



Kelp

Updated: March 10, 2024.

OVERVIEW

Introduction

Kelp is a form of seaweed belonging to the order Laminariales that is used as a food and a source of vitamins and minerals, administered as a botanical supplement, and employed in food processing and production of fertilizers. Preparations of kelp are generally recognized as safe, and there is no evidence that they can cause elevations in liver related enzymes or clinically apparent liver injury.

Background

Kelp is a seaweed that grows in nutrient rich coastal waters in temperate and subtropical zones of the world. Kelp is a subgroup of seaweed and refers to several genera of the order Laminariales. The kelp most commonly found in the United States is *Laminaria hyperborea*. Kelp has multiple uses including as a food, as a colloidal gel in toothpaste and ice cream, as a botanical medication, and as a source of nitrogen and phosphate in fertilizer. Kelp is not a plant, but rather brown algae that grows like a plant in long branches (thalluses) in forests near shorelines. The constituents of kelp include salts of alginic acid (laminaric acid: 25%), carbohydrates (laminarin, mannitol, fucoidan, and others: 55%) and minerals and trace elements typically found in coast waters. Kelp is particularly rich in iodine but can also take up other metals and minerals from the ocean such as calcium, iron, mercury, lead, cadmium and even arsenic. Use of kelp as a major food source can lead to thyroid abnormalities and even metal poisoning. Kelp preparations have been used in several traditional medicine systems, and while not approved as therapy of any disease or medical condition, it is available in many over-the-counter formulations purported to be helpful in improving wellness, hair and nail growth, high blood sugar, high blood pressure, migraine headaches, ulcer symptoms, indigestion, and constipation. There is no reliable data on adverse events from kelp and it is designated as “generally recognized as safe” (GRAS), although in large doses it can be harmful in thyroid conditions and have interactions with some prescription medications. Kelp was previously thought to help induce uterine contractions and was used in attempts to induce abortion. There have been no large scale clinical trials that have reported on adverse events associated with use of kelp preparations.

Related to kelp is *Ecklonia kurome*, a brown alga seaweed that is the source of oligomannate, a short acidic oligosaccharide made from the polysaccharides of *Ecklonia kurome* by digestion to shorter chains. In cell culture and in animal models of Alzheimer disease, oligomannate demonstrated activity against brain injury and neuroinflammation. A series of clinical trials of oligomannate therapy of Alzheimer disease conducted in China demonstrated improvement of some surrogate markers of Alzheimer disease progression, and it was approved for human use in China in 2018. Similar trials were initiated in international trials but were suspended because of poor enrollment during the COVID pandemic. Oligomannate had few side effects that were generally mild and no more common than with placebo therapy.

Hepatotoxicity

While kelp is generally recognized as safe, it has not been formally assessed for hepatic adverse effects or elevations of serum aminotransferase, alkaline phosphatase, or bilirubin levels. However, despite common use, there have been no published case reports of liver injury convincingly attributed to kelp. Large case series of liver injury due to herbal and dietary supplements do not mention or list kelp as a possible cause. In contrast, there have been several clinical trials of oligomannate, a derivative of the seaweed species, *Ecklonia kurome*. In these studies that included 1072 patients with Alzheimer disease, serum ALT elevations arose in 1.7% of subjects on oligomannate vs 0.4% on placebo, and bilirubin elevations in 1.2% vs 0.2% on placebo. A few patients discontinued therapy early because of serum aminotransferase elevations. However, no episodes of hepatotoxicity or clinically apparent liver injury with jaundice were reported.

Kelp likelihood score: E (unlikely cause of clinically apparent liver injury).

Oligomannate likelihood score: E* (unproven but suspected rare cause of liver injury).

Drug Class: [Herbal and Dietary Supplements](#)

Other Names: Seaweed, Brown algae, *Laminaria hyperborea*

PRODUCT INFORMATION

REPRESENTATIVE TRADE NAMES

Kelp – Generic

DRUG CLASS

Herbal and Dietary Supplements

CHEMICAL FORMULA AND STRUCTURE

DRUG	CAS REGISTRY NUMBER	MOLECULAR FORMULA	STRUCTURE
Laminaria Hyperborea	90046-13-2	Not Available	Not Available

ANNOTATED BIBLIOGRAPHY

References updated: 10 March 2024

Abbreviations: AOSC, acidic oligosaccharide sugar chain; DILI, drug induced liver injury; HDS, herbal and dietary supplements.

