

Aquatic Antagonists: Seaweed Dermatitis (*Lyngbya majuscula*)

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PRACTICE POINTS

- *Lyngbya majuscula* causes seaweed dermatitis in swimmers and can be prevented by avoiding rough turbid waters in areas known to have *L. majuscula* blooms.
- Seaweed dermatitis should be included in the differential diagnosis for erythematous papulovesicular rashes manifesting in patients who recently have spent time in the ocean.

The cyanobacterium *Lyngbya majuscula* grows in marine and estuarine environments across the world and produces many biologically active compounds. Direct contact with *L. majuscula* and its dermatoxins can cause seaweed dermatitis, which manifests as a papulovesicular eruption. As oceans warm, *L. majuscula* will bloom more frequently; therefore, public awareness of *L. majuscula* and seaweed dermatitis in oceanside communities can help promote precautions that can reduce the risk for exposure. This article describes the irritants that lead to dermatitis, clinical presentation, and prevention and management of seaweed dermatitis.

The filamentous cyanobacterium *Lyngbya majuscula* causes irritant contact dermatitis in beachgoers, fishers, and divers in tropical and subtropical marine environments worldwide.¹ If fragments of *L. majuscula*

lodge in swimmers' bathing suits, the toxins can become trapped against the skin and cause seaweed dermatitis.² With climate change resulting in warmer oceans and more extreme storms, *L. majuscula* blooms likely will become more frequent and widespread, thereby increasing the risk for human exposure.^{3,4} Herein, we describe the irritants that lead to dermatitis, clinical presentation, and prevention and management of seaweed dermatitis.

Identifying Features and Distribution of Plant

Lyngbya majuscula belongs to the family Oscillatoriaceae; these cyanobacteria grow as filaments and exhibit slow oscillating movements. Commonly referred to as blanketweed or mermaid's hair due to its appearance, *L. majuscula* grows fine hairlike clumps resembling a mass of olive-colored matted hair.¹ Its thin filaments are 10- to 30-cm long and vary in color from red to white to brown.⁵ Microscopically, a rouleauxlike arrangement of discs provides the structure of each filament.⁶

First identified in Hawaii in 1912, *L. majuscula* was not associated with seaweed dermatitis or dermatotoxicity by the medical community until the first outbreak occurred in Oahu in 1958, though fishermen and beachgoers previously had recognized a relationship between this particular seaweed and skin irritation.^{5,7} The first reporting included 125 confirmed cases, with many more mild unreported cases suspected.⁶ Now reported in about 100 locations worldwide, seaweed dermatitis outbreaks

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have occurred in Australia; Okinawa, Japan; Florida; and the Hawaiian and Marshall islands.^{1,2}

Exposure to Seaweed

Lyngbya majuscula produces more than 70 biologically active compounds that irritate the skin, eyes, and respiratory system.^{2,8} It grows in marine and estuarine environments attached to seagrass, sand, and bedrock at depths of up to 30 m. Warm waters and maximal sunlight provide optimal growth conditions for *L. majuscula*; therefore, the greatest risk for exposure occurs in the Northern and Southern hemispheres in the 1- to 2-month period following their summer solstices.⁵ Runoff during heavy rainfall, which is rich in soil extracts such as phosphorous, iron, and organic carbon, stimulates *L. majuscula* growth and contributes to increased algal blooms.⁴

Dermatitis and Irritants

The dermatotoxins Lyngbyatoxin A (LA) and debromoaplysiatoxin (DAT) cause the inflammatory and necrotic appearance of seaweed dermatitis.^{1,2,5,8} Lyngbyatoxin A is an indole alkaloid that is closely related to telocidin B, a poisonous compound associated with *Streptomyces* bacteria.⁹ Sampling of *L. majuscula* and extraction of the dermatotoxin, along with human and animal studies, confirmed DAT irritates the skin and induces dermatitis.^{5,6} *Stylocheilus longicauda* (sea hare) feeds on *L. majuscula* and contains isolates of DAT in its digestive tract.

