



REVIEW: STUDY OF MARINE SOURCE

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Abstract: Natural product compounds are the source of numerous therapeutic agents. Recent progress to discover drugs from natural product sources has resulted in compounds that are being developed to treat cancer, resistant bacteria and viruses and immunosuppressive disorders. Many of these compounds were discovered by applying recent advances in understanding the genetics of secondary metabolism in microorganisms, exploring the marine environment and applying new screening technologies. Microbes have made a phenomenal/unique contribution to the health and well-being of people throughout the world. In addition to producing many primary metabolites, such as amino acids, vitamins and nucleotides, they are capable of making secondary metabolites, which constitute half of the pharmaceuticals on the market today (and provide agriculture with many essential products). A growing number of marine microorganisms are the sources of novel and potentially life-saving bioactive secondary metabolites. Here, we have discussed some of these novel antibacterial, antiviral, anticancer compounds isolated from marine-derived microbes and their possible roles in disease eradication and commercial exploitation of these compounds for possible drug development using many approaches.

Index Terms - Marine agents, Pharmacology of marine sources, Natural Agents, secondary metabolite, under water study.

INTRODUCTION

Oceans contain more than 80% of diverse plant and animal species in the world. Marine organisms such as sponges, tunicates, fishes, soft corals, nudibranchs, sea hares, opisthobranch Molluscs, echinoderms, bryozoans, prawns, shells, sea slugs, and marine microorganisms are sources of bioactive compounds (viz. oils and cosmetics). In late 1970, it was established that marine plants and animals are genetically and biochemically unique. Around 15,000 such unique natural compounds have been described and out of them 30% products have been isolated from sponges.

Marine pharmacognosy is the investigation and identification of medically important plants and animals in the marine environment. Generally the drugs are obtained from the marine species of bacteria, virus, algae, fungi and sponges. It is a relatively new field of study in western medicine, although many marine organisms were used in Traditional Chinese Medicine. It was not until 2004 that the first FDA approval of a drug came directly from the sea: ziconotide, which was isolated from a marine cone snail.

Defination

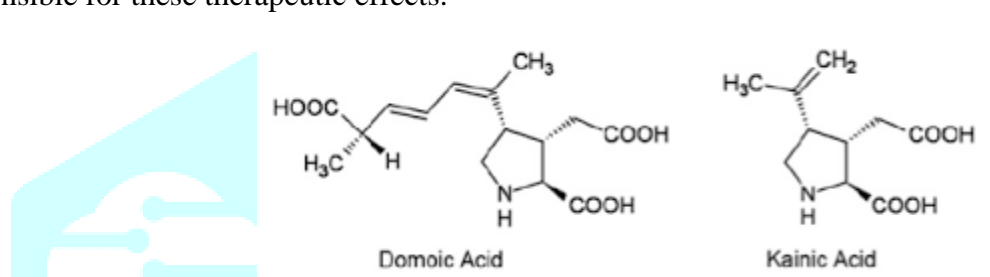
Marine Drugs are a branch of Pharmacognosy that deals with the isolation and identification of bioactive molecules from marine organisms. That means the study of chemicals that are derived from marine sources. Bioactive molecules obtained from microbes, sponges, seaweeds, and other marine organisms.

Marine drugs can be broadly classified based on their actions as follows:

- Antibacterial. ...
- Anti-inflammatory. ...
- Neuroprotective. ...
- Antiparasitic. ...
- Antiviral agents. ...
- Anticancer. ...
- Analgesic. ...
- Antimicrobial.

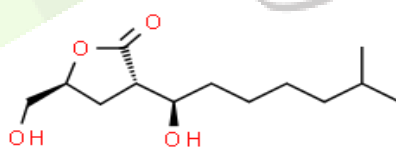
Antiparasitic agents

Kainic Acid and Domoic Acid, Neurotoxic Anthelmintics From Red Algae, two Japanese red algae, *Digenea simplex* and *Chondria armata*, have been employed for more than 1000 years in Japan for their potent anthelmintic properties; that is, eliminating intestinal worms, such as parasitic roundworms (*Ascaris lumbricoides*), whip worms (*Trichuris trichura*), and tape worms. Two closely related compounds, domoic acid and kainic acid, have been isolated from these red algae and are responsible for these therapeutic effects.



