The world's healthiest foods

whfoods.org

Sea vegetables

What's New and Beneficial about Sea Vegetables

- Sea vegetables may be a better source of bioavailable iron than previously thought. One tablespoon of dried sea vegetable will contain between 1/2 milligram and 35 milligrams of iron, and this iron is also accompanied by a measurable amount vitamin C. Since vitamin C acts to increase the bioavailability of plant iron, this combination in sea vegetables may offer a special benefit.
- Brown algae (including the commonly eaten sea vegetables kombu/kelp, wakame, and arame may be unique among the sea vegetables in their iodine content. Some species from the brown algae genus Laminaria are able to accumulate iodine in up to 30,000 times more concentrated a form than sea water!
- Sea vegetables may be a unique food source not only of the mineral iodine, but also of the mineral vanadium. As part of their natural defense mechanisms, sea vegetables contain a variety of enzymes called haloperoxidases. These enzymes all require vanadium in order to function. Although this mineral is not as well known as some of the other mineral nutrients, it appears to play a multi-faceted role in regulation of carbohydrate metabolism and blood sugar. While research in this area is still in the preliminary stage and remains mixed in terms of results, vanadium may help to increase our body's sensitivity to insulin by inhibiting a group of enzymes called protein tyrosine phosphatases. It may also help us decrease our body's production of glucose and help us increase our body's ability to store starch in the form of glycogen.
- Unlike some other types of vegetables, sea vegetables do not appear to depend on common polyphenol antioxidants (like carotenoids and flavonoids) for their total antioxidant capacity. Recent research from India makes it clear that a variety of non-flavonoid and non-carotenoid antioxidant compounds are present in sea vegetables, including several different types of antioxidant alkaloids.
- An increasing number of health benefits from sea vegetables are being explained by their fucoidan concent. Fucoidans are starch-like (polysaccharide) molecules, but they are unique in their complicated structure (which involves a high degree of branching) and their sulfur content. Numerous studies have documented the anti-inflammatory benefits of fucoidans (sometimes referred to as sulfated polysaccharides), and osteoarthritis has been an area of specific interest for these anti-inflammatory benefits. The sulfated polysaccharides in sea vegetables also have anti-viral activity and have been studied in relationship to herpes simplex virus 1 (HSV-1) and herpes simplex virus 2 (HSV-2). By blocking the binding sites used by HSV-1 and HSV-2 for cell attachment, sulfated polysaccharides help prevent replication of these viruses. The sulfated polysaccharides in sea vegetables also have important anticoagulant and antithrombotic properties that bring valuable cardiovascular benefits.

- Sea vegetables may play a role in lowering risk of estrogen-related cancers, including breast cancer. Since cholesterol is required as a building block for production of estrogen, the cholesterol-lowering effects of sea vegetables may play a risk-reducing role in this regard. However, more interesting with respect to breast cancer risk is the apparent ability of sea vegetables to modify aspects of a woman's normal menstrual cycle in such a way that over a lifetime, the total cumulative estrogen secretion that occurs during the follicular phase of the cycle gets decreased. For women who are at risk of estrogen-sensitive breast cancers, sea vegetables may bring a special benefit in this regard.

WHFoods Recommendations

While the broad range of minerals provided by sea vegetables make them a great addition to your Healthiest Way of Eating, Westerners are often not quite sure how to add more of these nutrient-rich foods to their meals. One easy way is to keep a container of kelp flakes on the dinner table and use it instead of table salt for seasoning foods. You can also experiment with adding your favorite sea vegetable to vegetable dishes, salads, and miso soups. They are easy to add to dishes as they require no cooking (see Tips for Preparing Sea Vegetables in the How to Enjoy section below). It is recommended to include 1 tsp of sea vegetables to your Healthiest Way of Eating each day.

Nutrients in Kelp (sea vegetable)

0.25cup (20grams)

	Daily Value (%)
Iodine	276.7%
Vitamin K	15%
folate	10%
magnesium	9%
calcium	5%
iron	5%
tryptophan	5%
Calories(8)	0%

This chart graphically details the %DV that a serving of Sea vegetables provides for each of the nutrients of which it is a good, very good, or excellent source according to our Food Rating System. Additional information about the amount of these nutrients provided by Sea vegetables can be found in theFood Rating System Chart. A link that takes you to the In-Depth Nutritional Profile for Sea vegetables, featuring information over 80 nutrients, can be found under the Food Rating System Chart.

