



# Marine Anti-Cancer Compounds and Adverse Effects of Global Warming on Oceans: An Overview

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**Mini Review**

**Volume 8 Issue 4**

**Received Date:** October 16, 2024

**Published Date:** November 08, 2024

**DOI:** 10.23880/oajpr-16000323

## Abstract

More than 70% of the Earth's surface is covered with marine water. World's oldest, most revered and holiest texts, the Vedas, term the Ocean as 'Ratnakar', or the bestower of immense riches. Over the past decades, global warming, climate change has resulted in higher atmospheric concentrations of carbon dioxide. This excess carbon dioxide has been absorbed by our oceans resulting in ocean acidification. The ocean acidification has its adverse effect on marine flora and fauna, causing bleaching of coral reefs and extinction of several rare marine species, including marine invertebrates. These invertebrates are a source of precious bio-chemicals, which are synthesized and stored within their bodies as secondary metabolites. Most of these chemical compounds possess valuable cytotoxic properties. To extract these biometabolites, the organisms are carefully collected and preserved in a suitable solvent, till they reach the laboratory. Thereafter, they are subject successive extraction &/or, successive fractionation as per the protocol. Chosen fractions are purified further, using sophisticated techniques to isolate, characterize and identify pure chemical compounds. These compounds are then evaluated for their bioactivities, for discovering better drugs. This valuable biodiversity needs to be preserved for future generations.

**Keywords:** Marine Organisms; Filter-Feeding; Marine Invertebrates; Secondary Metabolites; Cytotoxic Compounds; Flora and Fauna; Global Warming; Climate Change; Ocean Acidification

## Introduction

Since times immemorial, the oceans have been considered full of riches and even called 'Ratnakar', or the bestower of jewels, in the worlds oldest and most revered, holy texts, the Vedas. Among other things, the oceans have the richest Bio-diversity, which includes marine invertebrates and other smaller organisms [1]. These are mostly sedentary, almost defenseless, mainly filter-feeding organisms, which synthesize several secondary bio-metabolites, for multiple purposes of preying, offence and defence. These bio-metabolites possess rich biological activities and have the potential to cure several deadly diseases, including Cancer [2].

For the purpose of extracting these useful chemical compounds, the organisms are collected from Sea and brought to the laboratory for necessary chemical processing [3].

These organisms which are collected from the ocean are brought to the laboratory and during their travel care and caution is exercised to ensure that they reach the laboratory in completely unaltered form that is, in their natural form as they are found in their habitats in the sea. Organisms on arrival in the laboratory are subjected to extraction, successful extraction, successive fractionation, depending upon the approved protocol designed for the purpose. The

objective is to isolate valuable chemicals, which are stored in the Marine organism's body as secondary metabolites [4].

The solvents used for the extraction and fractionation of the chemical compounds are the bio-metabolites stored in the body of the organisms are chosen very judiciously to avoid any undesirable metabolic alteration, or artifact formation. The aim is to isolate, purify and characterize the natural compounds in their original state. So it is important that the solvent chosen for the purpose must not react with the desired chemical compound [5]. The compound once isolated and purified from the organism is then subjected to evaluation of its biological activity to ascertain its therapeutic potential.

Many bioactive and cytotoxic compounds, including high molecular weight alkaloids have been isolated from marine invertebrates, particularly marine sponges. Of late, we have seen the unfortunate destruction of many natural habitats such as coral reefs, mangrove forests all over the world where these Marine organisms live, feed, reproduce and complete their life cycle, due to destruction of this natural habitat [6]. The primary reason behind the destruction of this natural habitat is climate change, ocean acidification and warming of our oceans. We have seen a significant rise in the number of Sea storms, where no storms or, very few storms used to occur during the past decades. For example, the Arabian Sea has seen a notable rise in the number of storms and cyclonic rainfall due to the warming of oceans. The warming of oceans has resulted in complete extension of several species which used to occur earlier mainly in the subtropical region. Nowadays, the hot ocean temperature region along the equator is widening and spreading both towards North and South of the equator. Due to this unusual phenomenon, the species which were once found in the areas away from the equator now are under constant threat and most of them have already disappeared, or are on the verge of extinction [7].

Similarly, our coastlines all over the world are under threat to be engulfed by the encroaching ocean. This is a grave threat and we have already lost many islands and several low lying areas along the coastline all over the world. This can be arrested / reversed with a few remedial measures, concerted efforts which will yield positive results only after several years or decades, provided we start today [8]. We need to plant giant Ficus trees, mangrove forests, along the coastline, dig deep freshwater trenches all along the coastline to prevent the salty water from percolating / seeping and spoiling the underground freshwater. Once the coastline is saturated with fresh underground water, coupled with the giant Ficus trees with their elaborate root system and supported by the salt resistant trees and plants, such as mangroves, we can protect our coastline and then may attempt to reclaim the land back from the ocean. In order to reclaim the land back from the ocean we need to convert the

coastal sand into fertile soil and for this we need to plant salt resistant plants to reduce the salt content from the soil, treat the soil by adding organic manure to it over a period of time and increase vegetation, rich humus accumulation on the sandy soil slowly till it is converted into fertile soil [9]. Once the sandy soil is converted into fertile soil we can succeed in reclaiming the land from the ocean and in pushing the ocean back, so as to reverse these encroaching phenomena we need to do urgently take pro-active steps in this direction, wherever possible. We should try our level best to achieve these goals. Yes, it is not possible everywhere, but it can be done at least in some places. The conversion of sand into fertile soil may not be an easy task but through a multipronged long drawn strategy, we can achieve the desired results because we are losing immensely due to global warming, so we need to shun the fear of failure we have no other option but to start all such efforts at a war footing [10].

Why not starve the sea/oceans of the fresh water? We can minimise the draining of freshwater through a rivers into sea upto 70% or more, in most cases. have no data to support my statement still I believe that we can arrest about 70% of the water being drained into the sea in most of the cases canals reservoirs ponds can be built/erected along the whole course of the river till it meets the sea so that we can draw maximum freshwater out of the river before it finally reaches the sea. The withdrawn river fresh water may also be diverted into deep fresh water trenches/canals dug all along the coastline, which will also strengthen the coastline, raise the ground water level and prevent the pollution of ground water by percolation of salty sea water [11]. Such trenches may be flanked by green-belt, including giant Ficus trees. The stepwise withdrawal of freshwater by means of canals and diverting them into various ponds and reservoirs as per convenience can reduce the volume of fresh water being drained into the sea. So, by all these concerted, planned strategy (which can be modified, as the situation demands), we can help arrest the encroaching ocean and the rising ocean levels. Reversing Climate Change is essential to save planet Earth and all life on it, including Humanity.

Involvement of local residents, tribals, fishermen communities is mandatory, for achieving sustainable development goals, green/ organic farming and similar initiatives need to be welcomed and encouraged [12].

Everyone needs to contribute to this existential cause, on which the future of mankind depends completely.

### Acknowledgements

The author thankfully acknowledges the Divine blessings and encouragement by his Spiritual Master Satguru Madhu Paramhans jee Maharaj ([www.sahibbandgi.org](http://www.sahibbandgi.org)). The valuable

support rendered by Amoolya Pandey is also acknowledged.

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