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Journal of Pharmaceutical and Biological Sciences

Journal homepage: https://www.jpbs.in/

Editorial

Tides of healing: Unlocking the therapeutic potential of marine drugs

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ARTICLE INFO

Article history:
Received 20-01-2024
Accepted 28-01-2024
Available online 01-02-2024

Organic compounds derived from microorganisms, animals, and plants as well as minerals have been utilized for centuries for alleviating medical conditions within humans. Because of many obstacles, the pharmaceutical industry's investigation into renewable resources has been declining during the previous few generations. However recent advances in spectroscopy, analytical innovations, and large-scale screening have greatly resurrected the therapeutic identification process for natural products, particularly marine-based medications. If properly investigated, the marine environment is an extraordinary asset that has a vast variety of organisms and has an opportunity to produce ground-breaking treatments. As more and more chemicals derived from marine sources make their way into human trials, this discipline's influence on the world of medicine is expanding.[1]

The manufacturing of novel pharmaceuticals heavily relies on organic products.[2] Compared to land-based sources and non-marine microbes, marine organisms are among the most attractive for the production of natural goods because of their broad spectrum and abundance of bioactive chemicals. Even while renewable resources have long been used to identify drugs, the marine ecosystem, which makes up seventy percent of the surface of the planet, continues to remain largely untouched. Different from the terrestrial versions, these chemical-based barriers are unique and powerful due to close rivalry for few resources.[3] An astounding array of secondary metabolites is fostered by the ocean's dynamic surroundings, which are marked by considerable fluctuations in pressure, salinity, pH level, temperature, nutrition accessibility, and light.Because of this variety between molecular makeup and biological behaviors, marine settings present an intriguing opportunity for the identification of new products with conceivable applications across a range of industries, most notably medication synthesis.[4]

It is being shown that the marine environment is an invaluable repository of molecules with unusual and distinctive chemical attributes, which can be used to inform chemical reactions and molecular simulations to create novel medications with improved therapeutic precision and effectiveness. Marine organisms evolved remarkable metabolic abilities via the synthesis of substances with highly specialized and powerful operations.[5] These molecules, which are frequently referred to as secondary metabolites, are typically restricted to a specific taxonomic family, genus, species, or even organism. They are distinguished by their great variety and frequently make up a relatively small portion of the creature's overall biomass.[6] This process mostly takes place in sluggish or sessile creatures (such as bryozoans, algae, sponges, cnidarians, and tunicates), which rely on chemical barriers to stay safe in the absence of structural safety or efficient evacuation routes.[7] However, a lot of species can extract secondary metabolites from their food and transform them into rather hazardous variants that are useful for purposes other than

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https://doi.org/10.18231/j.jpbs.2023.012

those for which they were intended.[8] Furthermore, naturally occurring substances that are discharged into water must be quite powerful to maintain their effectiveness.[9] Because of these variables, it is generally acknowledged that a vast array of naturally occurring pollutants (NPs) and unique chemical compounds found in oceans may have applications that are beneficial to people and the economy in the long run.

In terms of history, the earliest known marine commodity was the dye Tyrian purple, which the Phoenicians produced from marine mollusks in 1600 BC. The subject of marine plant-based goods had long been preoccupied with fish and marine algal metabolites. Prominent instances include fish liver oil-derived vitamins A and D, marine biopolymers such as agar and carrageenan, and polyunsaturated fatty acids such as docosahexaenoic and eicosapentaenoic acid. The 1950s saw the discovery of spongothymidine and spongouridine from the Caribbean sponge Tethya crypta, which marked the beginning of the actual creation of marine drugs.[10] The fungus Acremonium chrysogenum, which had been discovered from Mediterranean saltwater specimens around Sardinia in the 1940s and generated cephalosporin C, served as the model for the invention of the cephalosporin antibiotic class.[11] The elevated prostaglandin concentration in the Gorgonian Plexaurahomomalla was reported by Weinheimer and Spraggins in 1969.[12] There has been a noticeable rise in patent applications for marine natural products since the mid-1980s, according to available data.[13] The majority of chemicals are derived from marine invertebrates. In the interim, there is a growing interest in marine microbes.[14]

Water covers almost two-thirds of Earth and is home to a vast array of valuable resources, including medicine and nourishment. Over the past, mankind has been ingesting sea goods like sea salt, which is made by directly evaporating seawater, and other seafood. The initial identification of the deadly molecule arabinosyl thymidine, also known as spagnothymidine, in the 1950s[15,16] piqued the curiosity and optimism of numerous pharmacists and biomedical investigators working on the potential medicinal properties of organic compounds originating from the sea. Many marine chemicals or synthetic equivalents of marine substances were found by committed investigators and scholars worldwide after their initial finding.[17,18] Before 1970, 2 significant marine-derived medicinal substances were utilized in medical settings: cytarabine (also known as arabinosyl cytosine, or ara-C) and protamine sulfate. Vidarabine (also known as arabinosyl adenine, or ara-A) was introduced in 1976. A different approach marine chemical, ziconotide, was authorized for medicinal purposes after over thirty years. Following that, there has been a lot of curiosity from investigators in looking at marine organisms to find new drugs.

Conflict of Interest

None.

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Cite this article: Tamboli FA. Tides of healing: Unlocking the therapeutic potential of marine drugs. *J Pharm Biol Sci* 2023;11(2):70-71.