

# What Future for the Application of Algal Molecules in Medicine?



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## Opinion

Seaweeds, micro-algae, or cyanobacteria are traditionally used in folk medicine in Asian countries. The brown seaweed *Sargassum naozhouense* has been applied in traditional Chinese medicine for thousands of years [1]. The main prescriptions concern the internal heat, various infections, and other ailments. The cyanobacteria *Nostoc commune*, well known under the name of Ge-Xian-Mi (Rice of Immortal Ge), has been described for their therapeutic properties in two important Chinese medicinal work, the Compendium of Materia Medica (Li, 1596) and the Supplement to compendium of Materia Medica respectively (Zhao, 1765) [2]. In scientific literature algae are described for containing various pharmacology properties such as antioxidant, anti-inflammatory, antibacterial, antiviral, anticoagulant, and antitumor activities. In this context, what are the molecular support involved to these

biological properties and what perspectives for the development of new drugs?

The consumption of brown seaweeds (e.g., Kombu, Wakame) were often cited for their benefic potential effect on human health. These algae contain original and characteristic polysaccharides such as alginates, fucans or laminarin (Figure 1). For example, sulfated fucans extracted from brown seaweeds have often been described for their anticoagulant and antithrombin activities [3,4]. A sulfated fucan with a molecular weight to 40 kDa extracted from the brown alga *Stoechospermum marginatum* was reported as an antiviral inhibitor of herpes simplex virus type 1 [5]. Many molecules other than fucans have also been described for their potential therapeutic effect (Table 1).

**Table 1:** Some examples of potential therapeutic activities of some brown seaweeds (from [7]).

Seaweed Species	Active Compounds	Health Biological Activity
<i>Fucus evanescens</i>	Fucoidan	Antitumor and antimetastatic
<i>Fucus vesiculosus</i>	Fucan	Antithrombotic
<i>Laminaria japonica (Kombu)</i>	Laminarin	Antiapoptotic
<i>Undaria pinnatifida (Wakame)</i>	Sulfated polysaccharides	Antiviral
<i>Ecklonia cava</i>	Phlorotannin	Inhibitor of HIV1-Reverse transcriptase
<i>Sargassum vulgare</i>	Alginic acid	Antitumor
<i>Pelvetia siliquosa</i>	Phlorotannin	Antidiabetic

Microalgae and cyanobacteria such as *Spirulina* also contain molecules with biological activities interesting for the human health. The microalga, *Chlorella vulgaris*, called “super food” by the NASA possesses exopolysaccharides developing in vitro antitumor activities against to two colon cancer cell lines (A HCT116, B HCT8) [6]. C-phycoerythrin a protein pigment present

in the cyanobacterium belonging to genus *Spirulina* (*Arthrospira*) has been also described for their antitumoral activities [7]. This phycobiliprotein induces in vitro the apoptosis of tumoral cells of HeLa line and it is also efficiency against to cells of colon cancer on the rat models.

Numerous species of macroalgae (seaweeds), microalgae and cyanobacteria contain various compounds with pharmacological activities such as antiviral, antitumoral, antithrombotic or antidiabetic properties. These properties mainly concern polysaccharides or phycobiliproteins. The development of a medical drug from these molecules is not easy because the molecular mass of these compounds is too heavy (40kDa to 3.10<sup>3</sup> KDa) and the solubility can sometimes be weak. However, the contribution of algae in the diet appears to be a reasonable

approach to take advantage of these activities as a possible means of disease prevention.

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