

Advances in Anticancer & Marine Drug Research: An Overview

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Abstract

Out of earth's total surface area, more than 70% is covered with marine/salty water. World oldest, most revered & holy texts, the Vedas, term the Ocean as 'Ratnakar', or the bestower of immense riches. From times immemorial the oceans have been a source of inspiration, awe & adventure for Humankind. Modern science for the first time in the nineteen fifties discovered for the first time, potent bioactive, chemical compounds from marine organisms. Apart from Marine & Natural Products Drug research, several Vascular Disruptive agents, as anticancer drugs have also been synthesized. Thus, today we have a diverse range of better anticancer agents.

Keywords: Anticancer; Marine organisms; Vascular Disruptive Agents; Cytotoxic chemicals; Bryostatins

Introduction

Anticancer drug research, has now centered around Marine Drug Research, as secondary metabolites from marine organisms, have proved to possess remarkable cytotoxic properties. Ara-C, & related nucleotides, was the foremost discoveries of cytotoxic metabolites from marine fauna. These secondary metabolites are bio-synthesized in the organisms, as a means for offense or defense, in order to sustain their existence in an otherwise highly hostile marine environment. Umpteen number of cytotoxic organic compounds have been isolated from marine organisms, particularly marine fauna. Some of these like, the Bryostatins, are in final stages of pre-clinical trials, and are on the way of becomes potent drug leads in the future. The unfortunate trend of global warming & climate change has dealt a severe blow to the natural habitats, threatening the very existence of

most of economically valuable marine organisms, which can be a gold mine of priceless chemicals [1]. Due to unusual warming of tropical oceans, several smaller invertebrates have almost disappeared as the drastic change in climatic conditions, proved too harsh for them to tolerate. This climatic change has adversely affected both the flora and fauna of the marine ecosystems.

Marine environment is complex in nature, which is a challenge to the organisms, & it only permits the survival of the fittest. Most small-sized marine organisms are filter-feeding in nature. In the hostile marine environment, predation is the main source of survival. Thus, the offensive & defensive mechanisms are very advanced in marine organisms. The biochemical processes in these organisms are specially designed to synthesize potent cytotoxic chemicals, to boost their weaponry of offence & defence. These cytotoxic

compounds help them prey, & also save their lives & defend themselves, when attacked, by a stronger predator [2-5].

This fact that these organisms produce & store such cytotoxic chemicals, as secondary metabolites, make them favourite & lucrative destination for scientific investigation, targeted towards Anticancer Drug discovery. Research in exploring bioactive secondary metabolites, from the ocean has yielded several promising compounds, & as much as, even some QSAR studies have also been attempted on these cytotoxic compounds [6].

Apart from Marine Drug research, several anticancer compounds have also been obtained via the synthetic route. Prominent among such synthetic compounds, are Vascular Disruptive agents, which destroy cancer cells, by blocking their nutrition supply, from adjoining healthy tissue, surrounding the tumour vasculature. Due to this extraordinary mechanism of action, & resulting comparatively lesser adverse effects, these compounds hold immense promise for the future [7].

In addition to these somewhat well acclaimed sources of anticancer compounds, even some heterocycles active as anti-fertility agents, can also be found active as anticancer agents. Although development & usage of such compounds, is more likely to be focused at anti-breast cancer therapy [8]. This possibility stems from the striking similarities between the biochemical and hormonal mechanisms associated with fertility, conception, menopause, breast cancer, etc.

Marine & natural resources will always be marred by the problem of supply, particularly because the demand for such drugs is always on the rise. This problem can be taken care of by developing synthetic drugs, such as Vascular Disruptive agents. Apart from these, some attempts at commercial, artificial culture/ production of marine organisms, & even efforts are also on, towards total synthesis of select anticancer compounds. Although, total synthesis is a technologically challenging & an expensive way of drug development.

Conclusion

To sum up, there are umpteen number of possibilities, regarding search of potent anticancer compounds, both via the marine/ natural, as well as the synthetic routes. Marine sources can proved to be the most economical sources, if the problems related to a regular supply of marine organisms, and losses due to climate change, are

taken care of. An attempt towards artificial farming/harvest of marine organism has been initiated in California, where Bryozoans like, *Bugula neritina* are being artificially harvested for extraction of cytotoxic Bryostatins. If such artificial harvests succeed, the supply problem of marine organisms will be addressed to a great extent. Then, we will have the liberty to extract the quantities of required compounds, almost at will.

Similarly, the advances made in the area of Vascular Disruptive Agents, are also remarkable, and give us a hope that anticancer drugs, with greater selectivity and efficacy, and reduced adverse effects, will soon be a reality. Recent developments hold great promise for anticancer drug development in the future.

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