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MARINE PHARMACEUTICALS: A REVIEW

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Abstract: Marine biological system could be a source of one of kind normal items which are primarily gathered in living life form and serves as valuable pharmacologically dynamic substances. Marine Medication could be a science of mending, keeping up and re-establishing wellbeing by anticipation and treatment in connection to sea subsidiaries. It has a related corollary field called Plunge. Pharmaceutical Marine Sponges, Molluscans, Green growth, Corals, Ascidians, Bryozoans and Vertebrates are major sources of biomedical compounds. The current situation in India is in an early stage, but steps are being taken within the right course to create a potential source of unused drugs. The most accentuation of marine sedate revelation is given in look of remedy for dangerous malady. Jumpers are uncovered to a number of physiological dangers as a result of introduction to profound ocean. Application of antihistamine drugs, pharmacotherapy and hyperbaric oxygen are thought of.

Keywords: Marine drug development, drug resources, Cytostatics, Analgesics, Antiviral, Antihyperlipidemic

1. Introduction

Drugs that are derived from natural products have been in use for centuries, for the management of various diseases. Today, over 50% of marketed drugs are either extracted from natural sources or produced using natural product as a starting material. It could be a known reality that diverse shapes of cancer, diseases, incendiary infections, and neurodegenerative illnesses cannot be treated effectively, giving rise to a ceaseless requirement for unused drugs.^[1] These requires are coupled with the improvement of resistance in numerous pathogenic living beings to anti-microbials and cancer cells to anti-tumor drugs. The approach to medicate disclosure by and by has ended up much more modern which includes planning drugs based on information of fitting biochemical target. Most of the drugs would not have been created without a characteristic item, novel science to its natural target. Subsequently, it shows up that a diverse approach, including all these strategies, is the foremost compelling approach. It is fundamental to distinguish the sources of modern organic exercises and chemical auxiliary differing qualities. Normal items have



long been utilized nourishments, scents, shades, bug sprays, drugs, etc. Due to their simple openness, earthly plants have served as the major source of medicinally valuable items, particularly for conventional or people medication. Agreeing to, almost 25% of all pharmaceutical deals are drugs inferred from plant common items and an extra 12% are based on microbial created common items.

The Ocean, is said to be the ‘mother origin of lives’ which is also the source of structurally unique natural products that are mainly accumulated in living organisms. Marine medicine is not separated from general medicine but rather the general medicine applied to the sea. Marine plants and creatures that deliver a wide assortment of chemicals. These chemicals have been permitted to living beings to adjust to numerous different habitats within the ocean by giving assurance against other organisms and by helping survival in unforgiving conditions.^[2] As investigation precedes, numerous more marine chemicals are found to have biomedical, mechanical, or dietary value. This remains a curiously and energizing region of inquire about for scientists studying marine natural product chemistry and marine chemical ecology. There’s a restorative gold surge going on the ocean floor from 50 years.

2. WHAT IS MARINE PHARMACY?

Marine Pharmacy is mainly concerned with the naturally occurring substances of medicinal value from marine. Generally, the drugs are obtained from the marine species of bacteria, virus, algae, fungi and sponges, etcetera. ^[3]

2.1 DERIVABLE DRUGS FROM THE MARINE ENVIRONMENT

Marine derived drugs are pharmacologically active substances extracted from marine organism and developed into suitable dosage form for human use. The ocean has a large variety of biodiversity which remains largely unexploited. The isolation of gentle corals turned into the primary example to signify that marine organisms would possibly function an essential supply of novel chemical structure of high therapeutic value.^[4] Marine organisms

incorporate approximately half of the total biodiversity on earth and the marine ecosystem is the greatest source to discover beneficial therapeutics (**Figure 1**). The ever increasing resistance of wide variety of human pathogen to the present drugs, the resurgence of in any other case eradicated infectious disease, the emergence of new infections, metabolic disease and the growing incidence of ageing and life fashion associated sicknesses amply justify the continuous seek for extra efficacious and distinctly selective drugs the use of both conventional and cutting-edge processes to new drug design and development.^[5]



