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“Anti-breast cancer activity of marine algae products”

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# Anti-breast cancer activity of marine algae products

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## Abstract

Breast cancer is the leading cause of cancer-related death among females worldwide. Globally, more than 1.1 million females are diagnosed each year, representing around 10% of all newly diagnosed cancer cases. The mortality rate for premenopausal breast cancer is almost four times greater in the Western world, compared with East Asia nation. In breast cancer etiology, genetics are thought to play a smaller role compared to environmental factors such as food diets. One important difference in the diet of East Asian populations compared to Western populations is higher amount of fish and marine algae consumption. Ancient tradition of marine algae consumption has made a large number of epidemiological researches showing the health benefit in females linked to marine algae consumption. Three decades ago, the effect of *Laminaria angustata* consumption and development of breast cancer was investigated in female Sprague-Dawley rats induced with the carcinogen 7, 12-dimethylbenz (a) anthracene (DMBA), a widely used rat mammary cancer model. Diet containing 5% *L. angustata* was found to be effective in delay in the time of DMBA-induced tumor developments. Although the mechanism for *L. angustata* activity is not elucidated yet, the authors argue that bioactivity of *L. angustata* might bring by their nutrient content such as polyphenols, sulfated polysaccharides, vitamins, minerals, carotenoids, etc. In accordance, wakame (*Undaria pinnatifida*) and mekabu (sporophyll of wakame) have been demonstrated to reduce the incidence, multiplicity, and size of breast tumors in female Sprague-Dawley rats induced with DMBA. Considering that wakame and mekabu are particularly rich in iodine, the investigators suggested that the cancer inhibition was brought about by the iodine. More recently, statistical correlations between dietary intake of iodine and breast cancers have been carried out; however, their exact mechanisms of action are not yet completely understood. Apoptosis or programmed cell death is a key process in cancer development and progression which can be characterized through distinct set of morphological and biochemical progresses. Inactivation of apoptosis has been considered to be one of the six fundamental hallmarks of cancer; therefore, apoptosis is a major target of cancer therapy development up to present. Estrogen-dependent cancers such as breast, endometrial, and ovarian cancer are among the leading causes of morbidity and mortality in American females. Increased incidence of these cancers is predicted in the future, and the need for primary prevention is clear. Epidemiological studies demonstrated that incidence rates of estrogen-dependent cancers are among the highest in Western, industrialized countries, while rates are much lower in China and Japan. Due to some research study, low estrogen-dependent cancer rates have been attributed to the soy-rich and marine algae diets inherent among Asian populations. As an example, dietary intake of *Alaria esculenta* and soy protein has been reported to modify estrogen and phytoestrogen metabolism in healthy postmenopausal females. The intake of *Fucus vesiculosus* (bladderwrack) significantly increased the total number of days of the menstrual cycle, reduced circulating 17 $\beta$ -estradiol levels, and elevated serumprogesterone levels in premenopausal women with abnormal menstrual cycling histories. Moreover, *F. vesiculosus* have been demonstrated to modulate endocrine hormones in female Sprague-Dawley rats and human luteinized granulosa cells. Hence, it may be assumed that intake of marine algae may contribute to the lower estrogen circulating level which may correlate to the lower incidence of hormone-dependent cancers in females. In addition, formation of cancer cells in human body can be directly induced by free radicals and natural anticancer drugs as chemopreventive agents have gained a positive popularity in treatment of cancer. Therefore, marine algal radical scavenging compounds such as phlorotannins, sulfated polysaccharides, carotenoids, carbamol derivatives can be used indirectly to reduce cancer formation in the female body. Taken together, marine algae and their secondary metabolites have shown promising anticancer activities, and hence, marine algae have a great potential to improve female health and longevity by being a part of anticancer medicinal foods and nutraceuticals. However, future studies are needed focusing on the synergistic benefits of consuming different marine algae species, recommended doses, and timing of intake and preparation methods for marine algae in order to maximize the desired effect in the prevention of cancer, particularly cancer which occurs mainly in female subject.

**Keywords:** Breast Cancer, Gastric Cancer, Ovarian Cancer, Cervical Cancer, Cancer Prevention, Lifestyle and Cancer, Cancer Treatment and Management

