

# BLADDERWRACK

*(Fucus vesiculosus)*

An Overview of the Research  
and Indications



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## Bladderwrack: An Overview of the Research and Indications

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### **BACKGROUND AND USES**

*Fucus vesiculosus*, commonly known as: Bladderwrack, Sea kelp, Red Fucus, Sea wrack, or Rock wrack, is a member of the Fucales family, a genus of brown algae found on rocky seashores of the temperate areas of the Atlantic and Pacific oceans. Bladderwrack is best harvested in the spring and early summer when the plant has new growth, as the iodine content is highest in young, freshly-cut blades.<sup>1</sup>

*Fucus* was named “Bladderwrack” because it has little air-filled bladders which keep it in the upright position and closer to the ocean surface. *Fucus* is often known as kelp, the name given to the alkaline ashes that were used as an alkali agent to make soap.<sup>2</sup>

*Fucus* is a rich source of iodine and as with many seaweeds, has been an important food source in coastal cultures around the world. It has been used traditionally in herbal medicine in the treatment of thyroid disorders, particularly hypothyroidism, weight management, rheumatoid arthritis, female hormonal disorders, as a laxative, and for its topical effects as a dermatological agent.<sup>3</sup>

Current research and science on bladderwrack shows this plant to have a role in reducing the risk of estrogen-related cancers in Asian populations<sup>4</sup> and potential improvement in menstrual symptoms.<sup>4</sup> These preliminary findings warrant more clinical studies to clarify the role of bladderwrack. In the research, bladderwrack extract has also been shown to demonstrate chemopreventive<sup>5</sup>, anti-collagenase and antioxidant properties.<sup>6</sup> Additionally, topical application of bladderwrack extract has been studied for dermatological disorders.

### **ACTIVE CONSTITUENTS**

Active constituents found in bladderwrack include iodine, in the form of inorganic salts bound to proteins and lipids, and as a component of iodoamino acids such as di-iodotyrosine. Other minerals include calcium, magnesium, potassium, sodium, and trace minerals. Other significant constituents are phenolics, phloroglucinol, fucophorethols, phlorotannins, mucopolysaccharides, algin, fucoidin, laminarin, sulphuryl-, sulphonyl- and phosphonyl-glycosyl ester diglycerides, and lipids including phosphatidyl-ethanolamine and phosphatidyl-choline.

Constituents of particular interest for their medicinal actions are iodine, phenolic compounds, and the mucopolysaccharides. One particular phenolic flavonoid, fucoxanthin, is reported to have the highest antioxidant activity of the edible seaweeds.<sup>7</sup>

## Bladderwrack: An Overview of the Research and Indications

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### **MECHANISMS OF ACTION**

#### ***Iodine***

Bladderwrack is rich in iodine, making it a useful plant for thyroid health. Iodine is essential to normal healthy thyroid function and is a building block for thyroid hormones. The thyroid gland actively absorbs iodine, combining it with tyrosine, in enzymatic reactions to synthesize thyroxine and triiodothyronine. Small doses of iodine, in the range of micrograms, appear to stimulate thyroid function and induce the iodinase and thyroxine synthesis enzymes, while large doses of iodine (ie 500 mg/day) will suppress thyroid function.<sup>8</sup> The influence of *Fucus*, both as a weight loss agent and on the thyroid supporting action, is strongly based on the pharmacological actions of iodine in the body and an overall increase in metabolic function.

#### ***Mucopolysaccharides***

An in vitro study showed antifungal activity against *Candida guilliermondii*, along with antibacterial action that inhibited growth of multiple strains of *Neisseria meningitidis* and *Escherichia coli*.<sup>9</sup> The mucopolysaccharide inhibited the growth of many *Neisseria meningitidis* strains at a concentration of 5mcg/mL and was bactericidal at concentrations above 10mcg/mL. The growth of select *Escherichia coli* strains was also inhibited by this mucopolysaccharide at concentrations over 10mcg/mL.<sup>9</sup> Other antibacterial and antifungal properties are thought to be due to its polyphenolic contents.<sup>10</sup>

Fucoidan, a high molecular weight sulfated polysaccharide isolated from *Fucus vesiculosus*, studied in an ex vivo analysis using human plasma, demonstrated the ability to prolong the activated partial thromboplastin time.<sup>10</sup> Several in vitro studies have shown the ability of fucoidan to enhance the heparin-cofactor II-thrombin reaction by forming a ternary complex with both heparin-cofactor II and thrombin.<sup>10,11</sup> Fucoidans isolated from *F. vesiculosus* have stronger anticoagulant properties than fucans isolated from other brown algae species, including *Sargassum muticum* and *Laminaria digitata*, due to higher contents of fucose and sulfate.<sup>12</sup>