- Health Benefits

- Description
- History
- How to Select and Store
- How to Enjoy
- Individual Concerns
- Nutritional Profile
- References

Health Benefits

Why would anyone want to eat sea vegetables? Because they offer one of the broadest ranges of minerals of any food, containing virtually all the minerals found in the ocean - and not surprisingly, many of same minerals found in human blood. The also offer a variety of unique phytonutrients, including their sulfated polysaccharides (also called fucoidans). Unlike some other categories of vegetables, sea vegetables do not appear to depend on carotenoids and flavonoids for their antioxidant benefits, because in additional to these two important categories of antioxidants, sea vegetables contain several other types, including alkaloid antioxidants. Sea vegetables are an excellent source of iodine and vitamin K, a very good source of the B-vitamin folate, and magnesium, and a good source of iron and calcium, and the B-vitamins riboflavin and pantothenic acid. They also contain measurable amounts of vitamins C and E.

Multiple Benefits from Sulfated Polysaccharides

To understand many of the anti-inflammatory, anti-cancer, anticoagulant, antithrombotic, and antiviral properties of sea vegetables, you need to look no further than their sulfated polysaccharides. These unique compounds (also called fucoidans) are starch-like molecules that are unusual in their complexity. Unlike many other types of polysaccharides, the fucoidans contain many chemical "branch points," and they also contain sulfur atoms. Multiple studies show anti-inflammatory benefits from consumption of the sulfated polysaccharides in sea vegetables. Some of these benefits appear to take place through the blocking of selectins and from inhibition of an enzyme called phospholipase A2. Selectins are sugar-protein molecules (glycoproteins) that run through cell membranes. During inflammatory responses by the body, selectins are important in allowing inflammatory signals to be transmitted through the cell. By blocking selectin function, some of the inflammatory signaling can be lessened. In case of chronic, unwanted inflammation, this blocking of selectin-related signals can provide important health benefits. Interest in this aspect of sea vegetable intake and anti-inflammatory benefits has received special focus in the area of osteoarthritis. More widely present in unwanted inflammatory problems is overactivity of the enzyme phospholipase A2 (PLA2). This enzyme is important for creation of the omega-6 fatty acid called arachidonic acid (AA), and AA is itself the basic building block for a wide variety of pro-inflammatory messaging molecules. Many corticosteroid medications lower inflammation by blocking PLA2, as does licorice, turmeric, and the flavonoid quercetin. The association of sulfated polysaccharides with decreased PLA2 activity may be especially important in the anti-inflammatory benefits of sea vegetables.

Sea vegetables' sulfated polysaccharides are also associated with its anti-viral activity. Best studied in this area is the relationship between sulfated polysaccharides and herpes simplex virus 1 (HSV-1) and herpes simplex virus 2 (HSV-2). By blocking the binding sites used by HSV-1 and HSV-2 for cell attachment, sulfated polysaccharides help prevent replication of

these viruses. It's important to point out that none of these HSV and sea vegetable studies have involved individuals with HSV who incorporated sea vegetables into their diet. Instead, the studies have been conducted in the lab using human fibroblast cells inoculated with HSV. We don't yet know whether dietary sea vegetables will help prevent HSV replication in individuals with HSV, even though we greatly look forward to future research results obtained in clinical studies with individuals who have HSV and add sea vegetables to their diet.

Many of the cardiovascular benefits of sea vegetables can also be attributed to their sulfated polysaccharide content. Extracts from sea vegetables are sometimes referred to as "heparin-like extracts" because they exhibit some of the same properties as this widely used anticoagulant medication. In fact, heparin itself can be described as a sulfated polysaccharide, and like the sulfated polysaccharides found in sea vegetables, it can decrease the tendency of blood platelet cells to coagulate and form clots. (A blood clot can also be called a "thrombus" - thus giving rise to the term "antithrombotic" in description of sulfated polysaccharides.) In addition to their anticoagulant and antithrombotic benefits, however, sea vegetables have also been shown to help lower total cholesterol and LDL cholesterol and to improve cardiovascular health in this way.

