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Marine Toxins: A New Tool Against the Diseases

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The different species of microscopic planktonic algae are the principal sustenance for filter-feeding organisms – mainly bivalve shell-fish – and also constitute an important food source for some crustaceans and fishes. There are about 5000 known marine algal species and approximately 300 of them can grow disproportionately, producing the so-called Harmful Algal Blooms (HABs), which are also known as 'red tides', because the discoloration of the water. This excessive growth has diverse severe effects. The microalgae can form a dense surface layer, which can lead to oxygen depletion, causing the death of fish and invertebrates.

Additionally, some species can produce potent toxins (named phycotoxins) that rarely affect to filter-feeding species, but which can bio-accumulate through the food chain, being consumed by animals and finally by human beings. There are two different classifications of the marine toxins: by their structure and by the symptoms observed in experimental animals and in human beings.

The symptomatology produced by the consumption of intoxicated seafood (and less frequently by intoxicated fishes), is very varied. The most frequent effects are gastrointestinal illness (diarrhoea, nausea or abdominal cramps), although neurological and cardiovascular alterations can be also produced by several phycotoxins.

Even a small group of phycotoxins is able to produce the death after the consumption of contaminated seafood. This is the case of the domoic acid, the main constituent of the Amnesic Shellfish Poisoning group, which is responsible for several neurological alterations (including the loss of short-term memory, effect which gives the name to this group), and in the year 1987 it produced the death of four people.

The interest of both the scientific community and the media in marine toxins has increased through the last years. This interest might be due to the major frequency of the HABs or the important health and economic repercussions of the HABs in some economies through the world, such as the seafood production of Japan, Spain, Chile Ireland or Canada.

Nevertheless, in spite of the repercussion of the marine toxins in the health of the human beings, some scientists have started different research lines trying to elucidate not the pernicious effects of their consumption, but trying to use these phycotoxins for the benefit of human health.

Because, what is essentially a toxin? A toxin is only a compound (naturally or artificially produced), able to provoke some kind of injury or a damage in a living organism. Therefore, a toxin is an active compound and it is possible that it may cause some useful effects.

That is the idea of some research groups, to study their effects by different ways (employing *in vitro* and *in vivo* assays), in order to demonstrate the potential use of these natural products. These beneficial effects are very varied, comprising anti-bacterial or anti-viral activities.

The yessotoxin, a marine compound able to produce important injuries in heart with important cardiovascular alterations, has been observed to have anti-allergic activities. Other phycotoxins are involved in anti-neoplastic activities, with the advantage that in the cancer treatment many side-effects are accepted in order to obtain results fighting against this illness.

Even some illness with a high complexity, such as Alzheimer's disease, can be liable to be treated with marine compounds or its derivatives. An example is the potential use of gambierol, a ciguatoxin, or its derivatives in the treatment of this illness. The gambierol is a neurotoxin and it has been discovered that it is able to attenuate the amyloid-β and tau pathology, two of the main characteristics of Alzheimer's disease. Other example is the employment of marine products in the treatment of infectious diseases, like the AIDS. Some algal polysaccharides are able to inhibit the penetration of HIV into human mononuclear cells, give us a new weapon against an illness which affects to almost 40 million people.

Additionally, some phycotoxins are such highly active compounds that the same toxin might be useful in the treatment of different illness. The yessotoxin I have cited previously can be useful not only in the treatment of the allergy, but it also exhibits an anti-tumoral activity. Other important advantage is the origin of these chemical compounds. The natural production of the phycotoxins would be useful when an important effect is discovered.

Research in marine compounds, and concretely the research in phycotoxins, is a fertile field in the future. Not only to understand the mechanisms of action of these compounds can be useful in order to avoid their pernicious effects in human health. Their potential use in the treatment of many illness might be an important area which should be taken into account in the coming years.

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