

# Wilderness Dermatology: Bugs, Plants, and Other Nuisances That May Ruin Your Hike

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## ABSTRACT

Spending time outdoors can be rewarding. However, exposure to the sun, insect bites, and plant exposures may result in a wide range of dermatologic manifestations. In this article, we describe potential cutaneous manifestations of common wilderness exposures in New England including photodermatoses from prolonged sun exposure, phyto-dermatoses from plant exposures, and arthropod-bite reactions from common insects (mosquitos, spiders, ticks, hymenoptera, mites and chiggers). The article will also address preventive and treatment strategies which may help physicians and their patients better prepare for spending time in the wilderness.

**KEYWORDS:** dermatology, wilderness, phototoxicity, arthropod reactions, plant exposure

## INTRODUCTION

Although hiking, biking, skiing, and other outdoor pursuits are wonderful physical activities and can enhance one's mental wellbeing, it is vital to take appropriate preventative measures to ensure the most enjoyable experience possible. Environmental exposure to the sun and altitude puts one at risk of sunburn and both acute and chronic skin damage. Insect bites can induce an array of dermatologic manifestations that, if not appropriately managed, may result in serious medical complications. Plant exposures can result in multiple cutaneous manifestations including allergic contact dermatitis, phytophotodermatitis, irritant contact dermatitis, and contact urticaria.

## SUN EXPOSURE

Prolonged ultraviolet (UV) radiation exposure may result in cutaneous manifestations including sunburn, aging, and malignancies. Approximately 1 in 5 people in the United States may develop skin cancer in their lifetimes.<sup>1</sup> Both UVA and UVB radiation may cause skin cancer, with UVA primarily responsible for chronic skin changes such as photoaging, wrinkling, and lentigines.<sup>2</sup> Even on cloudy days, up to 80% of harmful UV radiation can reach the skin.<sup>3</sup> As one

reaches higher in altitude, the total amount of UV radiation exposure increases as much as 30% for every 1000 meters.<sup>4</sup>

### a. Sun Protection

All people older than 6 months of age, regardless of skin color, should apply a broad-spectrum and water-resistant sunscreen of at least SPF 30. It is also important to re-apply sunscreen at least every 2 hours, and after each water exposure. Patients should seek shade when possible, avoid sun at peak hours between 10am–2pm, and wear sun protective clothing including broad-brimmed hats and sunglasses. The American Academy of Pediatrics recommends that children younger than 6 months of age should have minimal exposure, wear appropriate clothing and have adequate shade.

### b. Drug-induced Phototoxicity

Some medications can induce phototoxic rashes that resemble sunburns after sun exposure. Common offenders include NSAIDs, quinolones, tetracyclines, and diuretics. This side effect is thought to be due to UV light absorption by the medication, leading to free radical formation and cellular damage in sun-exposed areas. The severity of the effect is often dose-dependent and linked to the duration and intensity of sun exposure. The phototoxic rash often occurs within 30 minutes of UV exposure and begins with burning and pruritus, with or without wheals, and further develops into a bright red edematous photodistributed rash. This may progress to erythema, hyperpigmentation, edema, and even blistering.

Management is supportive and involves prevention strategies such as sun protection, limiting sun exposure, and dose reduction or elimination of the offending medication. Cool compresses and ice packs may offer significant relief. Similar to sunburns, the patient should maintain hydration and use gentle emollients.

## INSECTS

In the northeast United States, the most common cutaneous complaints from insect exposure are due to mosquitoes, mites and chiggers, gypsy moths, fleas, spiders, hymenoptera, and ticks. Their bites may contain toxins and irritants that can cause a wide range of dermatologic manifestations.

### a. Mosquitos

Mosquitos are vectors for many diseases including West Nile virus, encephalitis, and more. Mosquito bites classically present as pruritic wheals and papules, often with a central punctum. Depending on the victim's immune response, these bites may appear as urticaria, vesicles, or even as granulomatous lesions.<sup>5</sup>

Prevention strategies include avoiding sites with stagnant water, wearing light-colored long-sleeved clothing to easily identify mosquitos, utilizing mosquito nets, and wearing insect repellent. Insect repellent containing DEET 10–35% or picaridin 20% can be quite effective,<sup>6</sup> and clothes can also be washed with permethrin.

Mosquito bites are generally self-limited. Ice packs, topical steroids, and over-the-counter topicals such as pramoxine 1% cream, menthol-containing products, and oral antihistamines may help patients with more severe and symptomatic reactions.<sup>7</sup> First-generation antihistamines are more sedating than second-generation agents, but tend to be more effective for pruritus.