Zimmerman HJ. Unconventional drugs. Miscellaneous drugs and diagnostic chemicals. In, Zimmerman, HJ. Hepatotoxicity: the adverse effects of drugs and other chemicals on the liver. 2nd ed. Philadelphia: Lippincott, 1999: pp. 731-4.

(Expert review of hepatotoxicity published in 1999; several herbal medications are discussed, but not seaweed or kelp).

Liu LU, Schiano TD. Hepatotoxicity of herbal medicines, vitamins and natural hepatotoxins. In, Kaplowitz N, DeLeve LD, eds. Drug-induced liver disease. 2nd ed. New York: Informa Healthcare USA, 2007, pp. 733-54.

(Review of hepatotoxicity of herbal and dietary supplements [HDS] published in 2007; no mention of seaweed or kelp).

Kelp. In, PDR for Herbal Medicines. 4th ed. Montvale, New Jersey: Thomson Healthcare Inc. 2007: pp. 496-497.

(Compilation of short monographs on herbal medications and dietary supplements, mentions that kelp is generally considered as safe and that “no health hazards or side effects are known in conjunction with the proper administration...”)

Hu J, Geng M, Li J, Xin X, Wang J, Tang M, Zhang J, et al. Acidic oligosaccharide sugar chain, a marine-derived acidic oligosaccharide, inhibits the cytotoxicity and aggregation of amyloid beta protein. J Pharmacol Sci. 2004;95:248–255. PubMed PMID: 15215650.

(Acidic oligosaccharide sugar chain [AOSC] is a derivative of brown algae seaweed Echlonia kurome Okam polysaccharide, which is digested to a smaller linear oligosaccharides of approximately 1300 molecular weight, prevented beta amyloid fibril formation in vitro and decreased the toxicity of beta amyloid aggregates to neuronal cells in culture).

Jacobsson I, Jönsson AK, Gerdén B, Hägg S. Spontaneously reported adverse reactions in association with complementary and alternative medicine substances in Sweden. Pharmacoepidemiol Drug Saf. 2009;18:1039–1047. PubMed PMID: 19650152.

(Among 778 spontaneous reports of adverse reactions to herbal and alterative medicines to a national Swedish Registry, no cases were attributed to seaweed or kelp).

Teschke R, Wolff A, Frenzel C, Schulze J, Eickhoff A. Herbal hepatotoxicity: a tabular compilation of reported cases. Liver Int. 2012;32:1543–1556. PubMed PMID: 22928722.

(A systematic compilation of all publications on the hepatotoxicity of specific herbal products identified 185 publications on 60 different herbs, herbal drugs and supplements but does not list or mention kelp).

Navarro VJ, Seeff LB. Liver injury induced by herbal complementary and alternative medicine. Clin Liver Dis. 2013;17:715–735. PubMed PMID: 24099027.

(Review of the epidemiology, regulatory status, diagnosis, pathogenesis and causes of liver injury from herbal products with specific discussion of conjugated linoleic acid, ephedra, germander, green tea, usnic acid, flavocoxid, aloe vera, chaparral, greater celandine, black cohosh, comfrey, kava, skullcap, valerian, noni juice, pennyroyal and traditional herbal remedies; no mention of seaweed or kelp).

Navarro VJ, Barnhart H, Bonkovsky HL, Davern T, Fontana RJ, Grant L, Rledy KR, et al. Liver injury from herbals and dietary supplements in the U.S. Drug-Induced Liver Injury Network. Hepatology. 2014;60:1399–1408. PubMed PMID: 25043597.

(Among 839 cases of liver injury from drugs collected in the US between 2004 and 2013, 130 were due to HDS products, including 45 from body building agents [probably anabolic steroids] and 85 from diverse HDS products but no case was attributed specifically to seaweed or kelp).

Brown AC. Liver toxicity related to herbs and dietary supplements: Online table of case reports. Part 2 of 5 series. Food Chem Toxicol. 2017;107:472–501. PubMed PMID: 27402097.

(Description of an online compendium of cases of liver toxicity attributed to HDS products, does not list or discuss seaweed or kelp).

Medina-Caliz I, Garcia-Cortes M, Gonzalez-Jimenez A, Cabello MR, Robles-Diaz M, Sanabria-Cabrera J, Sanjuan-Jimenez R, et al; Spanish DILI Registry. Herbal and dietary supplement-induced liver injuries in the Spanish DILI Registry. Clin Gastroenterol Hepatol. 2018;16:1495–1502. PubMed PMID: 29307848.

