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## Marine Ingredients for the Future of Skin Care

By Angela Erikson-Stanley

Scientists believe the first cell life to form on earth was marine bacteria, or a very simple single-cell alga. The depths of the ocean provided a simple filtration system for the harsh UV rays that blazed down on the planet that, at the time, was devoid of an ozone layer. Thanks to the water's protection from the harsh rays and the nutrients in seawater, species of microalgae could form and flourish.

Now, 3.8 billion years later on a planet with diverse marine and terrestrial plant content, microalgae species are being seen as a wave of the future for topical skin and body care products.

As a picture begins to be painted of what marine-based skin care has to offer, it is important to understand the unique nutrient composition of the oceanic environment. It's no coincidence that seawater and blood plasma have a nearly identical chemical composition in terms of mineral and trace element levels. Both blood plasma and seawater contain naturally occurring trace elements and minerals, and the concentration of each mineral present is very similar. Seawater is so close to the body's internal environment that if white blood cells are removed from the body and placed in a sterile diluted seawater solution, they are able to maintain normal cell function-and this is the only solvent that will accommodate continued cellular activity.

The human body needs replenishment of minerals such as zinc, phosphorous, calcium and magnesium on a daily basis. Because seawater contains the body's ideal balance of minerals, it is the perfect medium to restore these levels. Minerals and trace elements are important catalysts to all cell functions. Maintaining ideal mineral levels is key to preventing cellular imbalances and boosting every cell function.

### **Marine Ingredients and Human Skin**

Not only can seawater provide a balanced way to supplement minerals to human cells, it also provides a nutrient-rich growing environment for micro- and macro-algae. As marine plants grow in this amazing mineral medium, they absorb and concentrate various nutrients also beneficial to the human body. Depending on the environment in which the seaweed is growing, it will develop different nutrients and cell functions as defense mechanisms to protect itself from various aggressors. Researchers have noted the similarities between human skin and various seaweed species, and have found ways to use marine extracts to improve many skin conditions.

This is especially true for micro- and macro-algae that grow in areas with large tidal fluctuations, such as the Brittany region of France. With the second highest tide fluctuations in the world, the span of distance between high tide and low tide can reach great lengths in this area, which provides a dual environment for the native marine plants to adapt. At different times of the day, these seaweeds are

being protected by cold, mineral-rich seawater. During low tide, these same plants are exposed to UV rays, airborne pollutants, wind and bacteria-the same aggressors skin is exposed to. In order to combat these aggressors, the seaweeds that grow in the tidal zone adapt and develop many skin like qualities to maintain hydration levels, protect themselves from UV-induced free radical formation and withstand cold temperatures, to name just a few.

### **Research and Development**

During the past 40 years, techniques used to preserve seaweed post-harvest including the process of nutrient extraction-have become extremely sophisticated. Once seaweeds have been harvested, they must be preserved in a way that respects the integrity of the raw material. If heat or chemicals are used to preserve seaweed, they can damage the potency of nutrients-including important peptides, vitamins, enzymes, fatty acids, antioxidants and complex sugars. Freeze-drying has proven to be the best way to preserve seaweed's potency because, instead of using heat or chemicals, a cold process removes the water. All that is left after freeze-drying is the dry matter, including nearly 100% of the original concentration of biological actives.

Perfectly preserved algae can then be used to create high-quality, potent ingredients, otherwise known as seaweed extracts. State-of-the-art extraction and filtration methods can isolate and extract very specific molecules. These molecules can then be concentrated into an ideal potency to help balance various skin conditions.

For instance, a peptide extracted from *Chlorella vulgaris*, a single-cell green algae, stimulates the product of four types of dermal collagen and elastin. This peptide has been formulated into topical creams to restore youthful function to maturing skin. Another seaweed, *Laminaria Digitata*, retains water in its plant tissue-much like the epidermis holds water-and

even during low tide, it stays plump and moisturized. After identifying that the skin of *Laminaria* contains water-binders very similar to those found in the epidermis, these water-binders (a combination of sugars, minerals and amino acids) were extracted to be used in beauty products. When used as a key ingredient in topical creams, the skin's hydration system may be improved.