### b. Spiders

Most spider bites encountered in the U.S. are harmless and may induce a brief localized skin reaction that spontaneously resolves. However, black widow (*Latrodectus mactans*) and brown recluse (*Loxosceles reclusa*) spider bites may require more directed medical care (Table 2).

Female black widow spiders are more commonly found in the South up to Southern New England and in the West. Their bites transmit a venom containing  $\alpha$ -latrotoxin, which leads to a large release of acetylcholine. The bite site typically appears as a painful pink edematous papule or plaque with central fang marks with possible central clearing. The victim may then experience muscle spasms and cramps within an hour in the chest or abdomen that may mimic a myocardial infarction. Treatment options include intravenous benzodiazepines for muscle spasms and narcotic pain medications. Antivenom can be considered up to 48 hours after a bite if severe pain persists after routine therapy.<sup>8</sup>

Brown recluse spiders are rare in the Northeast. The bite itself may be only slightly painful. However, soon after the bite, a tender erythematous halo rash may develop. In many cases, this progresses to central necrosis, sometimes even requiring a skin graft. It is thought that sphingomyelinase D in the venom triggers platelet aggregation and activates thromboxane B2 which leads to skin necrosis.<sup>6,9</sup> Treatment options are controversial; however, most experts suggest that overly aggressive management, such as excising the bite site to prevent necrosis, is harmful and not indicated. Most suggest proper wound care and minor debridement, with or without antihistamines or dapsone.<sup>10</sup>

### c. Ticks

Ticks can carry a multitude of diseases including Lyme disease (Table 1). Tick bites are typically not painful, as their saliva contains anesthetic and anticoagulant factors.

Lyme disease typically presents with the erythema migrans rash (red macule or thin plaque that slowly expands outwards with central clearing resembling a target). The incidence of Lyme disease has increased since 2007, and the geographic distribution has broadened from primarily New England, the Mid-Atlantic States, and Wisconsin to include adjacent states.<sup>11</sup> If the tick is identifiable as *I. scapularis*, has been attached to the host for more than 36 hours and is engaged in a Lyme-endemic area, prophylactic treatment with a single dose of doxycycline 200 mg orally may be administered within 72 hours of tick removal (if no other contraindications).<sup>12</sup>

Ticks should be removed carefully using a pair of forceps or a tick-removal device by grasping the tick as close to the skin as possible and removing the parasite with gentle, steady traction perpendicular to the skin without twisting.<sup>6,13</sup>

Tick bites may be prevented by wearing clothing treated with permethrin. Applying DEET-containing insect repellents, tucking pants into socks, wearing long-sleeved clothing and pants, and performing daily tick checks can help to reduce potential exposure.

### d. Hymenoptera (Bees, Wasps)

Stings from bees and wasps can be incredibly painful, and may even provoke anaphylaxis. Their stings often produce immediate burning and pain at the site, followed by an erythematous wheal. This usually resolves spontaneously within a few hours. However, some individuals have a more exaggerated response, such as swelling greater than 6 inches in diameter lasting up to 7 days. More severe local reactions in select individuals may be due to venom-specific IgE antibodies in sensitized victims.<sup>5</sup>

To remove a bee or wasp sting, the victim should ideally use a straight, hard surface such as the edge of a credit card to nudge out and remove the stinger. One should avoid using fingers or tweezers to remove the stinger, as this may squeeze additional venom into the stinging site. Some stings, such as that of the honeybee, have venom sacs and attached musculature that may continue to pump venom if the sac is not removed. Intradermal skin allergy testing can be performed with dilute quantities of venom to identify individuals at high risk of anaphylaxis to venom. These individuals at risk for hymenopteran anaphylaxis have the option of undergoing venom immunotherapy which has been shown to be effective. They should always carry a preloaded epinephrine device for emergency administration.<sup>5,14</sup> (Table 3)