Figure 1.- Tethya, a genus of sea sponges

The deliverance medications are primarily found copiously in microorganisms, algae and invertebrates. Trendy technologies have opened immense areas of analysis for the extraction of medical specialty compounds from oceans and seas. Sessile marine invertebrates akin to sponges, bryozoans, tunicates, principally lacking morphological defense structures have developed the biggest variety of marine-derived secondary metabolites including a number of the foremost fascinating drug candidates. In recent years, a big variety of novel metabolites with potent medical specialty properties are discovered from the marine organisms.^[6] Similar work has been conducted targeting uncultivated microbes of marine sediments and sponges victimisation metagenomic based techniques to develop recombinant secondary metabolites. Marine microorganisms are rising as Associate in Nursing exciting resource for the invention of recent categories of medical specialty. The promising malignant neoplasm clinical candidates like salinosporamide A and bryostatin solely hint at the unimaginable wealth of drug leads hidden simply to a lower place the ocean surface.

Salinosporamide A, that is isolated from marine microorganism that's presently in clinical trial clinical trials for the treatment of drug-resistant multiple myelomas and three alternative styles of cancers^[7]

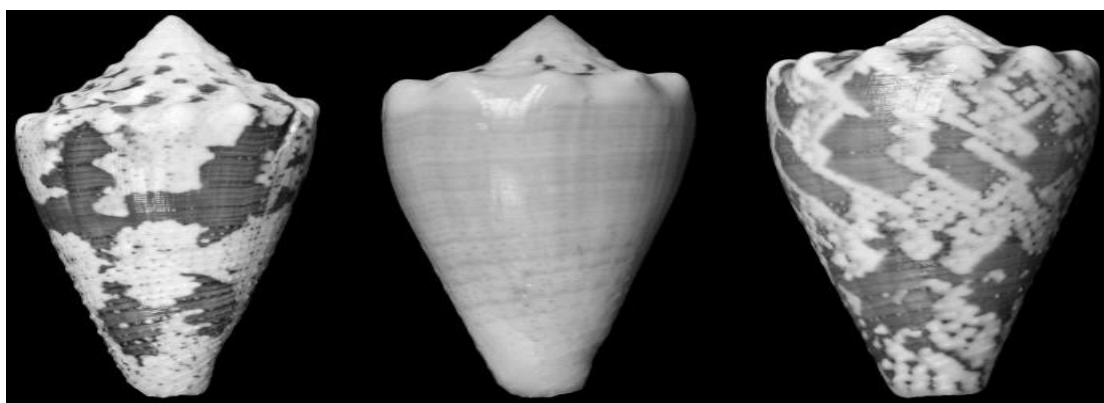


Figure 2- Cone snail (*Conus magnus*)

This has additional to try to with the relative infancy of the sector (compared to terrestrial bioprospecting) than any lack of potential for discovery. **(Figure 2)** In fact, the natural product isolated from marine sources tend to be additional highly bioactive than terrestrial counterparts.^[8] Marine organisms have some powerful toxins found in them which frequently have nice medical and therapeutic edges to humans. Maybe, okadaic acid found in dinoflagellates will kill cancer cells at extraordinarily low concentrations **(Figure 3)**.



Figure 3- *Ecteinascidia turbinata*



SPONGE

Sponges are far-famed to be wealthy supply of terpenoids that has shown sturdy antibiotic activity. Terpenoids is a lively ingredient in medicine like Variabilins and Hydroquinone with each analgesic and anti-inflammatory properties. Antimalarial drug, mefloquine, quinine and sulfadoxinpyrimethamine once were effective medicine in treating malaria caused by the protozoan, Plasmodium falciparum. However, the effectuality of those medicines has met rising cases of developed resistance by the protozoan itself.

Manzamine kind alkaloids have been isolated from Associate in Nursing Indonesian sponge and have shown its effects against protozoal infection, additionally to TB and mastigophores. They can be cultivated from cutting parent Associate in Nursing planted within the ocean or a vivarium.

There are range of medication derived from the marine sponge however only 2 are approved by Food and drug administration (FDA) namely; Vidarabine (Ara-A) and Cytarabine (Ara-C).