Anti-Cancer Benefits

Not fully understood but of increasing interest to researchers are the anti-cancer benefits of sea vegetables. Research interest in this area has tended to focus on colon cancer, with a special emphasis on the loss of calcium-sensing receptors (CaSRs) in colon cancer cells, and the ability of sea vegetable extracts to alter CaSR-related events. But since chronic, unwanted inflammation and chronic oxidative stress are both risk factors for development of cancer, it would be quite natural for scientists to be interested in sea vegetables are anti-cancer foods not only in the case of colon cancer, but for other types of cancer as well. Sea vegetables are well-researched as containing a variety of anti-inflammatory and antioxidant compounds, and this nutrient combination is likely to result in some risk-lowering benefits in the case of colon cancer and other cancer types. Although much more research is needed in this area, we expect the anti-caner benefits of sea vegetables to become more firmly established over time.

Of special note in this area of cancer and sea vegetables is the issue of estrogen-related cancers, especially breast cancer. Intake of sea vegetables appears able to modify various aspects of a woman's normal menstrual cycle in such a way that over long periods of time (tens of years) the total cumulative estrogen secretion that occurs during the follicular phase of the cycle gets reduced. Since overproduction of estrogen can play a role in the risk of breast cancer for women who are estrogen-sensitive, sea vegetables may offer unique benefits in this regard. It's also important to note that cholesterol is required as a building block for production of estrogen, and intake of sea vegetables has repeatedly been shown to lower blood levels of total cholesterol and LDL-cholesterol.

Other Benefits

Array of Minerals

Sea vegetables have been rightly singled out for their unique mineral content. You're going to find measurable amounts of calcium, copper, iodine, iron, magnesium, manganese, molybdenum, phosphorus, potassium, selenium, vanadium, and zinc in sea vegetables, and

in some cases (like iodine) you can simply not find a more concentrated mineral source. Brown algae like kombu/kelp, wakame, and arame can be particularly concentrated sources of iodine, and for some health conditions - like hypothyroidism, in which the cells of the thyroid make too little thyroid hormone - increased iodine intake can provide important health benefits. The wide variety of minerals found in sea vegetables is simply not found among most other vegetable groups.
The vanadium content of sea vegetables is an area of special interest with respect to their mineral content. While research in this area remain inconclusive, sea vegetables may be able to help us increase our cells' sensitivity to insulin, help us prevent overproduction of glucose by our cells, and help us take existing blood sugars and convert them into storable starches. All of these factors would help us increase our blood sugar control, and lower our risk of type 2 diabetes.

Concentration of Iron
Sea vegetables may turn out to be a better source of bioavailable iron than previously thought. One tablespoon of dried sea vegetable is likely to contain between 1/2 milligram and 35 milligrams of iron. At the lower end of this range, the iron content of sea vegetables is not really significant. But at the higher end of this range, the amount of iron found in sea vegetables is outstanding. (As an overall iron rating in our food rating system, we describe sea vegetables as being a "good" source of iron.) The iron found in sea vegetables is also accompanied by a measurable amount vitamin C. Since vitamin C acts to increase the bioavailability of plant iron, this combination in sea vegetables may offer a special benefit.

Antioxidant Potential
The antioxidant content of sea vegetables also deserves mention with respect to its health benefits. While sea vegetables do contain measurable amounts of polyphenols like carotenoids and flavonoids, they also contain other phytonutrient antioxidants, including several types of alkaloids that have been shown to possess antioxidant properties. Coupled with measurable amounts of antioxidant vitamins (like vitamins C and E) and antioxidant minerals (like manganese and zinc), sea vegetables can be expected to help us reduce our risk of unwanted oxidative stress and many types of cardiovascular problems that are associated with poor antioxidant intake.