Table 1. Tick-borne Illnesses






Disease/Organism/ Vector	Vector image	Cutaneous findings and clinical photo	Non-cutaneous findings/ Tests	Treatments
<p>Disease: <b>Rocky Mountain Spotted Fever</b></p> <p>Organism: <i>Rickettsia Rickettsii</i></p> <p>Tick vectors: <i>Dermacentor andersoni</i>  <i>Dermacentor variabilis</i></p>	 <p><i>Dermacentor variabilis</i><sup>1</sup> -8 legged tick -Brown to reddish brown in color -Females: grayish markings of upper body -Males: markings on entire back of males</p>	 <p>Rocky Mountain Spotted Fever rash<sup>1</sup></p> <p>Cutaneous findings: may not develop until 2-5 days after systemic symptoms present -Red, purple macules on wrists, ankles, forearms that later become hemorrhagic à trunk, hands, feet</p>	<p>Non-cutaneous findings: -Fever -Myalgias -Nausea, vomiting -Headaches</p> <p>Tests: -Serology with indirect immunofluorescence assay (IFA) -ELISA</p>	<p>Doxycycline (even in children &lt;8)</p> <p>May use chloramphenicol if pregnant</p>
<p>Disease: <b>Lyme Disease</b></p> <p>Organism: <i>Borrelia Burgdorferi</i></p> <p>Tick vectors: <i>Ixodes scapularis</i>  <i>Ixodes pacificus</i>  <i>Ixodes ricinus</i></p>	 <p><i>Ixodes scapularis</i><sup>1</sup></p> <p><b>-Black legged tick</b> -Females: orange to red body surrounding the black scutum -Males: body completely dark brown</p>	<p>Cutaneous findings Early: erythema migrans</p>  <p>Erythema migrans<sup>1</sup></p> <p>Late or chronic: Acrodermatitis chronica atrophicans (loss of subcutaneous fat with thin atrophic skin in chronic disease)</p>	<p>Non-cutaneous findings: A) Early localized disease -flu like symptoms  B) Early disseminated disease -facial nerve palsy -joint pain -carditis  C) Chronic disease -persistent neurologic and rheumatologic symptoms</p> <p>Tests: -Enzyme immunoassay for IgM and IgG antibodies  -Western blot of enzyme immunoassay positive or equivocal</p>	<p>Doxycycline in adults and children &gt; 8 yrs old: 14–21 days Amoxicillin in pregnant women, children &lt; 8 yrs old: 14–21 days For severe disseminated disease - Ceftriaxone IV Prophylaxis if 1) Tick is <i>Ixodes scapularis</i> tick and has been attached for approximately 36 hrs 2) Post exposure prophylaxis within 72 hours of tick removal 3) Local rate of infection with <i>Borrelia</i> at least 20% 4) Doxycycline is not contraindicated When these criteria are met, treat with: Doxycycline 200mg in single dose w/ 72 hours of tick bite for adults Doxycycline 4mg/kg in children &gt; 8 yrs old (max dose 200mg) w/ 72 hrs of tick bite</p>
<p>Disease: <b>Babesiosis</b></p> <p>Organism: <i>Babesia microti</i></p> <p>Tick vector: <i>Ixodes scapularis</i></p>	<p>See Lyme disease</p>	<p>In severe infection, can have petechiae and ecchymoses</p>	<p>Non-cutaneous findings: -flu like symptoms -fatigue -malaise -fevers -chills -myalgias -occasionally mild hepatomegaly or splenomegaly</p> <p>-Dark-colored urine <b>due to hemolytic anemia</b></p> <p>Tests: -CBC to look for hemolytic anemia -Reticulocyte count</p> <p><b>-Definitive diagnosis by Giemsa or Wright stains</b> of blood smears which show ring forms and tetrads</p>	<p><b>Treatment:</b> Atovaquone and Azithromycin for 7-10 days</p> <p>For severe disease treat with clindamycin IV and quinine</p>

Table 1. Tick-borne Illnesses (continued)

Disease/Organism/ Vector	Vector image	Cutaneous findings and clinical photo	Non-cutaneous findings/ Tests	Treatments
Disease: <b>Anaplasmosis</b>  Organism: <i>Anaplasma phagocytophilum</i>  Tick vector <i>Ixodes scapularis</i>  <i>Ixodes pacificus</i>	See Lyme disease	Usually no exanthem, so presence of cutaneous findings should raise suspicion for other diseases or coinfection	Non-cutaneous findings: -Fevers -Malaise -Myalgias Headaches -Nausea, vomiting -Confusion  Tests: -serology by IFA -ELISA -PCR	Doxycycline in adults and children > 8 yo
Disease: <b>Ehrlichiosis</b>  Organism: <i>Ehrlichia chaffeensis</i>  Tick vector: <i>Amblyomma americanum</i>	 <p>Female lone star tick<sup>1</sup>                      Females: characteristic dorsal white spot                      Male: scattered spots/streaks around perimeter of body</p>	Exanthem present in 10% of cases -Faint, blanching generalized erythema -Erythematous macules, papules, petechiae	Non-cutaneous findings: -Fevers -Malaise -Myalgias Headaches -Nausea, vomiting -Confusion -Meningoencephalitis -Cranial nerve palsies  Tests: -serology by IFA -ELISA -PCR	Doxycycline in adults and children > 8 yo