Anti-inflammatory agent

Marine organism have shown presence of novel anti-inflammatory agent. The anti-inflammatory function of extracts and other parts of a mediterranean sponge species *Spongia officinalis* in the in vivo study on rat model of carrageenan-induced paw edema assay. Butanolide derivatives obtained from *Euplexaura flava* have shown anti-inflammatory effect in dose of 100 micro gm per ml.

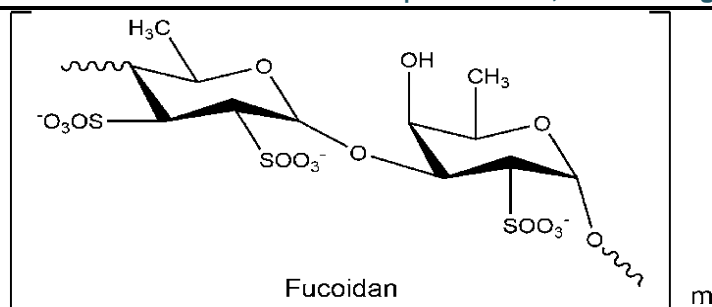


Butanolide

Neuroprotective agent

Fucoidan is a long chain sulfated polysaccharide found in various species of brown algae. Commercially available fucoidan is commonly extracted from the seaweed species *Fucus vesiculosus*, *Cladophora okamurae*, *Laminaria japonica* and *Undaria pinnatifida*. Variant forms of fucoidan have also been found in animal species, including the sea cucumber.

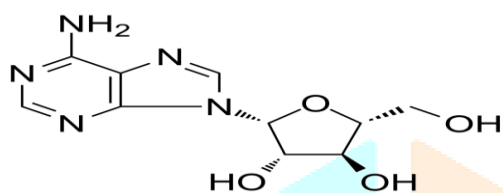
The extracts of South Indian green seaweed *Ulva reticulata* has shown neuroprotection by inhibiting acetyl- and butyryl-cholinesterases, efficacy comparable to agents currently approved for Alzheimer's disease treatment.



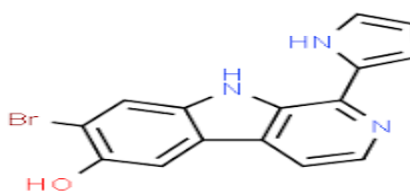
Antiviral agents

Ara-A is a semi synthetic antiviral agent isolated from marine sponge *Tethya crypta*.

Eudistomins are β -carboline derivatives, isolated from ascidians (marine tunicates of the family Ascidiacea).



Ara-A



Eudistomin A

Anti-herpes simplex virus-1 (HSV) activity found in high molecular weight exo-polysaccharides extracted from the *Celtodoryx girardae* (French marine sponge) and its associated symbiotic bacteria has been reported.

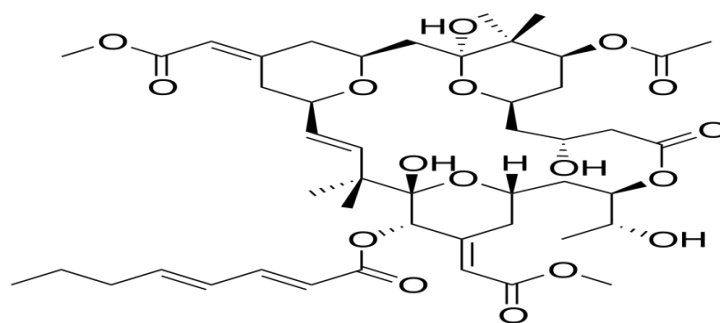
Anticancer agent

Several compounds with anticancer and cytotoxic activities also isolated from various marine organism as sponges, gorgonian corals, sea algae, sea hares and sea cucumbers.

Discodermolide, bryostatins, sarcodictyin, and eleutherobin are among the most effective anticancer drugs produced mainly by marine bacteria.

Bryostatins are a group of macrolide lactones from the marine organism *Bugula neritina* that were first collected and provided to JL Hartwell's anticancer drug.

Discodermolide was found to be a potent inhibitor of tumor cell growth in several cancer cell lines, discodermolide also shows some unique characters, including a linear backbone structure, immunosuppressive properties.