Description
Western cultures are only recently beginning to enjoy the taste and nutritional value of sea vegetables, often referred to as seaweed, which have been a staple of the Japanese diet for centuries. Numerous various varieties of sea vegetables can be found in health food and specialty stores throughout the year. Owing to their rise in popularity, they are also becoming much easier to find in local supermarkets as well.
Sea vegetables can be found growing both in the marine salt waters as well as in fresh water lakes and seas. They commonly grow on coral reefs or in rocky landscapes and can grow at great depths provided that sunlight can penetrate through the water to where they reside since, like plants, they need light for their survival. Sea vegetables are neither plants nor animals but classified in a group known as algae.
There are thousands of types of sea vegetables, which are classified into categories by color, known either as brown, red or green sea vegetables. Each is unique, having a

distinct shape, taste and texture. Although not all sea vegetables that exist are presently consumed, a wide range of sea vegetables are enjoyed as foods. Because Japan remains one of the world's largest sea vegetable producers and exporters, the Japanese names for sea vegetables are among the most common names found in grocery stores throughout the United States. The words we use to describe commonly eaten sea vegetables like nori, hijiki, wakame, arame, kombu, and dulse are all Japanese names for these sea vegetables. Many people aren't sure exactly what is meant by the word "kelp," even though they associate it with sea vegetables. This word is often used very loosely to refer to any type of sea vegetable. However, when it's used in a scientific way, the word "kelp" refers specifically to the family of large brown algae and specifically to a variety of brown algae species that are found within the genus Laminaria.

Here is a little more information about some of the most popular types of sea vegetables: *Nori*: dark purple-black color that turns phosphorescent green when toasted, famous for its role in making sushi rolls *Kelp*: light brown to dark green in color, oftentimes available in flake form *Hijiki*: looks like small strands of black wiry pasta, has a strong flavor *Kombu*: very dark in color and generally sold in strips or sheets, oftentimes used as a flavoring for soups *Wakame*: similar to kombu, most commonly used to make Japanese miso soup *Arame*: this lacy, wiry sea vegetable is sweeter and milder in taste than many others *Dulse*: soft, chewy texture and a reddish-brown color

On the science side of the equation, here is a brief chart showing basic types of sea vegetables and some of their most commonly eaten varieties:

Sea Vegetables From a Science Standpoint

Green Algae	Brown Algae	Red Algae	
Scientific Name	Chlorophycophyta	Phaeophycophyta	Rhodophycophyta
Approximate Number of Species	7,000	4,000	2,000
Commonly Eaten Forms	sea lettuce	kombu/kelp (*Laminaria*genus)	nori (*Porphyra*genus)
		wakame (*Undaria*genus)	agar-agar (*Euchema* genus)
		arame (*Eisenia*genus)	dulse (*Palmaria*genus)
		hijiki (*Hijikia*genus)	
Other Well-Studied Forms	*Caulerpa* genus,*Ulva* genus,*Chetomorpha*	*Sargassum*genus, *Padina*genus, *Fucus*genus	*Euchema* genus,*Gracilaria* genus,*Gelidiella*

	genus	(Atlantic brown kelp, also called bladderwrack)	genus,*Plocamium*genus,*Lithothamnium*genus,*Kappaphycus*genus

History
The consumption of sea vegetables enjoys a long history throughout the world. Archaeological evidence suggests that Japanese cultures have been consuming sea vegetables for more than 10,000 years. In ancient Chinese cultures, sea vegetables were a noted delicacy, suitable especially for honored guests and royalty. Korea, Vietnam, and Malaysia are other Asian countries where sea vegetables are widely consumed. Yet, sea vegetables were not just limited to being a featured part of Asian cuisines. In fact, most regions and countries located by waters, including Scotland, Ireland, Norway, Iceland, New Zealand, the Pacific Islands and coastal South American countries have been consuming sea vegetables since ancient times.

How to Select and Store
Look for sea vegetables that are sold in tightly sealed packages. Avoid those that have evidence of excessive moisture. Some types of sea vegetables are sold in different forms. For example, nori can be found in sheets, flakes, or powder. Choose the form of sea vegetables that will best meet your culinary needs.
Store sea vegetables in tightly sealed containers at room temperature where they can stay fresh for at least several months.

How to Enjoy
Tips for Preparing Sea Vegetables
Many types of sea vegetables require soaking for 5-10 minutes before adding to your dish. It is best to follow the directions on the package. The soaking water can be used for soups or to Healthy Sautéeing vegetables. Other types of sea vegetables such as nori and kelp flakes can be used without soaking.

Healthiest Way of Cooking Sea Vegetables
Sea vegetables require no cooking.