**e. Mites and Chiggers**

Mites are small arthropods with eight legs whose bites may cause pruritic papules. Its six-legged larval form is called the chigger, which appear as tiny red insects that crawl around until they reach a barrier such as lining of a sock. The mites' saliva sometimes provokes an allergic reaction from the human host, producing a pruritic papule. Mite and chigger bites classically present as grouped 1–2 mm pruritic red papules with an abrupt demarcation line around borders of clothing such as around the ankles.

These bites tend to be self-limited and may be treated symptomatically for more severe reactions. Prevention and treatment strategies are similar to those for mosquitos.

**PHYTODERMATOSES**

Exposure to plants may result in a variety of cutaneous manifestations including phytophotodermatitis, irritant contact dermatitis, allergic contact dermatitis, and contact urticaria.

**a. Phytophotodermatitis**

Phytophotodermatitis is a cutaneous eruption resulting from the exposure of skin to photosensitizing agents from plants such as furocoumarins (eg. psoralen) which react with UV radiation. Some plants that are known to cause phototoxicity include lemon, lime, celery, carrots, dill, and anise. A common presentation is a patient who squeezed limes outdoors and subsequently developed a burning, erythematous

rash. Wild parsnip (*Pastinaca sativa*) is found throughout New England and may cause a severe phytophotodermatitis reaction.

Cutaneous manifestations include burning and painful, bullous, erythematous eruptions, which may result in chronic skin hyperpigmentation.<sup>15</sup> Treatment is mostly symptomatic (with cool compresses and oral antihistamines if needed), and prevention involves avoidance of triggers. With appropriate sun protection and time, the post-inflammatory hyperpigmentation should resolve spontaneously.


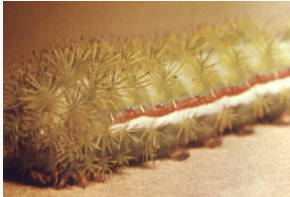

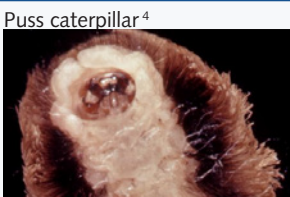
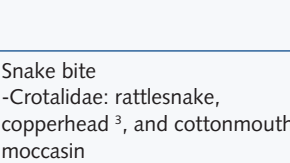






**b. Irritant contact dermatitis**

There are two main categories of irritant contact dermatitis (ICD) from plant exposures: mechanical (physical injury), and chemical.

Mechanical ICD is a result of physical trauma to the skin caused by a plant's trichomes (hairs), spines, glochids (barbed hairs), or thorns. These defense mechanisms may breach the epidermis and trigger a papular eruption. A classic example of this are cacti which contain spines and sometimes glochids, which, if a person is exposed, may present as erythematous papules and nodules that spontaneously resolve with time.

Chemical ICD is often provoked by plant chemicals such as calcium oxalate that may be transferred to the epidermis after physical contact with a plant, resulting in subsequent inflammation. Daffodils commonly cause erythema, dry skin, as well as scaling of the finger tips among florists due

