usually will bypass the receptor with no effect. This isn't always the case, however. Ibuprofen, the popular non-steroidal anti-inflammatory, is four times stronger in its left-handed form, so enzymes in your body convert right-handed ibuprofen into the more potent left-handed twin because both are present in the drug. Both forms also were present in thalidomide, a drug taken by pregnant women in the '50s and '60s to prevent severe morning sickness. One form was a high-powered sedative, the other produced birth defects.

Thankfully, applying the wrong chiral twin to the skin

does not deliver such terrible results. Cosmetic chemists have been aware of the chiral importance of certain molecules for decades, so much so that, when chirality is important, the biologically acceptable form

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is used automatically. In fact, the unacceptable twin often isn't even available to the formulator. For instance, L-ascorbic acid is the only form of vitamin C recognized by the body, so D-ascorbic acid never is used in cosmetics. Even when the esters and salts of vitamin C are used, such as ascorbyl palmitate and magnesium ascorbyl phosphate, scientists make sure the body's enzymes can break them down into the L-ascorbic acid form once they enter the skin. Only "L" forms of amino acids are incorporated into cosmetics, with the exception of glycine, the simplest amino acid, which is not chiral, and only "D" forms of simple sugars. A notable exception is tocopherol, commonly called vitamin E. Available in a form where both twins exist, DL-tocopherol is about 40% cheaper than the optically pure D-alpha-tocopherol, so the formulator needs to use much more of the mixed form to achieve the same antioxidant benefits delivered by the pure form.

Today, two-thirds of the drugs on the market—for allergies, anxiety, Parkinson's, indigestion, arthritis, AIDS and even heartburn—are chiral drugs, representing a jump in sales of these optically pure drugs from \$18 billion in 1992 to more than \$100 billion last year. Some cosmetic companies see this trend as an excellent opportunity to explore the effects of what might be called—"chirally correct" molecules on the skin. But most cosmetic chemists believe chirality is important only in specific instances. According to Stephen Smith, a Los Angeles-based consultant to the cosmetic industry and owner of Bio Clin Formulations, "Chirality is not the first order of significance when designing a product. But it may be the second, especially when using plant-derived ingredients for their skin bleaching effects or when an ingredient is targeting a chiral-specific cell receptor or transport device." In the first two instances, the U.S. Food and Drug Administration (FDA) would deem the product a drug, not a cosmetic. So cosmetic companies who make products with these effects usually are mum about their presence when discussing their products with estheticians and consumers.

Ingredient suppliers frequently determine the chirality

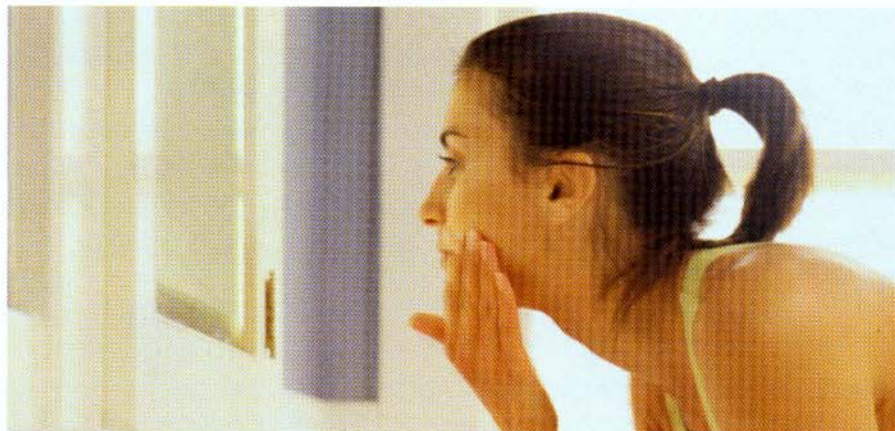


bioactive form of an ingredient by testing their ingredient's effects on the skin. If an ingredient produces irritation or has no effect—both signs of incorrect chirality, as well as other causes—it is rejected in favor of one that is safer and produces results. So, while the manufacturer of the end product doesn't know which form is desirable, the ingredient supplier usually does.

"Other issues become more important than chirality," says Guy Langer, education chairperson for the California chapter of the Society of Cosmetic Chemists and a sales representative for one of the West Coast's leading raw material suppliers. "Focusing on chirality as the key issue can cause you to not pay attention to other very important issues, like proper preservation, product stability, low irritation, product performance and if the claims made for the product are justified."

If the latter are true, agree many cosmetic chemists, then you can assume the product contains safe and effective chiral ingredients, or that chirality is not important to this product.

## Recovery complex



**Q:** Is there a new ingredient that stimulates collagen production in the skin? I believe it's called TNS Recovery Complex. Are there any studies that prove it works?

**A:** There are many new ingredients purported to stimulate collagen production in the skin. However, the one you are referring to contains NouriCel, a trademarked solution derived from a patented process developed by Advanced Tissue Sciences, Inc., in La Jolla, California. This solution originates from bio-engineered human tissue discarded from neonatal foreskin. As the tissue develops, a variety of natural growth factors, immune system hormones, antioxidants, matrix proteins and soluble collagens found in healthy human skin are produced. According to the company, these compounds are not present in sufficient quantity to keep skin healthy or youthful as skin ages or as it is exposed to sunlight. Once the compounds develop, the tissue is harvested, and the compounds are collected in a nutrient-rich solution. This solution, which does not contain any cells, is available in the TNS Recovery Complex.

In more than 90 subjects, NouriCel was determined to be safe, non-irritating, and effective in reducing the appearance of fine lines and wrinkles. At the end of a 45-day study conducted by Advanced Tissue Sciences, participants experienced up to an 80% reduction in the number of wrinkles, a 44% reduction in wrinkle depth, a 62% reduction in the appearance of fine lines and a dramatic improvement in overall skin texture.

On a personal note, a friend took part in one of the NouriCel studies, and could clearly see a "youthening" of treated skin compared to the area that was not treated. Age spots seemed to clear as well, but Advanced Tissue Sciences made no mention of this in its test results, perhaps because skin lightening is a drug claim, and this is intended for use in cosmetic skin care products, not drugs.

A large, 90-day, double-blind, controlled study is underway to compare the effects of NouriCel to one side of subjects' faces, while a placebo is applied to the other. Results from more than 200 subjects will be presented to the industry late this year. ■