Sodium alginate, a soluble algae polysaccharide found in many seaweeds including *Fucus* may lower serum lipid levels.<sup>13</sup> The fucosterols found in bladderwrack have been shown to lower plasma cholesterol levels by competitive inhibition. As cholesterol is a precursor for the biosynthesis of steroid hormones, a reduction in cholesterol bioavailability may lower circulating estradiol levels, thereby altering menstrual cycling patterns.<sup>14</sup>

## Bladderwrack: An Overview of the Research and Indications

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Hyperthyroidism causes levels of SHBG to fall, which may contribute to a greater availability of estrogen. It has been suggested that oral ingestion of kelp may affect circulating sex hormone levels and menstrual cycling patterns.<sup>4</sup> An extract of bladderwrack reduced 17beta-estradiol levels and also acted as a competitive inhibitor of estradiol, binding to alpha- and beta- estrogen receptors in vitro.<sup>4</sup>

### **RESEARCH SUMMARY**

#### ***Anti-estrogenic effects***

Researchers tested the effects of bladderwrack on women with or at high risk for estrogen-dependent diseases to determine the effects of *Fucus* on circulating estrogens and other sex hormones. One small preliminary human clinical study looked at the use of *Fucus* in lowering the risk of estrogen dependent disease in women who are high risk. Three pre-menopausal women with abnormal menstrual cycling patterns and/or menstrual-related disease histories received *Fucus*. Bladderwrack significantly increased menstrual cycle length by 5.5-14 days. Hormone measurements in one woman revealed significant anti-estrogenic and progestagenic effects. Mean baseline 17beta-estradiol levels were reduced from  $626 \pm 91$  to  $164 \pm 30$ pg/mL ( $p=0.04$ ) following 700mg daily, which decreased further to  $92.5.0 \pm 3.5$ pg/mL ( $p=0.03$ ) with a 1.4g daily dose. Mean baseline progesterone levels increased from  $0.58 \pm 0.14$  to  $8.4 \pm 2.6$ ng/mL with a 700mg daily dose ( $p=0.1$ ), which increased further to  $16.8 \pm 0.7$ ng/mL with a 1.4g daily dose ( $p=0.002$ ). The authors concluded that dietary bladderwrack may prolong the menstrual cycle and exert anti-estrogenic effects in pre-menopausal women, and suggested that seaweed may help reduce the risk of estrogen-related cancers as observed in Japanese populations. These preliminary findings are just a start, there needs to be follow-up with well-controlled clinical trials.<sup>4</sup>

#### ***Anti-lipidemic effects***

Sodium alginate, a soluble algae polysaccharide from the cell walls of brown algae, can lower lipid levels in animals without altering weight or growth when added to a cholesterol and chocolate diet.<sup>13</sup> *Fucus* also has the ability to decrease transsialidase activity in the blood, an enzyme associated with cholesterol accumulation.<sup>15</sup> This may benefit patients with a low functioning thyroid gland, as decreased metabolism is associated with hyperlipidemia.

## Bladderwrack: An Overview of the Research and Indications

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### ***Anti-neoplastic effects***

Antitumor activity of low molecular weight fucans extracted from brown seaweed species, including *Ascophyllum nodosum* and *Fucus vesiculosus*, have been studied in animal models, in vitro and in vivo for their suppressive effects on human sarcoma -180 ascitis cells and human colon adenocarcinoma. These sulfated polysaccharides have also shown tumor growth inhibiting activity against non-small-cell human bronchopulmonary carcinoma.<sup>16,17</sup>

### ***Laxative effects***

Laxative properties of bladderwrack and other brown seaweeds (Phaeophyceae) have traditionally been attributed to the component alginic acid, a hydrophilic colloidal polysaccharide.

### ***Dermatological agent***

Topical bladderwrack extract reduced skin thickness while improving the mechanical/elastic properties of the skin.<sup>3</sup> The mucopolysaccharides seem to inhibit the skin enzymes elastase and collagenase from breaking down the skin structure.

### ***Antioxidant effects***

In vitro analysis has demonstrated that *Fucus vesiculosus* inhibits oxidation of methyl linoleate with a shortened induction period similar to results seen with vitamin E, but without the oxygen uptake suppression.<sup>12</sup> The antioxidant properties are thought to be due to the seaweeds polyphenolic contents.<sup>10</sup> The phenolic flavonoid, fucoxanthin is reported to have the highest antioxidant activity of the edible seaweed's phenolic compounds.