Table 2. Arthropod and Snake Reactions

Organism and image	Presentation	Treatment	Organism and image	Presentation	Treatment
Scorpion <sup>2</sup> 	-Pain and paresthesias of bite site -May have neurological or cardiopulmonary complications	-Remove stinger -Supportive care -Ice -Antihistamines	Gypsy moth 	-Eczematous, pruritic dermatitis -Urticaria	-Strip bite site with adhesive tape to remove caterpillar hairs -Wash site with soap and water -Topical or oral steroids for severe reactions
Bees, wasps, hornets 	-Ranges from pain and local edema at site of bite to urticaria, respiratory distress, anaphylaxis	Remove stinger, symptomatic care	Io moth <sup>4</sup> 	-Immediate pruritus and stinging of involved skin	Same as gypsy moth
Fire ants <sup>2</sup> 	-Line or ring of pustules with surrounding red or hemorrhagic halo -May have neurologic systemic symptoms, anaphylaxis	Symptomatic care	Puss caterpillar <sup>4</sup> 	-Intense burning pain -Hemorrhagic linear track marks	Same as gypsy moth
Snake bite -Crotalidae: rattlesnake, copperhead <sup>3</sup> , and cottonmouth moccasin 	-Fast onset pain, swelling, hemorrhage, necrosis	Emergency: visit closest emergency department.  Antivenom, tetanus prophylaxis, possible antibiotics	Saddle back caterpillar <sup>4</sup> 	-Immediate painful stinging -Redness -Edema	Same as gypsy moth
-Elapidae: coral snake (touching red and yellow bands) <sup>3</sup> 			Black widow spider <sup>5</sup> -hourglass-shaped marking on abdomen 	-Acute edema -Pain -Symptoms resembling a surgical abdomen	-Antivenom -Benzodiazepines -IV calcium gluconate
			Brown recluse spider <sup>5</sup> -violin-shaped marking on head 	-Erythema -Bullae -Necrosis -Possible disseminated intravascular coagulation	-Ice -Elevation -Possibly dapsone

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**Table 3.** Wilderness Dermatology Kit

	Over-the-counter	Prescription-Only These items may require prescriptions from your doctor. Consider these items based on discussions with your doctor.
<b>Prevention</b>	<ul style="list-style-type: none"> <li>• Broad brimmed hat</li> <li>• UV protective long-sleeved clothing</li> <li>• Broad-Spectrum sunscreen with an SPF of 30 or more</li> <li>• Sunglasses</li> <li>• DEET-containing insect repellent</li> <li>• Permethrin-treated clothing</li> </ul>	
<b>Treatment (Ointments)</b>	<ul style="list-style-type: none"> <li>• Hydrocortisone 1% cream or ointment</li> <li>• Vaseline</li> <li>• Neosporin or other antibiotic ointment</li> <li>• Anti-itch creams such as Sarna</li> </ul>	<ul style="list-style-type: none"> <li>• Clobetasol 0.05% ointment</li> <li>• Hydrocortisone 2.5% ointment</li> <li>• Mupirocin antibiotic ointment</li> </ul>
<b>Treatment (Oral medications)</b>	<ul style="list-style-type: none"> <li>• Antihistamines (eg. Zyrtec, Benadryl, Claritin, Allegra)</li> </ul>	<ul style="list-style-type: none"> <li>• Prednisone 10 mg tablets</li> <li>• Doxycycline 100 mg tablets</li> </ul>
<b>Dressings</b>	<ul style="list-style-type: none"> <li>• Band-aids</li> <li>• Gauze</li> <li>• Medical Tape</li> <li>• ACE bandage</li> <li>• Tegaderm dressing</li> </ul>	

to contact with calcium oxalate crystals. Reactions tend to be self-limited and require no medical treatment.

### c. Allergic contact dermatitis

Allergic contact dermatitis (ACD) is a type of delayed or type IV hypersensitivity reaction. Urushiol found in poison ivy, poison oak, and poison sumac, is a common cause of ACD in the United States. Although poison ivy may appear as clusters of three leaves, poison oak and sumac have anywhere from three to 13 leaves. Clinically, these lesions appear as erythematous pruritic patches and plaques within 48 hours of contact, which often progress to vesicles in a linear distribution, most often on extremities. Crusted plaques and even bullae, along with significant edema may also be seen. A key exam finding is lesions in a linear configuration where the leaves have brushed against the skin.

Immediate management involves removal of the plant oils using soap and water or rubbing alcohol. All plant oils should also be washed from clothing and gear that may have touched the oils. High potency topical corticosteroids such as clobetasol 0.05% cream or betamethasone dipropionate 0.05% cream or ointment may be applied on the trunk and extremities for limited skin disease. For lesions on the face and skinfolds, low potency topical corticosteroids such as hydrocortisone 2.5% cream or ointment are preferred. In more severe cases, long taper of oral steroids of 2–3 weeks may be necessary. Shorter courses of oral corticosteroids may result in a rebound flare.

### CONCLUSION

Hiking and spending time outdoors is a healthy and potentially therapeutic pastime. Exposures to insects, plants, and the weather, however, can result in a multitude of symptomatic dermatologic manifestations. Equipping oneself with the knowledge of potential exposures and prevention and treatment strategies can help physicians prepare patients to make the most out of their time in the wilderness.

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