Aquatic Antagonists: Sponge Dermatitis

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Sponges belong to the phylum Porifera. They are the second most prevalent life-form in tropical reefs (after corals) and have a widespread distribution in other aquatic environments. Sea sponges vary in color from white to black, red, orange, yellow, and blue. Many sponges contain silica or calcium carbonate crystals, which can cause skin irritation (Figures 1 and 2). A few sponges also sting, and stinging sponges include many of the more colorful species.[1-3] Toxin-containing species include the red-beard sponge (*Micronia prolifera*), the fire sponge (*Tedania ignis*), the touch-me-not sponge (*Neofibularia nolitangere*), and the poison-bun sponge (*Fibulila* species). Signs and symptoms of sponge dermatitis include erythema, edema, tenderness, itch, pain, and arthralgia.

Stinging sponges produce crinotoxins. Stings mainly are reported by divers and collectors, though stings from sponges in aquariums have been reported.[4] *Tedania anhelans* sponges are flame red or orange, making them attractive to collectors. When they wash up on shore, they sting tourists who try to gather them. Immediate effects of the stings include erythema, edema, and pain. Delayed reactions are characterized by erythema, edema, itching, and pain. Vesiculobullous lesions and desquamation have been described.[4]

Dogger Bank itch, a form of allergic contact dermatitis that affects trawlermen in the Dogger Bank area of the North Sea, is caused by (2-hydroxyethyl) dimethylsulfoxonium chloride, a chemical found in the marine sponge *Theonella mirabilis*.[5] The marine bryozoan *Alcyonidium gelatinosum* also contains the chemical and is implicated as a cause of Dogger Bank itch. Bryozoans are coral-like polyps that form mossy colonies. They may be found together with sponges, complicating identification of the causative organism.

The so-called sponge diver's sickness seen in the Mediterranean region is actually caused by *Sagartia rosea*, a small coelenterate that attaches to the sponge. Red moss dermatitis, common among North American oyster fishers, appears to be caused by a scarlet sponge rather than a bryozoan.

Although the classification of sponges is evolving, common taxonomic schemes divide them into 3 major classes. Sponges from the class Calcarea contain spicules of calcium carbonate in the form of calcite. These marine sponges are quite small, many the size of a seed. The class Hexactinellida, known as glass sponges, are deep water marine species that contain spicules of silica. Sponges of the class Demospongiae typically have silica spicules and a collagenous network of spongin. Demosponges are widely distributed in marine, brackish, and freshwater environments. They thrive on the bacteria and organic debris typical of harbors and river mouths. Mediterranean sponges harvested as bath sponges belong to the genus *Spongia*. They have a skeleton rich in spongin fibers, but mature sponges lack spicules.

As a group, sponges are asymmetrical and have no true body cavity. Most sponges are capable of both sexual and asexual reproduction. Sponge cells remain pluripotent throughout the life of the organism, meaning that each cell retains the potential to differentiate into other cell types. All sponges contain water channels. Water enters through pores and exits through a large opening called the osculum. Choanocytes, flagellated cells within the sponge, are responsible for water circulation. Amoebocytes and archeocytes digest and transport nutrients. Amoebocytes also produce the spicules that cause sponge dermatitis.

The southern Australian stinging sponge *Neofibularia mordens* contains neurotoxins and

Accepted for publication December 6, 2006.
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The author reports no conflict of interest.
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Figure 1. This brown tube sponge *(Agelas conifera)* caused sponge dermatitis in the author. The sensation on squeezing the sponge was that of breaking spun glass, with shards of glass puncturing the skin.

Figure 2. Brown tube sponge *(Agelas conifera).*

has antimicrobial properties.[6] *T mirabilis*, another stinging sponge, is promising as a source of pharmaceuticals, including human immunodeficiency virus (HIV)–inhibitory substances. HIV-inhibitory cyclic depsipeptides have been isolated from other sponges such as *Neamphius huxleyi* from Papua New Guinea.[7] Alkaloids from a common Indonesian *Acanthostrongylophora* sponge are active against malaria, *Mycobacterium tuberculosis*, *Leishmania*, and HIV-1.[8] Indo-Pacific sponges contain a variety of manzamine-type alkaloids with anti-inflammatory, antifungal, antimycobacterial, and anti–HIV-1 activity.[9,10] It is an interesting irony that many of the same species that cause dermatitis in humans also may become the source of drugs to cure human disease.

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