ARA-A (VIDARABINE, VIDARABIN)

Two nucleosides were confined from the Caribbean wipe *Tethya crypta*: spongothymidine and spongouridine; which contained D-arabinose instead of D-ribose. These compounds driven to the blend of a modern era, sugar altered nucleoside analog vidarabine, and the related compound cytarabine. The drug was originally intended as an anti-cancer drug. Vidarabine works by interfering with the synthesis of viral DNA. [9] Vidarabine ophthalmic may be a drug derived from a marine sponge, the preparations are wont to treat infective agent infections of the attention. **(Figure 4)**

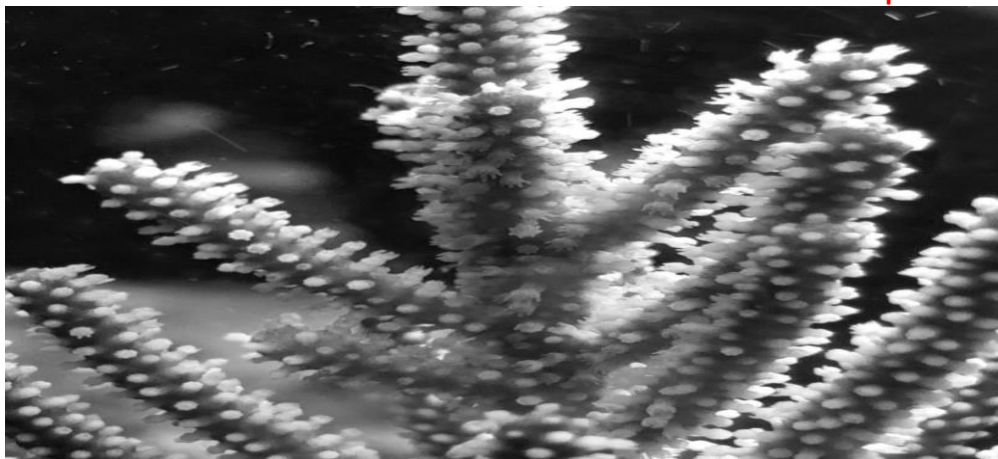


Figure 4-Soft Coral (*Pseudopterogorgia elisabethae*)

ARA-C (CYTARABINE)

Cytarabine is antineoplastic drug additionally derived from marine sponge. It slows down the expansion and unfolds of the cancer cells within the body to effectively cure bound types of cancer. It's used in the treatment of many kinds of leukemia including acute myelogenous leukemia and membrane leukemia. Opposing metabolites masquerade as purine or pyrimidine that becomes the building blocks of DNA.^[10] Cytosine arabinoside meddling with the blend of DNA. Other cancer drugs adjust the base. Its mechanism of action is due to its fast transformation into cytosine arabinoside triphosphate, which harms DNA when the cell cycle holds within the S stage (union of DNA). Cytarabine is the primary of a arrangement of cancer drugs that modified the sugar component of nucleosides. Fastly separating cells, which require DNA replication for mitosis, are subsequently most influenced. Cytosine arabinoside also hinders both DNA and RNA polymerases and nucleotide reductase chemicals required for DNA synthesis. **(Figure 5)**



Figure 5- Red Seaweed

CONE SNAIL

Conus may be a massive genus of little to large predatory ocean snails, marine mollusk mollusks, with the common names of cone snails, cone shells or cones^[11] This genus is placed within the taxonomic category Coninae within the family ConidaeIs, Phylum Gastropoda that injects potent cocktail of amide toxins into their prey to immobilize them. They're not culturally as a result of they are being at some stages of their life cycle.(Figure 6)

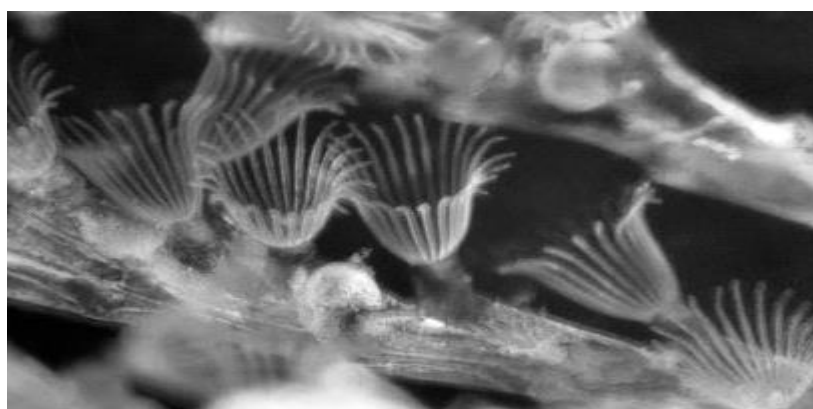


Figure 6- Bryozoan (Bugula neritina)