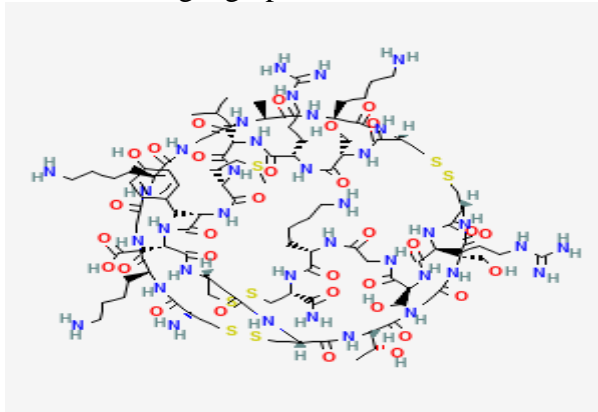


Bryostatin

Analgesic agent

Ziconotide, also called intrathecal ziconotide (ITZ) because of its administration route, is an atypical analgesic agent for the amelioration of severe and chronic pain. Derived from *Conus magus*, a cone snail, it is the synthetic form of an ω -conotoxin peptide. It is 1,000 times as powerful as morphine. In December 2004 the Food and Drug Administration approved ziconotide when delivered as an infusion into the cerebrospinal fluid using an intrathecal pump system.

Contulakin-G is a marine natural product which targets neurotensin receptors and exhibits potent analgesic activities. Contulakin-G was discovered over 15 years ago as a member of the neurotensin (NT) family from the venom of predatory marine snail, *Conus geographus*.



Ziconotide

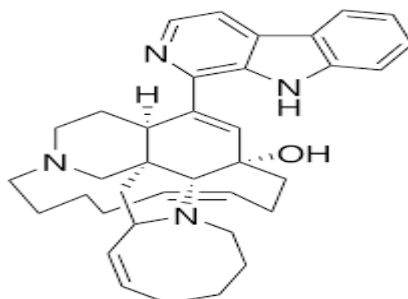
Antimicrobial agent

Polyketides such as polycyclic ether macrolides and open-chain polyketides are produced and stored by marine sponges and show strong antiviral and antimicrobial activities and also antibiotics, antifungals, cytostatics, anticholesteremic, antiparasitics, coccidiostats, animal growth promoters and natural insecticides are in commercial use.

The cephalosporins are well-known antimicrobial agents with a marine source of origin. Cephalosporin C was firstly extracted and purified from a marine fungus, *Cephalosporium acremonium*.

Antimalarial agent

Manzamines are undoubtedly the most important and potent antimalarial alkaloids isolated from marine sources. The representative manzamine alkaloids, manzamines A–C, were isolated from a marine sponge *Haliclona* sp. collected off Cape Manzamo, Okinawa, Japan. About 100 manzamine alkaloids have been isolated from more than 16 species of marine sponges belonging to 5 families.



Manzamines

Some of the following Marine drugs are FDA approved and some under different clinical trial phases are as follows,

Clinical Status	Compound Name	Marine Organism	Chemical Class	Disease Area
FDA-Approved	Cytarabine (Ara-C)	Sponge	Nucleoside	Cancer
	Vidarabine (Ara-A)	Sponge	Nucleoside	Antiviral
	Ziconotide	Cone Snail	Peptide	Analgesic
	Omega-3-Fatty Acid Ethyl Esters	Fish	Omega-3 Fatty Acids	Hypertriglyceridemia
	Trabectedin (ET-743) EU Approved only	Tunicate	Alkaloid	Cancer
Phase III	Brentuximab Vedotin (SGN-35)	Mollusk	Antibody-Drug Conjugate (MM Auristatin E)	Cancer
	Plitidepsin	Tunicate	Depsipeptide	Cancer
Phase II	DMXBA (GTS-21)	Worm	Alkaloid	Cognition, Schizophrenia
	Plinabulin (NPI 2358)	Fungus	Diketopiperazine	Cancer
	Elisidepsin	Mollusk	Depsipeptide	Cancer
Phase I	Marizomib (Salinosporamide A)	Bacterium	Beta-Lactone-Gamma Lactam	Cancer
	Hemiasterlin (E7974)	Sponge	Tripeptide	Cancer
	Bryostatin 1	Bryozoa	Polyketide	Cancer, Alzheimers
	Pseudopterosins	Soft Coral	Diterpene Glycoside	Wound Healing

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