Related Species

The Phaeophyceae (brown algae) are a large class of mostly marine multicellular algae that include many dietary and medicinal seaweeds, including kombu (*Saccharina japonica*), *Fucus vesiculosus*, and others.

Indications

Used as an iodine source for hypothyroidism with goiter attributable to iodine and other mineral deficiencies, hyperlipidemia, and obesity.

Mechanism of Action

Dietary seaweeds provide all essential minerals in varying amounts, depending on the species. The most abundant elements are potassium, sodium, calcium, magnesium, zinc, copper, chloride, sulfur, phosphorous, vanadium, cobalt, manganese, selenium, bromine, iodine, arsenic, iron, and fluorine. The large brown seaweeds, which include the *Laminaria* and *Fucus* species, generally contain more minerals than the red seaweeds (e.g., nori, Irish moss, dulse, grapestone, and euchemia).

One of the most important minerals in seaweeds is iodine, an element that is required by all vertebrates. In the thyroid gland, iodine is combined with the amino acid tyrosine to make the thyroid hormones thyroxine (T4) and tri-iodothyronine (T3). Thyroid hormones control cellular metabolism and play an essential role in fetal development and postnatal growth. The average dried weight iodine content of kombu is 1542 μg/g.

Polysaccharides (soluble fiber) present in brown algae include fucans, laminarans, and alginates. Ingestion of these fibers is associated with lower levels of blood cholesterol. Many researchers believe that this mechanism involves bile, whereby soluble fiber prevents reabsorption of bile by the small intestine. Because bile is manufactured from cholesterol in the liver, when bile is not reabsorbed, more must be made to replace it. Some of the cholesterol that would have circulated in the blood is used to make that bile. Fucoidans are sulfated polysaccharides that include a substantial amount of fucose. *Laminaria* spp. contain about 5% dried weight of fucoidans, which are also known to have an antilipidemic activity in the body.

Evidenced-Based Research

The effect of iodine supplementation on thyroid function was tested in seven patients with severe motor and intellectual disabilities. The patients were unable to swallow and therefore were supplemented via enteral nutrition containing only 20 μg/day of iodine for 3 years. As a result, tests
showed extremely low urinary iodine levels (<25–58 µg/L) with high thyroid-stimulating hormone (TSH) levels (7.6–82.3 µU/ml) and lower free T4 (0.4–1.5 ng/dL). Antithyroid antibodies were negative. The patients were diagnosed with hypothyroidism because of iodine deficiency and suffered from a variety of symptoms including constipation, goiter, bradycardia, and low body temperature. The treatment protocol of the study involved giving patients 1–2 g of powdered kelp (200–400 µg as iodine) once a day. After 11 months, this treatment restored their thyroid function, vastly improved their thyroid panel, and normalized their urinary iodine concentration. All symptoms were resolved by the end of the study, with the exception of constipation.5

Dietary fibers are being investigated for their effect on obesity and associated conditions. Fiber is believed to effect nutrient uptake from the small intestine. A human cross-over study monitored the uptake of glucose and cholesterol in human subjects with normal and high body mass index. The uptake of these substances was shown to increase as body fat increased. However, when the obese subjects were given a 1.5-g dose of alginate, uptake of cholesterol and glucose levels was restored to the levels of healthy subjects.6

Safety in Pregnancy and Breastfeeding

It has been shown that almost two thirds of the population of Western and Central Europe are iodine deficient. Iodine deficiency is associated with impaired reproductive function and has a detrimental effect on fetal and newborn development.7 However, newborns are suspected to be especially sensitive to iodine, and high doses during and after pregnancy have resulted in possible cases of infant goiter.8

Iodine requirements actually increase during pregnancy. It is believed this is attributable to an increase in iodine clearance by the kidneys and by an increase in thyroid hormone production. Iodine deficiency in pregnancy is associated with neurological deficits in offspring. In 2007, the International Council for the Control of Iodine Deficiency Disorders (WHO/UNICEF/ICCIDD) reached a consensus regarding iodine supplementation with pregnant women. Women living in a population with a median urinary iodine concentration (UIC) at or above 100 µg/L were determined to not be in need of iodine supplementation. However, if the population median UIC is below 100 µg/L, it is WHO/UNICEF/ICCIDD’s determination that pregnant women should take iodine-containing supplements.9

General Safety

Long-term studies (55–87 days) involving the administration of large doses of kombu (15–30 g/day, amounting to 35–70 mg/day of iodine per day) have revealed increased TSH levels. T4 and T3 levels did not significantly change.10 Considered to be a food in many cultures and generally safe in large doses.

Dosage

Seaweed is generally considered safe at doses up to 1000 mg/day, with 200–500 mg one to two times per day being a commonly recommended dose. The traditional Japanese diet includes an average daily intake of >2 g of kombu.2

Traditional Uses

Seaweeds have a long history of use as a food and a medicine worldwide, including in China, Japan, Iceland, and the Mediterranean. Kombu has been eaten as a food in Japan for at least several hundred
years. One of the earliest mentions of it comes from the Shoku Nihongi, an imperially commissioned Japanese history text, circa 797 AD.

References


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