

Laminaria angustata extract reduces denture-related inflammation – An *in vitro* study

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ABSTRACT

Introduction: Laminaria is a kind of algae. It is used as food in several Asian countries. Protoctist genus contains iodine, part that the body must build thyroid hormones. The study is to investigate the antiinflammatory potential of *Laminaria angusta* against denture-related inflammations *in vitro* **Methodology:** Percentage of inhibition of growth of *Candida albicans* by varying concentrations of *Laminaria* was tested **Result:** *Laminaria* extract was found to possess potent antimicrobial activity against *Candida albicans*.

KEY WORDS: Denture, Inflammation, *Laminaria angustata*

INTRODUCTION

Seaweeds have been an important dietary component since, at least fourth century in Japan and sixth century in China. *Laminaria angustata*, commonly known as “kombu” is a brown algae a type of seaweed used as food in many Asian countries.^[1-3] It is rich in potassium and iron. Kombu is a kind of seaweed growing in northern Japan. In Hidaka District, Hokkaido Island, it comprises an important source of income.^[4] In the harvest of wild kombu, competition among the harvesters tends to be intense because of its high price and the fact that it is a limited resource. About a century ago, severe competition caused resource depletion and decline of kombu quality.^[5] Today, however, the resource is used sustainably by the villagers, who observe complex communal regulations for the use of common property.^[6]

Laminaria is usually used as a laxative, to treat high blood pressure, for treating radiation sickness, for weight loss and to treat cancer.^[7] *Laminaria angustata* var. *longissima* is a brown algae eaten widely since 300 years ago in Okinawa, Japan. Animal model studies suggest that diets containing *Laminaria angustata*,

a brown seaweed commonly eaten in Japan, inhibit breast carcinogenesis.^[8] The inhibitory effects of *Laminaria* sp. on triglyceride absorption were investigated in triglyceride-loaded mice and in mice with high-fat-diet-induced obesity. Shaved *Laminaria*, known as “tororokombu,” showed more effective activities in these experiments. The active component was considered to be alginic acid in the water-soluble fraction. On the other hand, the antihyperglycemic effects of a hot water extract of immature *Laminaria* were investigated in carbohydrate-loaded mice and in *in vitro* experiments using Caco-2 cells.^[9] The potential usefulness of *Laminaria* sp. as marine medicinal foods may be increased through the use of different processing methods and/or growth stages.

Animal model studies suggest that diets containing *Laminaria angustata*, a brown seaweed commonly eaten in Japan, inhibit breast carcinogenesis.^[10] In order to identify the compound(s) in the seaweed responsible for tumor-inhibiting activity, we used Ames/mammalian microsome assay system to determine the antimutagenic (or anticarcinogenic) effect of various solvents and water extracts of *Laminaria angustata*.^[11] The antimutagenic effects of acetone, ether, chloroform, chloroform + methanol, hot water and cold water extracts on the mutagenicity induced by 7,12-dimethylbenz[a]anthracene (DMBA), a breast carcinogen, and 3,2'-dimethyl-4-aminobiphenyl

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(DMAB), a colon and breast carcinogen, was studied using the *Salmonella typhimurium* strains TA98 and TA100.^[12]

The study is to investigate the antimicrobial potential of *Laminaria angustata* in reducing the denture-related inflammations by *in vitro* method.

METHODOLOGY

Preparation of Extract

L. angustata was purchased and the samples were ground with grinder, and the seaweed powders were stored in a freezer at -20°C until use. *L. angustata* (500 g) were refluxed with MeOH (1 L) for 3 h, and the filtrates were concentrated to dryness *in vacuo* at 40°C . These MeOH extracts were separately suspended in distilled H_2O . Different concentrations of LAE (25–200 $\mu\text{g/ml}$) were prepared using dimethyl sulfoxide.

Microbiological Test

Before culture of *Candida albicans* on acrylic resin plate, all specimens are sterilized by immersion in 2% glutaraldehyde for 30 min to prevent contamination and placed in a sterilized container. Pure culture of *C. albicans* was grown on agar Sabouraud plates containing 500 mMol/L of sucrose at 25°C . After 24 h, the colonies were suspended in tubes containing 5 mL of brain heart infusion (BHI) broth. The cell suspension in each tube was adjusted spectrophotometrically at 800 nm (O.D.800). Next, the specimens were placed into the tubes containing BHI plus inoculums and remained for 11 h at 37°C to favor initial colonization of the acrylic resin surfaces and colony count was calculated at this stage. Each specimen was first washed with saline after immersion in the contaminated culture broth. Saline excess was removed with a gentle compression of sterile gauze. It was then transferred to individual tubes containing 5 mL of BHI broth containing *L. angustata* extract. After 24 h of incubation, the tubes were individually transferred to a spectrophotometer at 530 nm wavelength to measure the turbidity degree, through the transmittance. Aliquots of 10 μL of each tube were then collected and inoculated into agar Sabouraud

plates containing 500 mMol/L of sucrose, which was incubated for 24 h at 37°C , to check microbial growth.

RESULTS

Table 1 clearly shows that there has been certain inhibition shown by the extract to the growth of more *C. albicans* in the resin.

DISCUSSION

Laminaria could be a kind of alga. It is used as food in several Asian countries. Protoctist genus contains iodine, part that the body must build thyroid hormones. It is additionally an expensive supply of iron and atomic number 19. Despite serious safety considerations regarding protoctist genus, some individuals use protoctist genus as drugs.

Amphotericin B is a polyene antifungal agent with a broad range of activity against yeasts and molds, as well as the protozoan parasite *Leishmania* spp. Liposomal AmB (LAmB) binds to ergosterol in the fungal cell membrane, leading to ion leakage and cell death. The initial formulation was amphotericin B deoxycholate (DAmB), which was developed in the 1950s. For many decades, DAmB was the only antifungal agent available for the treatment of invasive fungal diseases. However, the significant dose-limiting toxicity of DAmB (most notably nephrotoxicity and infusion-related reactions) provided the impetus to develop new less toxic formulations. Liposomal amphotericin B (AmBisome[®]; LAmB) is a unique lipid formulation of amphotericin B that has been used for nearly 20 years to treat a broad range of fungal infections. While the antifungal activity of amphotericin B is retained following its incorporation into a liposome bilayer, its toxicity is significantly reduced.

As the extract of *L. angustata* also shows an inhibitory effect to the growth of *C. albicans* in resin, it can be used as a great natural alternative to drugs that inhibit the growth. Intake of *Laminaria* in day-to-day meal would be sufficed.

CONCLUSION

Hence it can be concluded that with further studies on the health effects of *L. angustata* is could be used as an alternative to artificially synthesized drugs.

Table 1: Antimicrobial potential of *Laminaria angustata* against *Candida albicans*

Treatment	Conc. ($\mu\text{g/ml}$)	Absorbance at 530 nm	% of inhibition
Resins contaminated with <i>Candida albicans</i> LAE		0.356 \pm 0.18	
	25	0.308 \pm 0.24*	13.4
	50	0.225 \pm 0.19*	36.7
	100	0.156 \pm 0.10*	56.1
	200	0.101 \pm 0.09*	71.6
Amphotericin	1	0.016 \pm 0.05*	95.5

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