## **CLINICAL INDICATIONS, PRACTITIONER DOSING, CONTRAINDICATIONS AND TOXICITY**

### ***Clinical Indications***

- Hypothyroidism
- Fatigue secondary to low functioning thyroid
- Iodine deficiency
- Anti-estrogenic agent useful in estrogen dominate conditions

## Bladderwrack: An Overview of the Research and Indications

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- Menstrual abnormalities
- Anti-oxidant agent
- Anti-candida agent both oral and as a topical dermatological agent
- Anti-bacterial agent
- Weight loss and slimming programs
- Skin care
- Cellulite
- Hyperlipidemia
- Antiproliferative effects on certain tumor types

### ***Practitioner Dosing***

- Infusion – Use 8 oz water to 2-3 tsp of dried seaweed, steep 10 minutes
- Tincture Extract 1:5, 25% ETOH - Use 2 to 6 mls TID <sup>18</sup>
- Fluid Extract 1:1, 25% ETOH - Use .5 to 2 mls TID <sup>18</sup>
- Powder (dry) - Use .5 to 2 grams TID.<sup>18</sup> The dried powdered seaweed can be used in food preparation or as a condiment for flavoring food. Kelp powder is a favorite on popcorn.
- Topical use (mucilage of seaweed) - A strong tea of bladderwrack can be made by simmering 3 tbsp of bladderwrack dried flakes in 16 oz of water for 5 minutes; turn heat off and steep 10 minutes. Strain, bottle and keep in the refrigerator for several weeks. I recommend this topically for burns and skin trauma from radiation treatment. It helps to reduce the burn damage to the skin and adjacent areas around the sight and relieves the discomfort. I suggest using it several times a day, applying it cold, and letting it dry in place.

### ***Contraindications and Side Effects***

Avoid in people with iodine allergy. Use caution with hyperthyroid patients, as excessive iodine intake can exacerbate that condition. Iodine levels in seaweeds are variable depending on the harvest time, type of seaweed and location. Iodine levels varied from 16 µg per gram to 8165 µg per gram depending on the type of seaweed,<sup>8</sup> making it difficult to monitor the amount of iodine a person is actually getting. The average of dietary iodine intake due to the ingestion of seaweeds is 1.2 mg/day in Japan.<sup>19</sup> Long-term bladderwrack supplementation may lead to an overconsumption of iodine in hyperthyroid patients. There are several cases in the literature that indicate the onset of hyperthyroid symptoms with long-term supplementation of iodine or kelp tablets.<sup>20,21</sup>

## Bladderwrack: An Overview of the Research and Indications

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### ***Unsubstantiated Drug Herb Interaction***

Bladderwrack contains mucopolysaccharides that may inhibit the absorption of some pharmaceutical medications. It may also increase the risk of bleeding when used in combination with anticoagulants and anti-platelet medications.

### ***Toxicity***

Bladderwrack shows no toxicity on acute and subacute (4 weeks) testing.<sup>19</sup> Brown seaweeds are known to concentrate various heavy metals and other toxic substances.<sup>18</sup> Environmental contamination of ocean waters exposes the seaweeds to such toxins.

### **CONCLUSIONS**

The versatility of *Fucus vesiculosus* as a medicinal plant warrants the application of the herb in several main areas: thyroid health and function, lipid metabolism, female steroidal hormone metabolism, as an antioxidant, and antimicrobial. New areas of research have indicated the use of *Fucus* as a chemoprotective, anti-tumor agent, anti-coagulant, and estrogen-lowering agent. Further research and clinical observation can help to establish the role of this medicinal plant in these areas.

Optimal thyroid function requires sufficient amounts of bio-available iodine. Humans depend on dietary sources of iodine including animal products, seaweed, and iodized salt. *Fucus vesiculosus*, which can be used as a food or extract, promotes thyroid function and is an excellent source of bio-available iodine.

*Fucus vesiculosus* can be used as a dermatological agent to support skin health and function in anti-aging cosmetics and in topical medicines for skin burns, radiation skin exposure, and fungal skin infection.

### **ABOUT THE AUTHOR**

Dr. Mary Bove obtained her Doctorate of Naturopathic Medicine and Midwifery Certification from Bastyr College of Natural Health Sciences in Seattle, WA and received her Diploma of Phytotherapy/Herbal Medicine at the School of Phytotherapy in Great Britain. Dr. Bove continues to practice Naturopathic Family Medicine at the Brattleboro Naturopathic Clinic, Brattleboro, VT. Once a full-time faculty member at Bastyr University, Dr Bove chaired the departments of Botanical Medicine and Naturopathic Midwifery. She served as adjunct faculty for the Massachusetts School of Pharmacy and Scottish School of Herbal Medicine Masters level course. Dr. Bove is the author of the



## Bladderwrack: An Overview of the Research and Indications

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*Encyclopedia of Natural Healing for Children and Infants*, considered an authoritative reference on natural pediatric medicine. Mary co-authored *Herbs for Women's Health* and has been published in many magazines, journals and collaborative books on botanical and natural medicine. She lectures and teaches internationally on the topics of naturopathic medicine, botanical medicine, pediatrics, natural pregnancy, childbirth, traditional food medicine and mind-body healing. Dr. Bove has recently produced an App for iPhone, *Momma Nature's Food Pharm Guide*, a fun and informative guide to the use of common foods and herbs for health, prevention, and kitchen first aid.

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## Bladderwrack: An Overview of the Research and Indications

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