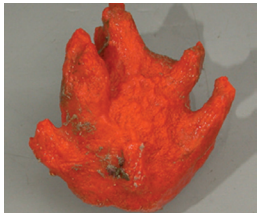
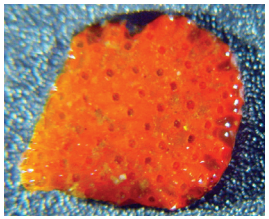
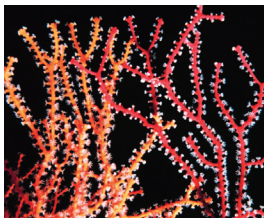
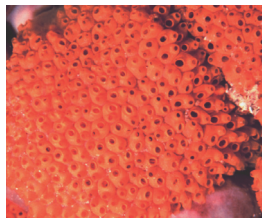
The Ocean Drugstore

Does this look like a drugstore?

Some of our most widely-used drugs come from nature:

- *Aspirin was first extracted from the willow tree*
- *Morphine is extracted from the opium poppy*
- *Penicillin was discovered in common bread mold*

Historically, almost all of our drugs from natural sources came from plants and animals that live on land. But recent searches for new drugs have discovered that marine invertebrates (animals without backbones) produce more antibiotic, anti-cancer, and anti-inflammatory substances than any group of organisms on land. Strangely, many of these substances come from animals that spend most of their lives just sitting around. If you looked at these animals in an aquarium, you would probably get bored pretty quickly because they don't move, and just look like blobs or skinny plants. And because they don't look very interesting, you might assume that they are not important.

But guess again! These unimpressive animals may hold the key to curing some of the most serious diseases that affect humans! Here's a way that you can help teach other people not to jump to conclusions about the importance of ocean animals.

NOAA's Ocean Explorer Program has supported several expeditions to search for new drugs from the sea. The 2003 Medicines from the Deep Sea Expedition was the first scientific exploration of marine organisms from deep-water habitats in the Gulf of Mexico. Samples collected during the Expedition are being studied by scientists at Harbor Branch Oceanographic Institution for chemicals that may lead to new ways to treat cancer, infectious diseases, disorders of the immune and central nervous systems, and cardiovascular disease.

What You Will Do

Make a poster to explain that we should protect animals that seem unimportant because they may provide new drugs for treating diseases such as heart disease, arthritis, and cancer

What You Will Need

- ❒ Copies of images from "Some Animals That Produce Raw Materials for New Drugs"
- ❒ Crayons, colored markers, or colored pencils
- ❒ Poster board
- ❒ Scissors (Be careful with sharp scissors!)

How to Do It

1. Use images and information from the worksheet to create a poster that explains why it is important to protect seemingly uninteresting ocean animals using the fact that these animals may be sources of important new drugs for treating human diseases.

2. Show your poster at school, to your parents, and to other groups. The more people know about the importance of ocean life, the more they will support actions to protect ocean resources.

Want to Do More?

Visit *http://oceanexplorer.noaa.gov/explorations/03bio/welcome.html* for more about the Ocean Explorer Medicines from the Deep Sea Expedition.

This activity was adapted from Chemists with no Backbones (4 pages, 356k) by Mel Goodwin, The Harmony Project, Charleston, SC; from the Ocean Explorer 2003 Medicines from the Deep Sea Expedition [http://oceanexplorer.noaa.gov/explorations/03bio/background/edu/media/Meds_ChemNoBackbones.pdf]

Competition for resources is intense in habitats such as reefs. Many of the sessile invertebrates produce natural products to help them be more competetive. Photo courtesy John Reed, NOAA.

Why Do Simple Animals Produce Powerful Drugs?

Many of ocean animals that produce powerful substances are sessile, which means that they do not move. This may give a clue about why they produce these substances: Basically, these animals are "sitting ducks," so they may use powerful chemicals to repel predators. Another possibility is that since many of these species are filter feeders, they are exposed to all sorts of parasites and disease-causing bacteria in the water; so the powerful chemicals may be a defense against parasites or antibiotics against disease-causing organisms. Competition for space may explain why some of these animals produce anti-cancer substances: If two species are competing for the same piece of bottom space, it would be helpful to produce a substance that would attack rapidly dividing cells of the competing organism. Since cancer cells often divide more rapidly than normal cells, the same substance might have anti-cancer properties.

Some Animals That Produce Raw Materials for New Drugs

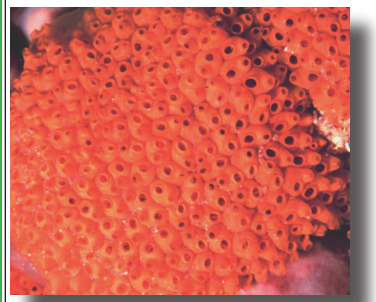


Photo courtesy NOAA.

This is a colony of tunicates. Tunicates are animals whose body is basically a sack with two openings called siphons through which water enters and exits. Small particles filtered out of the water are used for food. They are called tunicates because their body wall resembles a coat or "tunic." Some tunicates produce a chemical called Ecteinascidin, which is being tested in humans for treatment of breast and ovarian cancers and other solid tumors.

Photo courtesy NOAA.

Sponges are the most primitive invertebrate animals that are composed of more than one cell. They do not have tissues or organs, but some of their cells are specialized to perform specific functions. Sponges of the genus *Forcepia* produce substances called Lasonolides, which may provide new treatments for cancer. Other sponges belonging to the genera *Topsentia*, *Hexadella*, and *Spongosorites* produce a chemical named Topsentin, which is an anti-inflammatory that may be helpful in treating diseases like arthritis. Deep-sea sponges of the genus *Discodermia* produce a tumor-fighting substance called Discodermalide.

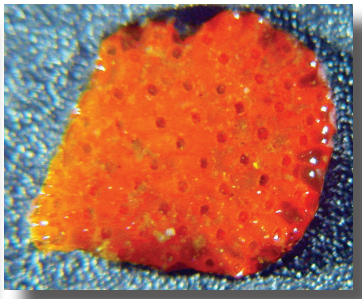
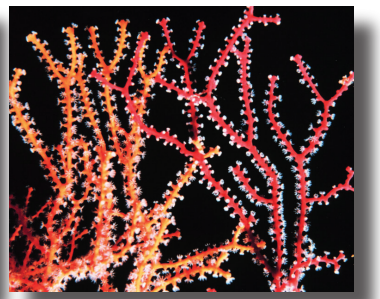


Photo courtesy NOAA.

Bryozoans are small, moss-like animals that do not move. They feed on very small floating animals called zooplankton. Some bryozoans produce a chemical called Bryostatin that may be useful in treating certain types of cancer such as leukemia and melanoma.



Courtesy Photo Collection of Dr. James P. McVey, NOAA Sea Grant Program

Gorgonians are a type of soft coral, also called "sea whips." *Pseudopterogorgia elisabethae* is a sea whip that produces substances called Pseudopterosins (soo-doh-TER-oh-sins) that reduce swelling and skin irritation and accelerate wound healing.

Photo courtesy NOAA.

Cone snails (also called cone shells) are carnivorous marine snails found in coral reefs. In this picture, the cone snail *Conus marmoreus* is eating a cowrie (another kind of snail). Cone snails produce a venom that helps capture food. The venom of some species is powerful enough to kill a human being. The cone snail *Conus magnus* also produces a chemical named ω-conotoxin MVIIA , which is a powerful pain-killer.