

## **Prospects and Challenges of Drug Discovery and Development from Biodynamic Molecules of Marine Origin**

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Man has been venturing the oceans for his livelihood since ancient times. Over 500,000 species in 30 phyla live in water. Hence, the ocean is rightly considered to be an untapped source of many things including potential drugs. Further, the unprecedented population growth; unchecked industrial expansion and urbanization have diverted the human attention for ocean exploitation. The marine environment, with its rich variety of organisms, have to adapt to extreme marine environmental conditions such as high pressure, high salt concentration, low nutrient concentration, low but steady temperature, limited sunlight, and low oxygen content. To acclimatize to these conditions and to survive in the competitive environment, marine organisms synthesize biologically active secondary metabolites. These biodynamic substances have been isolated both from marine fauna and flora including microorganisms leading to increased interest in marine organisms as potential sources of pharmaceutical agents in current years. A recent census of marine life that involved the participation of 2700 scientists from over 80 nations assessed the diversity, distribution and abundance of marine life resulted in the discovery of over 6000 potentially novel species. As a consequence of these research efforts, it is clear that the marine environment represents an important source of unknown natural compounds whose medicinal potential must be evaluated. Efforts to exploit this biodiversity through the identification of new chemical compounds approximately 22,000 natural products of marine origin have been discovered so far, whereas 131,000 terrestrial natural products exist. The major sources of bioactive compounds are sponges (37%), coelenterates (21%) and microorganisms (18%) followed by algae (9%), echinoderms (6%), tunicates (6%), molluscs (2%) bryozoans (1%), etc

Seaweeds or marine macroalgae became an industrial resource much earlier than marine invertebrate and marine microorganisms (including phytoplankton). They constitute one of the commercially important marine living renewable resources. Apart from industrial production of agar, agarose and carrageenan from seaweeds, utilisation of seaweeds in food and pharmaceutical industries has recently achieved a great quantum leap due to rapid innovative technology to enhance the biomass production of highly nutritive species and improvement in the quality of algal products. Also, considering their great taxonomic diversity, investigations related to the search of new biologically active compounds from most species of red, brown and green algae indicates that the novel compounds from marine algae are more suitable as potential drugs than those from marine invertebrate. In the classical Indian, Ayurvedic and Siddha

system of medicine, a little has been reported regarding the medicinal use of seaweeds. Seaweed has been employed as dressings, ointments and in managing ulcers and gynecological problems. There are numerous reports of compounds derived from macroalgae with a broad range of biological activities, such as antibacterial, antiviral, anticoagulant, antiulcer, and antifouling. In order to use seaweeds as nutraceutical and pharmaceutical agents for health and disease, an attempt was made to screen a few commonly available seaweeds of the Gulf of Mannar Region (Mandapam, Thoniturai and Rameshwaram) for the various pharmacological activities such as anti-tumor, anti-venom, anti-ulcer, hepatoprotective, anti-oxidant, hematinic, urolithiatic, anti-inflammatory anti-cancer and anti-arthritis activity and analyse the chemical composition of these algae for bioactivity. Some of the interesting results of *in-silico*, *in-vitro* and *in-vivo* studies would be addressed as a part of drug discovery and development from the bountiful oceans.