

The Ocean – A Treasure Trove for Human Medicine



The ocean is home to a vast variety of organisms, diverse in their adaptations to the marine environment. Marine organisms produce an abundance of natural products to defend themselves against predators, to locate mates, to communicate and to compete for space and food. Many of these compounds have no terrestrial equivalents and are unique in terms of chemical structure and biological activity.

Studying the physiology of marine organisms (the study of how an organism and its body parts function) and their natural products has increased knowledge of how our own bodies function and uncovered new medicines to treat disease. These are compelling reasons why we need to protect marine biodiversity into the future. There is much more to discover.

» THERE ARE 7 MARINE-DERIVED MEDICINES IN CLINICAL USE

Compound	Disease Area	Marine Organism	Species
Trabectedin	Cancer	tunicate	<i>Ecteinascidia turbinata</i>
Eribulin Mesylate	Cancer	sponge	<i>Halichondria okadai</i>
Cytarabine	Cancer	sponge	<i>Cryptotethya crypta</i>
Brentuximab vedotin	Cancer	mollusc	<i>Dolabella auricularia</i>
Ziconotide	Chronic pain	cone snail	<i>Conus magus</i>
Vidarabine	Antiviral	sponge	<i>Cryptotethya crypta</i>
Omega-3-acid ethyl esters	Hypertriglyceridemia	fish	Oily fish such as mackerel and anchovy

Many more compounds are currently going through clinical trials to treat conditions such as schizophrenia, Alzheimer's, chronic pain and cancer. Hundreds more compounds isolated from marine animals, algae, fungi and bacteria have been shown to have antibacterial, antifungal, antiprotazoal, antituberculosis, antidiabetic, anti-inflammatory and antiviral activities.



» MARINE ORGANISMS TELL US A LOT ABOUT OURSELVES

- As well as being a source of medicines, studying marine organisms increases our knowledge of human physiology and disease. It is the specific adaptations of organisms to the marine environment that makes them so valuable as models.
- **Sharks and the immune system:** Sharks have an immune system with the same fundamental components found in humans. This makes them a good comparative model for studying features of the immune system including autoimmunity (the immune response of an organism against its own cells and tissues), which is the underlying cause of several human diseases such as lupus and rheumatoid arthritis. Sharks also have some extraordinary immune mechanisms which mammals lack, offering exciting new possibilities for immunotherapeutics (using the immune system to fight disease).
- **Sea urchins and the cell cycle:** Sea urchins produce huge quantities of large, clear eggs that lack external coatings, making them ideal for studying the cell cycle, the sequence of events in which a cell reproduces its genetic material and then divides. The discovery of cyclins (a group of proteins that regulate the cell cycle) in sea urchin eggs in 1982 revolutionized the study of the mammalian cell cycle and paved the way for new research into the diagnosis and treatment of cancer.
- **Squid and the nervous system:** The squid giant axon (a nerve fibre that transmits nerve impulses) is 1000-fold larger than vertebrate axons. Its discovery opened up new avenues for researching the nervous system. The concepts that emerged from this research formed the basis for diagnosis and treatment of disorders of conduction in nerves and other tissues such as heart and skeletal muscle.

» HELP PROTECT MARINE BIODIVERSITY

An estimated 91% of marine species still await description. Any one of these species could be holding the key to the next disease treatment.

Leave only bubbles: When diving or snorkeling, don't touch coral reefs or marine life, or take souvenirs.

Select sea-friendly souvenirs: Don't buy jewellery and products made from marine animals or animal parts, including shells, coral and turtle shell.

Choose non-toxic cleaning products and low-phosphate detergents: Products that go down the drain can eventually end up in the ocean and harm aquatic life. Many household chores can be done with simple ingredients like vinegar, baking soda, or lemon juice.





Find out more about initiatives you can get involved in and the everyday actions you can take by visiting the Sea Change website.

Remember
**OUR OCEAN
OUR HEALTH**

Key Information Sources and Further Reading

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A colony of *Ecteinascidia turbinata* which is the source of the anticancer agent trabectedin.



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The ascidian *Aplidium albicans* is the source of an anticancer agent called plitidepsin, which is currently going through clinical trials.