A Few Quick Serving Ideas
Make homemade vegetable sushi rolls by wrapping rice and your favorite vegetables in sheets of nori.
Slice nori into small strips and sprinkle on top of salads.
Combine soaked hijiki with shredded carrots and ginger. Mix with a little olive oil and tamari.
When cooking beans, put kombu in the cooking water. It will not only expedite the cooking process, but will improve beans' digestibility by reducing the chemicals that can cause flatulence.
Add sea vegetables to your next bowl of miso soup.

WHFoods Recipes That Include Sea Vegetables

- 5-Minute Miso Soup with Dulse (sea vegetable)
- Shiitake Mushroom Seaweed Soup
- Spicy Healthy SautéedTofu
- Cucumber Seaweed Salad
- Spicy Vegetable Tart
- Kale with Hijiki
- Seaweed Rice

Individual Concerns

Sea vegetables have been a topic of ongoing debate and research concern involving heavy metals. In the world of marine biology and marine ecology, sea vegetables are widely recognized as plants with an excellent ability to take up minerals from the water and hold onto these minerals in their cells. This ability makes sea vegetables a rich source of many wonderful minerals, including magnesium, calcium, iron, and iodine. However, in waters that have become polluted with heavy metal elements - including arsenic, lead, and cadmium - sea vegetables can also act like a sponge in absorbing these unwanted contaminants. Some marine ecologists actually use sea vegetables as a kind of "biomonitor" to determine levels of heavy metal pollution in bodies of water.

Among all of the heavy metals, arsenic appears to be most problematic when it comes to sea vegetable toxicity risk. Virtually all types of sea vegetables have been determined to contain traces of arsenic. These types include arame, hijiki, kombu, nori, and wakame. Among all types of sea vegetable, however, hijiki stands out as being particularly high-risk when it comes to arsenic exposure. During the period 2000-2005, government-related agencies in England, New Zealand, and Canada issued public health recommendations advising against consumption of hijiki sea vegetable unless verified as containing very low levels of inorganic arsenic. Based on these reports, we recommend avoidance of hijiki as a sea vegetable unless available in the form of certified organic hijiki.

Although regulations for sea vegetables at the National Organics Program at the U.S. Department of Agriculture (USDA) are in a state of partial review, there are two types of certified organic sea vegetables currently available in the marketplace. Some certified organic sea vegetables have been farmed in a process that's usually referred to as "aquaculture" or "mariculture" and that involves a closely-monitored, contained-water environment for the sea vegetables. Other certified organic sea vegetables have been wild-harvest, but typically in regions where ocean waters are better protected against contaminants. In both cases, you're much more likely to get a low level of contaminants like arsenic (or no arsenic contamination whatsoever) by selecting certified organic hijiki (or any other sea vegetable). To assure yourself of no arsenic contamination whatsoever, you'll need to find a certified organic product that reports lab testing on the packaging and specifically indicates an arsenic-free status.

The levels of arsenic found in other types of sea vegetable have been relatively small. The U.S. Environmental Protection Agency (EPA) has set an oral Reference Dose (RfD) for arsenic exposure of 0.3 micrograms per kilogram of body weight per day. For a person weighing 154 pounds, that amount translates into 21 micrograms of arsenic. In research on sea vegetables, sea vegetable-containing supplements (like kelp supplements) are better studied than fresh sea vegetables, so it can be helpful to look at sea vegetable supplement data when trying to evaluate the arsenic risk from sea vegetables. In multiple research

studies, the amount of arsenic present in one tablespoon (10 grams) of kelp has averaged about 4-5 micrograms, or approximately 20-25% of the RfD. While this level of arsenic intake is well beneath the EPA's threshold for daily oral intake, it may still be an amount that some persons wish to avoid. Your only guarantee for avoiding this arsenic exposure is to find and purchase sea vegetables that have been specifically tested for arsenic content and report arsenic-free contents on the packaging. As described earlier, you are also much more likely to get a low level of arsenic exposure (or no arsenic exposure at all) by selecting of certified organic sea vegetables.