ZICONOTIDE:

Ziconotide is derived from the toxin of predatory cone snails (*Conus magus*). Ziconotide is a hydrophilic molecule that is freely soluble in water and is practically insoluble in methyl t-butyl ether. Ziconotide acts as a selective N-type voltage-gated calcium channel blocker. It's since been used as treatment for severe cases of chronic pain in patients with conditions such as cancer and AIDS. **(Figure 7)** Current clinical results counsel may be a powerful, non-addictive different to medicine love morphine^[12]



Figure 7- Dog fish shark

Ziconotide may be a non-narcotic pain reliever that works by block pain signals from the nerves to the brain. It's wont to treat severe chronic pain in people that cannot use or don't reply to commonplace pain-relieving medications. Tunicates The tunicates are usually called ocean squirts. They're sessile as adults and hermaphrodites. The name arises from the existence of tunics generally this tunic is connected to substrate by a little fastening and stands upright. These compounds are straightforward amino acid or complicated alkaloids. These compounds have shown various biological activities like antifungal, medicine, toxicity, antimalarial activity, inhibition of super molecule enzyme C.

Didemnin B: Didemnins are cyclic depsipeptide compounds isolated from a urochord (sea-squirt). Though over 9 didemnins (didemnins A-E, G, X and Y) are isolated from the extract of that the one that possesses the most potent biological activities. It's a robust antiviral



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against each DNA and ribonucleic acid viruses herpes simplex virus kind one, a strong medication that shows some potential in cutis and is additionally terribly cytotoxic. It shows sturdy activity against murine leukemia cells. There are style of different marine natural merchandise that has potential healthful worth love antitumor agent, medicinal drug agent and pain-killers.

LAL (Limulus-Amoebocyte-Lysate)

It is determined from the crab *Limulus polyphemus*, is utilized within the shape of the LAL test for the touchy location of pyrogenic lipopolysaccharides (LPS) from gram-negative microscopic organisms. Genuine pharmacopoeia, e.g. European Pharmacopoeia, endorse the LAL test to check the nonattendance of LPS in parenteralia.

GFP (Green Fluorescent Protein)

It was to begin with separated from the jellyfish *Aequorea victoria*. It is utilized as natural marker for naming of cellular structures in vitro and in vivo. For comparable purposes, phycoerythrin and other colors from photoautotrophic cyanobacteria are utilized. In creating living beings GFP and comparable proteins have conceivably the work to act as light driven electron exchange.^[13]

TRABECTEDIN:

Trabectedin may be a present compound that is derived from a marine organism, *Ecteinascidia turbinata*. It is tetrahydroisoquinoline organic compound. It's the primary type of therapy drugs accepted within the Europe for cancer called Associate in nursing anti-neoplastic.

3. EFFECTS OF DIVING WITHIN THE MARINE ENVIROMENT WHILE STUDYING OR GATHERING THE MARINE PLANTS

Exposure to the underwater environment is increasing as a result of the medical gold rush occurring the ocean floor. Bio prospectors are scouring the ocean for microorganisms and plants that naturally manufacture chemical compounds used for biodefence and health



sweetening. These compounds are extracted, analyzed and synthesized for potential human use.

1) Bites/Envenomation

Abrasions, bites, and lacerations are sometimes the results of a marine creature's instinct to safeguard itself against a perceived danger. Several invertebrate and vertebrate animal species have developed natural defense mechanisms, a number of that involves envenomation, with many species motility the threat of significant injury or death. Coral poisoning could be a lot of virulent version of coral infection because the symptom includes chills, fever, swollen humor glands and putrid discharge from the wound. Coral scrap is one in every of the foremost common injuries to diverse as they play important amounts of your time round the marvelous communities of corals. The mechanism of a coral injury involves the depositing of living organisms into the wound caused by the contact with the rigid stone structure.

