

## Fucoidan Component Summary

**Fucoidan**, a fucose-containing sulfated poly-saccharide derived from brown seaweeds, provides exceptional health-enhancing bioactive properties. The oligosaccharide in fucoidan has been shown to provide comparable benefits to those of human oligosaccharides, and it has been referred to as the “Milk of the Sea” in part because its healing properties include those comparable to human milk.<sup>1</sup> Examples of reported benefits include: 1) support of both innate and adaptive immune function,<sup>2</sup> including enhancement of NK cells and Th1 activity,<sup>3</sup> and enhanced maturation and activity of important immune dendritic cells for recognition of harmful microbes;<sup>4</sup> 2) inhibition of growth of some potential pathogens;<sup>5</sup> 3) support of appropriate immune function response to abnormal cell growth.<sup>6,7</sup> 4) support of healthy vascular function;<sup>8</sup> 5) support of healthy inflammatory responses;<sup>9</sup> 6) support of healthy wound healing;<sup>10</sup> 7) potential radio-protective effects;<sup>11</sup> 8) chemo-protective effects;<sup>12</sup> 9) good antiviral activities against viruses such as HIV, HSV and human cytomegalovirus;<sup>13</sup> 10) support in pain control;<sup>14</sup> 10) liver-protective effects;<sup>15</sup> 11) enhanced metabolism;<sup>16</sup> 12) inhibition of fat cell maturation, and enhancement of breakdown of fat;<sup>17</sup> and 13) sulfated polysaccharide of fucoidan and carotenoid of fucoxanthin were found to be the most important active metabolites of brown algae as potential chemotherapeutic or chemopreventive agents.<sup>18</sup>



---

<sup>1</sup> **Human milk-derived oligosaccharides and plant-derived oligosaccharides stimulate** cytokine production of cord blood T-cells in vitro. Eiwegger T, Stahl B, Schmitt J. *Pediatr Res*. 2004 Oct;56(4):536-40. <http://www.ncbi.nlm.nih.gov/pubmed/15295093>

<sup>2</sup> **Defensive effects of a fucoidan from brown alga *Undaria pinnatifida* against herpes simplex virus infection.** Hayashi K, Nakano T, Hashimoto M, et al. *Int Immunopharmacol*. 2008 Jan;8(1):109-16. <http://www.ncbi.nlm.nih.gov/pubmed/18068106>

<sup>3</sup> **The role of NK cells in antitumor activity of dietary fucoidan from *Undaria pinnatifida* sporophylls (Mekabu).** Maruyama H, Tamauchi H, Iizuka M, Nakano T. *Planta Med*. 2006 Dec;72(15):1415-7. <http://www.ncbi.nlm.nih.gov/pubmed/17054048>

<sup>4</sup> **Immunostimulatory effects of fucoidan on bone marrow-derived dendritic cells.** Kim MH, Joo HG. *Immunol Lett*. 2008 Jan 29;115(2):138-43. <http://www.ncbi.nlm.nih.gov/pubmed/18077003>

<sup>5</sup> **Inhibition of reverse transcriptase activity of HIV by polysaccharides of brown algae.** Queiroz KC, Medeiros VP, Queiroz LS, Abreu LR, Rocha HA, Ferreira CV, Jucá MB, Aoyama H, Leite EL. *Biomed Pharmacother*. 2008 Jun;62(5):303-7. <http://www.ncbi.nlm.nih.gov/pubmed/18455359>

<sup>6</sup> **Antitumor and antimetastatic activity of fucoidan, a sulfated polysaccharide isolated from the Okhotsk Sea *Fucus evanescens* brown alga.** Alekseyenko TV, Zhanayeva SY, Venediktova AA, et al. *Bull Exp Biol Med*. 2007 Jun;143(6):730-2. PMID: 18239813 [PubMed - indexed for MEDLINE] <http://www.ncbi.nlm.nih.gov/pubmed/18239813>