Because 20% of all foodborne disease is associated with seafood intake, and half of these seafood-related disease problems involve toxins from algae, it's also important to understand the relationship between sea vegetables (very large algae) and algae that occur in other forms. Harmful algal blooms (HABs), or what were previously referred to as "red tides," involve unwanted changes in the sea environment in which very small, one-celled algae become too plentiful. These small, one-celled algae come in the form of dinoflagellates and diatoms. These one-celled algae are capable of producing certain types of compounds (for example, saxitoxins) that can be harmful to humans. Filter-feeding shellfish (like oysters and clams) can ingest large amounts of these small, one-celled algae and can serve to pass on their potential toxins in more concentrated form to humans. "Shellfish poisoning" is the general name given to this set of events. While shellfish poisoning is an important health problem in and of itself, it is a different type of problem than the problem of potential heavy metal residues found in sea vegetables, and the toxin-related risks associated with shellfish poisoning should not be confused with heavy metal risks associated with sea vegetables.

We continue to include sea vegetables among the World's Healthiest Foods because of their incredibly rich mineral content and other unique health benefits, and because the toxicity risks described above can be prevented through the purchase of certified organic sea vegetables! Because most certified organic sea vegetables can be purchased in dried form and reconstituted at home, they can often be ordered from outside of your local area and shipped to you at a relatively low cost.

Nutritional Profile

Sea vegetables are unique amongst all vegetables in terms of their nutritional profile. Perhaps unrivaled is their diverse mineral content. You're going to find measurable amounts of calcium, copper, iodine, iron, magnesium, manganese, molybdenum, phosphorus, potassium, selenium, vanadium, and zinc in these ocean-based foods. You're also going to find some unusual and spectacular phytonutrients, including sulfated polysaccharides that bring along with them anti-inflammatory, anti-viral, and cardiovascular benefits. Sea vegetables are an excellent source of iodine and vitamin K and a very good source of folate and magnesium. In addition, sea vegetables are a good source of the minerals iron and calcium.

For an in-depth nutritional profile click here: Sea vegetables.

In-Depth Nutritional Profile

In addition to the nutrients highlighted in our ratings chart, an in-depth nutritional profile for Sea vegetables is also available. This profile includes information on a full array of nutrients, including carbohydrates, sugar, soluble and insoluble fiber, sodium, vitamins,

minerals, fatty acids, amino acids and more.

Introduction to Food Rating System Chart
In order to better help you identify foods that feature a high concentration of nutrients for the calories they contain, we created a Food Rating System. This system allows us to highlight the foods that are especially rich in particular nutrients. The following chart shows the nutrients for which this food is either an excellent, very good, or good source (below the chart you will find a table that explains these qualifications). If a nutrient is not listed in the chart, it does not necessarily mean that the food doesn't contain it. It simply means that the nutrient is not provided in a sufficient amount or concentration to meet our rating criteria. (To view this food's in-depth nutritional profile that includes values for dozens of nutrients - not just the ones rated as excellent, very good, or good - please use the link below the chart.) To read this chart accurately, you'll need to glance up in the top left corner where you will find the name of the food and the serving size we used to calculate the food's nutrient composition. This serving size will tell you how much of the food you need to eat to obtain the amount of nutrients found in the chart. Now, returning to the chart itself, you can look next to the nutrient name in order to find the nutrient amount it offers, the percent Daily Value (DV%) that this amount represents, the nutrient density that we calculated for this food and nutrient, and the rating we established in our rating system. For most of our nutrient ratings, we adopted the government standards for food labeling that are found in the U.S. Food and Drug Administration's "Reference Values for Nutrition Labeling." Read more background information and details of our rating system.

Kelp (sea vegetable)
0.25 cup
20.00 grams
8.60 calories

Nutrient	Amount	DV (%)	Nutrient Density	World's Healthiest Foods Rating
iodine	415.00 mcg	276.7	579.1	excellent
vitamin K	13.20 mcg	16.5	34.5	excellent
folate	36.00 mcg	9.0	18.8	very good
magnesium	24.20 mg	6.0	12.7	very good
calcium	33.60 mg	3.4	7.0	good
iron	0.57 mg	3.2	6.6	good
tryptophan	0.01 g	3.1	6.5	good

World's Healthiest Foods Rating	Rule				
excellent	DV>=75%	OR	Density>=7.6	AND	DV>=10%
very good	DV>=50%	OR	Density>=3.4	AND	DV>=5%
good	DV>=25%	OR	Density>=1.5	AND	DV>=2.5%