2) Arterial gas embolism (AGE)

Arterial gas embolism occur secondary to pneumonic barotrauma once gas is forced into the pulmonary vasculature blood vessel gas embolism may be a major reason for death in diving and also the initiating cause (pulmonary barotrauma) sometimes goes unseen. Caused most frequently by the growth of metabolic process gases throughout ascent, it additionally happens once the breath is command throughout ascent from a dive, once there's native pneumonic pathology, once there's dynamic airway collapse within the non-cartilaginous airways and if there is low pneumonic compliance, significantly if this is often not distributed equally throughout the lungs.

3) Nitrogen narcosis

Nitrogen Narcosis additionally referred to as chemical element high spirits or raptures from the deep may be a reversible alteration in consciousness that happens whereas skin diving at depth. Chemical element fraught affects the brain by acting as an anaesthetic manufacturing a state like alcohol intoxication or inhalation anesthetic inhalation, and might occur



throughout shallow dives, however sometimes doesn't become noticeable till larger depths, on the far side thirty meters (100 ft). Apart from He and Ne, all gases that may be breathed have a narcotic result. This result is systematically larger for gases with a better lipide solubility and there's smart proof that the 2 properties are mechanistically connected.

4) Hypothermia

Hypothermia may be a condition within which core temperature drops below the specified temperature for traditional metabolism and body functions which is outlined as 35°C. 0°C (95.0°F). Blood heat is typically maintained close to a relentless level of 36.5– 37.5°C (98– 100°F) through biological physiological state or thermoregulation.

4. CURATIVE METHODS AND MARINE MEDICINE PROCEDURES

Curative ways and Marine medication Procedures Hyperbaric Oxygen medical care (HBOT) may be a major curative methodology within the treatment of most marine diseases and injuries. It's a procedure wherever a patient is placed into a module referred to as a chamber and subjected to high Oxygen, with the intention of stimulating healing surely medical issues. It absolutely was found that Oxygen saturates the hemoprotein within the blood, and may facilitate patients with routine wounds heal quicker. the general issue with hyperbaric Oxygen medical therapy is that there aren't plenty of medical faculties that really teach physicians regarding it as a result of the instrumentation is simply too expensive.

The major disadvantage of Hyperbaric Oxygen Therapy is that it's not 100 percent safe, like any process, there are risks concerned cherish element toxicity, temporary myopia and cavum injuries. Some individuals have suffered minor injury to their lungs, their eyes, and their nasal airways; most of the time, the injuries are temporary. On rare occasions, patients suffer temporary sightlessness. Hyperbaric Oxygen Therapy is usually recommended to be used on patients with Air or gas embolism, carbon monoxide gas poisoning, Acute traumatic anemia, Exceptional blood loss, toxic condition, bends, Some non-healing wounds, progressive emphysematous necrosis, Necrotizing infections, Some cases of osteitis, Radiation effects, Compromised skin flaps and Burns.



5. DISCUSSION

Marine medication treatments are the topic of clinical trials associate degreed long studies with a history of safety to make a treatment protocol. Before a brand-new treatment or drug is approved to be used on the general public, it goes through an in-depth testing method, first within the laboratory, and so through many layers of patient testing. The ocean has a huge vary of diverseness that remains for the most part unexploited. Medicine from marine sources provides hope as novel mechanisms to fight a number of the foremost debilitating sickness of man such as: HIV, pathology, Alzheimer's sickness and cancer.

6. CONCLUSION

The good thing about marine medication is that the work of allopathic practitioners is subject to rigorous safety and effectiveness protocols. Treatments and medications pass a strict review before a patient will receive them. Although, the value of developing these medicines from marine sources are prohibitory within the past, the event of latest technology and a larger understanding of marine organisms and their system are permitting analysis during this space. thus there's a dire would like for property within the ever broadening fate of the ocean to produce and sustain a high momentum of analysis in marine medication, there's a requirement for additional trained diverse, who will create collections from the deep ocean, biologist for identification of latest species and marine chemist for fast isolation and characterization of pure compounds in spare quantities. Spare resource is required to sustain the varied activities for swish and fast implementation.

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