Samples of *L. majuscula* taken from several Hawaiian Islands where seaweed dermatitis outbreaks have occurred were examined for differences in toxicities via 6-hour patch tests on human skin.⁶ The samples obtained from the windward side of Oahu contained DAT and aplysiatoxin, while those obtained from the leeward side and Kahala Beach primarily contained LA. Although DAT and LA are vastly different in their molecular structures, testing elicited the same biologic response and induced the same level of skin irritation.⁶ Interestingly, not all strands of *L. majuscula* produced LA and DAT and caused seaweed dermatitis; those that did lead to irritation were more red in color than nontoxic blooms.^{5,9}

Cutaneous Manifestations

Seaweed dermatitis resembles chemical and thermal burns, ranging from a mild skin rash to severe contact dermatitis with itchy, swollen, ulcerated lesions.^{1,7} Patients typically develop a burning or itching sensation beneath their bathing suit or wetsuit that progresses to an erythematous papulovesicular eruption 2 to 24 hours after exposure.^{2,6} Within a week, vesicles and bullae desquamate, leaving behind tender erosions.^{1,2,6,8} Inframammary lesions are common in females and scrotal swelling in males.^{1,6} There is no known association between length of time spent in the water and severity of symptoms.⁵

Most reactions to *L. majuscula* occur from exposure in the water; however, particles that become aerosolized during strong winds or storms can cause seaweed

dermatitis on the face. Inhalation of *L. majuscula* may lead to mucous membrane ulceration and pulmonary edema.^{1,5,6} Noncutaneous manifestations of seaweed dermatitis include headache, fatigue, and swelling of the eyes, nose, and throat (Figures 1 and 2).^{1,5}

Prevention and Management

To prevent seaweed dermatitis, avoid swimming in ocean water during *L. majuscula* blooms,¹⁰ which frequently occur following the summer solstices in the Northern and Southern hemispheres.⁵ The National Centers for Coastal Ocean Science Harmful Algae Bloom Monitoring System provides real-time access to algae bloom locations.¹¹ Although this monitoring system is not specific to *L. majuscula*, it may be helpful in determining where potential blooms are. Wearing protective clothing such as coveralls may benefit individuals who enter the water during blooms, but it does not guarantee protection.¹⁰

Currently, there is no treatment for seaweed dermatitis, but symptom management may reduce discomfort and pain. Washing affected skin with soap and water within an hour of exposure may help reduce the severity

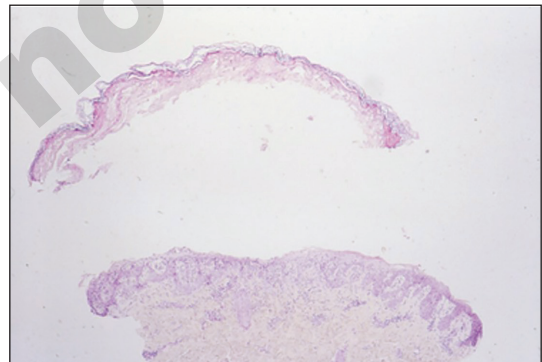


FIGURE 1. A punch biopsy of an abdominal lesion in a patient with seaweed dermatitis (*Lyngbya majuscula*) showed an intraepidermal blister with superficial desquamation at the top (H&E, original magnification $\times 40$). Photograph courtesy of Scott Norton, MD, MPH, MSc (Washington, DC).



FIGURE 2. Classic erythematous papulovesicular rash on the abdomen of a patient with seaweed dermatitis (*Lyngbya majuscula*). Photograph courtesy of Scott Norton, MD, MPH, MSc (Washington, DC).

of seaweed dermatitis, though studies have shown mixed results.^{6,7} Application of cool compresses and soothing ointments (eg, calamine) provide symptomatic relief and promote healing.⁷ The dermatitis typically self-resolves within 1 week.

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