<sup>7</sup> **Fucoidan as a marine anticancer agent in preclinical development.** Kwak JY. *Mar Drugs*. 2014 Jan 28;12(2):851-70. <http://www.ncbi.nlm.nih.gov/pubmed/24477286>

<sup>8</sup> **A comparative study of the anti-inflammatory, anticoagulant, antiangiogenic, and antiadhesive activities of nine different fucoidans from brown seaweeds.** Cumashi A, Ushakova NA, Preobrazhenskaya ME. *Glycobiology* vol. 17 no. 5 pp. 541–552, 2007. <http://www.ncbi.nlm.nih.gov/pubmed/17296677>

<sup>9</sup> **A comparative study of the anti-inflammatory, anticoagulant, antiangiogenic, and antiadhesive activities of nine different fucoidans from brown seaweeds.** Cumashi A, Ushakova NA, Preobrazhenskaya ME. *Glycobiology* vol. 17 no. 5 pp. 541–552, 2007. <http://www.ncbi.nlm.nih.gov/pubmed/17296677>

<sup>10</sup> **Fucoidin prevents *Clostridium difficile* toxin-A-induced ileal enteritis in mice.** Barreto AR, Cavalcante IC, Castro MV, et al. *Dig Dis Sci*. 2008 Apr;53(4):990-6. <http://www.ncbi.nlm.nih.gov/pubmed/17805968>

<sup>11</sup> **Radioprotective effects of fucoidan in mice treated with total body irradiation.** Lee J, Kim J, Moon C, Kim SH. *Phytother Res*. 2008 Aug 6.

---

<http://www.ncbi.nlm.nih.gov/pubmed/18683851>

<sup>12</sup> **In vitro chemopreventive potential of fucophlorethols from the brown alga *Fucus vesiculosus* L. by anti-oxidant activity and inhibition of selected cytochrome P450 enzymes.** Parys S, Kehraus S, Krick A, Glombitza KW, Carmeli S, Klimo K, Gerhäuser C, König GM. *Phytochemistry*. 2010 Feb;71(2-3):221-9.

<sup>13</sup> **Antiretroviral activity of fucoidans extracted from the brown seaweed *Adenocystis utricularis*. *Phytother*.** Trincherro, J.; Ponce, N.M.; Córdoba, et al. *Res*. 2009, 23, 707–712.

<sup>14</sup> **Crucial role of neutrophils in the development of mechanical inflammatory hypernociception.** Cunha TM, Verri WA Jr., Schivolar, et al. *Journal of Leukocyte Biology*. 2008;83:824-832. <http://www.ncbi.nlm.nih.gov/pubmed/18203872>; Full text: <http://www.jleukbio.org/cgi/content/full/83/4/824>

<sup>15</sup> **The effects of fucoidan extracts on CCI(4)-induced liver injury.** Kang KS, Kim ID, Kwon RH, et al. *Arch Pharm Res*. 2008 May;31(5):622-7. <http://www.ncbi.nlm.nih.gov/pubmed/18481019>

<sup>16</sup> **Mitochondrial dysfunction in an animal model of hyperoxaluria: a prophylactic approach with fucoidan.** Veena CK, Josephine A, Preetha SP, Rajesh NG, Varalakshmi P. *Eur J Pharmacol*. 2008 Jan 28;579(1-3):330-6 <http://www.ncbi.nlm.nih.gov/pubmed/18001705>

<sup>17</sup> **Inhibitory Effects of Fucoidan in 3T3-L1 Adipocyte Differentiation.** Kim MJ, Chang UJ, Lee JS. *Mar Biotechnol (NY)*. 2008 Dec 10. <http://www.ncbi.nlm.nih.gov/pubmed/19067076>

<sup>18</sup> **Anticancer and antitumor potential of fucoidan and fucoxanthin, two main metabolites isolated from brown algae.** Zorofchian MS, Karimian H, Khanabdali R, et al. *ScientificWorldJournal*. 2014 Jan 2;2014:768323. <http://www.ncbi.nlm.nih.gov/pubmed/24526922>  
Free Full Text: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3910333/>