(Among 856 cases of hepatotoxicity enrolled in the Spanish DILI Registry between 1994 and 2016, 32 were attributed to herbal products, the most frequent cause being green tea [n=8] and Herbalife products [n=6], no mention of seaweed or kelp).

Wang X, Sun G, Feng T, Zhang J, Huang X, Wang T, Xie Z, et al. Sodium oligomannate therapeutically remodels gut microbiota and suppresses gut bacterial amino acids-shaped neuroinflammation to inhibit Alzheimer's disease progression. *Cell Res.* 2019;29:787–803. PubMed PMID: 31488882.

(In a mouse model of Alzheimer disease, sodium oligomannate changed gut microbiota and decreased neuroinflammation).

Syed YY. Sodium Oligomannate: first approval. *Drugs.* 2020;80:441–444. PubMed PMID: 32020555.

(Summary of the structure, proposed mechanisms of action, clinical efficacy, and toxicity of sodium oligomannate shortly after its approval as therapy of Alzheimer disease in China mentions that safety studies in 577 treated patients and 495 controls yielded low rates of treatment related adverse events in both groups [15% vs 18%], and elevations in ALT arose in 1.9% vs 0.4% and bilirubin in 1.2% vs 0.2%).

Wang T, Kuang W, Chen W, Xu W, Zhang L, Li Y, Li H, et al. A phase II randomized trial of sodium oligomannate in Alzheimer's dementia. *Alzheimers Res Ther.* 2020;12:110. PubMed PMID: 32928279.

(Among 242 patients with Alzheimer dementia treated with oligomannate [600 or 900 mg] or placebo daily for 24 weeks, improvements were more frequent with the higher dose, while adverse event rates were similar in the three groups; no mention of ALT elevations or hepatotoxicity).

Xiao S, Chan P, Wang T, Hong Z, Wang S, Kuang W, He J, et al. A 36-week multicenter, randomized, double-blind, placebo-controlled, parallel-group, phase 3 clinical trial of sodium oligomannate for mild-to-moderate Alzheimer's dementia. *Alzheimers Res Ther.* 2021;13:62. PubMed PMID: 33731209.

(Among 818 Chinese adults with mild-to-moderate Alzheimer disease treated with oligomannate [450 mg] or placebo twice daily for 36 weeks, improvements in the Alzheimer Disease Assessment Scale were greater with oligomannate [21.3 to 18.3] than placebo [20.8 to 20.5] while scores for two other scales did not differ; adverse event rates were similar in the two groups [75% vs 74%] and there were no episodes of clinically apparent liver injury, although several patients in both groups developed cholecystitis).

Ballotin VR, Bigarella LG, Brandão ABM, Balbinot RA, Balbinot SS, Soldera J. Herb-induced liver injury: systematic review and meta-analysis. *World J Clin Cases.* 2021;9:5490–5513. PubMed PMID: 34307603.

(Systematic review of the literature on HDS induced liver injury identified 446 references describing 936 cases due to 79 different herbal products, the most common being He Shou Wu [91], green tea [90] Herbalife products [64], kava kava [62], and greater celandine [48]; kelp and seaweed were not listed or discussed).

Bessone F, García-Cortés M, Medina-Caliz I, Hernandez N, Parana R, Mendizabal M, Schinoni MI, et al. Herbal and dietary supplements-induced liver injury in Latin America: experience from the LATINDILI Network. *Clin Gastroenterol Hepatol.* 2022;20:e548–e563. PubMed PMID: 33434654.

(Among 367 cases of hepatotoxicity enrolled in the Latin American Drug-Induced Liver Injury Network between 2011 and 2019, 29 [8%] were attributed to herbal products, the most frequent being green tea [n=7], Herbalife products [n=5], and garcinia [n=3]; seaweed and kelp are not mentioned).

Yeo-Teh NSL, Tang BL. A review of scientific ethics issues associated with the recently approved drugs for Alzheimer's disease. *Sci Eng Ethics.* 2023;29:2. PubMed PMID: 36625928.

(Discussion of the ethics of accelerated approval of drugs for Alzheimer disease questioning the appropriateness in view of their marginal beneficial effects in registration randomized controlled trials).