In-Depth Nutritional Profile for Sea vegetables

References

- Amster E, Tiwary A, and Schenker MB. Case report: potential arsenic toxicosis secondary to herbal kelp supplement. Environ Health Perspect. 2007 Apr;115(4):606-8. 2007.
- Aslam MN, Bhagavathula N, Paruchuri T et al. Growth-inhibitory effects of a mineralized extract from the red marine algae, Lithothamnion calcareum, on Ca2+-sensitive and Ca2+-resistant human colon carcinoma cells. Cancer Lett. 2009 October 8; 283(2): 186–192. 2009.
- Cabrita MT, Vale C and Rauter AP. Halogenated Compounds from Marine Algae. Mar. Drugs 2010, 8, 2301-2317. 2010.
- Cumashi A, Ushakova NA, Preobrazhenskaya ME et al. A comparative study of the anti-inflammatory, anticoagulant, antiangiogenic, and antiadhesive activities of nine different fucoidans from brown seaweeds. Glycobiology vol. 17 no. 5 pp. 541–552, 2007. 2007.
- Ganesh EA, Das S, Arun G et al. Heparin like Compound from Green Alga Chaetomorpha antennina - As PotentialAnticoagulant Agent. Asian Journal of Medical Sciences 1(3): 114-116, 2009. 2009.
- Garcý´a-Casal MN, Pereira AC, Leets I et al. High Iron Content and Bioavailability in Humans from Four Species of Marine Algae. J. Nutr. 137: 2691–2695, 2007. 2007.
- Güven KC, Percot A and Sezik E. Alkaloids in marine algae. Mar Drugs. 2010 Feb 4;8(2):269-84. 2010.
- Harden EA, Falshaw R, Carnachan SM et al. Virucidal Activity of Polysaccharide Extracts from Four Algal Species against Herpes Simplex Virus. Antiviral Res. 2009 September ; 83(3): 282–289. 2009.
- Krishnaiah D, Rosalam S, Prasad DMR, et al. Mineral content of some Seaweeds from Sabah`s South China sea. Asian J. Scientific Res., 2008;1: 166-170. 2008.
- Manoharan N, Sampathkumar P, Dheeba B et al. Potential Hepatoprotective Effect of Aqueous Extract of Gracilaria corticata in AFB1 Induced Hepatotoxicity in Wistar Rats. Journal of Biological Sciences. Year: 2008 | Volume: 8 | Issue: 8 | Page No.: 1352-1355. 2008.
- Myers SP, O'Connor J, Fitton H et al. A combined phase I and II open label study on the effects of a seaweed extract nutrient complex on osteoarthritis. Biologics. 2010; 4: 33–44. 2010.
- Passadouro M, Metelo AM, Melão AS et al. Study of the antidiabetic capacity of the

VO(dmpp)2 complex. J Inorg Biochem. 2010 Sep;104(9):987-92. 2010.
- Skibola CF. The effect of Fucus vesiculosus, an edible brown seaweed, upon menstrual cycle length and hormonal status in three pre-menopausal women: a case report. BMC Complement Altern Med. 2004; 4: 10-18. 2004.
- Unauthored. Vanadium (vanadyl sulfate). Monograph. Altern Med Rev. 2009 Jun;14(2):177-80. 2009.
- Vadlapudi V and Naidu KC. In vitro Bioevaluation of Antioxidant activities of selected Marine algae. Journal of Pharmacy Research 2010, 3(2),329-331. 2010.
- Van Dolah FM. Marine Algal Toxins: Origins, Health Effects, and Their Increased Occurrence. Health Perspect 1 08 (suppl 1):1 33-141 (2000). 2000.
- Winter JM and Moore BS. Exploring the Chemistry and Biology of Vanadiumdependent Haloperoxidases. J Biol Chem. 2009 July 10; 284(28): 18577–18581. 2009.
- Young-Joo L, Adlercreutz H and Kwon HJ. Quantitative Analysis of Isoflavones and Lignans in Sea Vegetables Consumed in Korea Using Isotope Dilution Gas Chromatography-Mass Spectrometry. Food Science and Biotechnology / v.15, no.1, 2006, pp.102-106. 2006.

More of the World's Healthiest Foods (& Spices)!