### **Sustainable Development**

Another facet to consider when looking for high-quality marine ingredients is the origin of the seaweed and how it is grown and harvested. If growing areas or conditions dramatically differ season to season, the seaweed will not contain the same balance of nutrients each harvest. When the nutrient concentration is different, the components in the marine extract will be impacted.

Seaweed and micro-algae cultivation practices is a great way to bypass this potential problem. Seaweeds can be grown via high sea farming, in which seaweed spores are attached to ropes. The ropes are put out to sea in a protected area where the water is very pure and stable. Once the seaweed reaches maturity, it can be cut, freeze-dried and used for ingredients. This method allows seaweed to be grown in a pure, consistent environment that is also incredibly sustainable.

These seaweeds can be grown specifically for cosmetic use, reducing the need to harvest from the wild and reducing human impact to sensitive marine areas. *Undaria pinnatifida* is one seaweed that is grown in this way for use in cosmetics. Extracts of *Undaria* help to improve the condition of the extracellular

matrix, or dermal network like collagen, elastin and hyaluronic acid that keep the skin dense and plump while circulating water throughout the epidermis.

Micro-algae and small seaweeds can also be cultivated by replicating natural marine conditions in the laboratory. Purified seawater is used as a medium, and all conditions—such as light, oxygenation and pH—are regulated to maximize the quality of the microalgae. All of these levels can be adjusted for the individual species being grown. Once the seaweed or microalgae have multiplied to appropriate levels, they are freeze-dried and specific actives can be extracted.

One alga that is cultivated in vitro for cosmetic use is *Porphyra conchocelis*. In nature, *Porphyra* produces alpha hydroxy acid to create holes on the surfaces of rocks so that it can adhere. This lactic acid is a very gentle, yet effective, exfoliating ingredient for the skin.

Further, using cultivation and sea farming as a means to produce seaweed creates very stable, consistent results in the final skin care product while offering sustainable, eco-friendly skin care options.

### **The Future of Marine Ingredients**

The use of marine biotechnology is a new frontier for creating advanced beauty ingredients. In nature, microscopic algae produce various molecules, such as polymers, enzymes, pigments and peptides. In the laboratory, it is possible to both cultivate these algae and to naturally stimulate their production of these valuable molecules.

Marine biotechnology uses micro-algae as "factories" to produce cosmetic ingredients that provide powerful results. An exopolysaccharide (EPS), or complex sugar that is excreted, is produced for skin care using this science. In nature, the micro-alga produces the EPS as a biofilm to help it adhere to surfaces when conditions get aggressive. This biofilm, made of a complex structure of sugars, provides both instant and long-term results. Fifteen minutes after applying a product containing the EPS, wrinkles are often visibly smoother and skin is lifted. After one month of daily use, the EPS improves the production of collagen and elastin in the skin to help restore a youthful appearance.

For an estimated 3.8 billion years, micro-algae have been adapting, thriving and multiplying. Although tiny, they have managed to create amazing self-protection systems from which skin can truly benefit. With the combination of the ability of seaweed to concentrate unique nutrients, and with aggressive research and development practices, marine skin ingredients can successfully provide solutions for most skin concerns. In general, using marine biotechnology provides the beauty industry with highly potent ingredients that cannot be acquired from any other marine or land-based raw material.

With such a plethora of seaweed micro-algae that have still not been discovered in the vastness of the seas, there is a virtually untapped arena of possibilities. Because of these incredible factors and the ability to creating ingredients so sustainably, marine skin care is truly a wave of the future in beauty. •

### **GENERAL REFERENCES**

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**ANGELA ERIKSEN-STANLEY**

<http://www.skininc.com/skinscience/ingredients/Marine-Ingredients-The-Future-of-Skin-Care-209180111.html>