

The Intersection of Dermatology & Toxicology in the Wilderness

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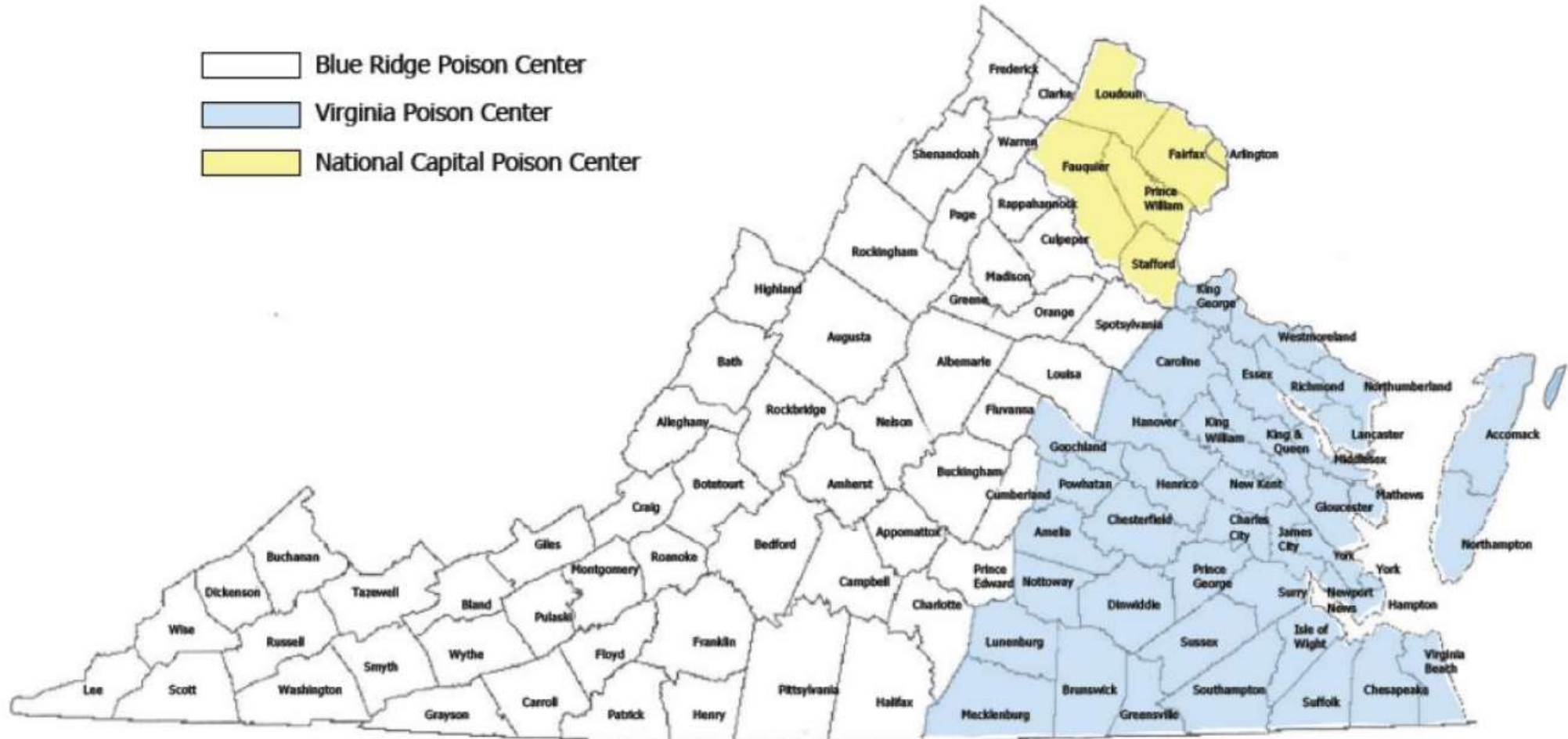
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Objectives

- 1) Discuss clinical toxicology cases that pertain also to the specialty of dermatology where the exposure is derived from the outdoor natural environment.
- 2) Review the treatments associated with those specific medical conditions reviewed.
- 3) Highlight errors made by the public that is enthusiastically increasingly engaging in the outdoor wilderness environment.

Virginia Poison Center Network: Service Regions



The Socrates Project



Poisonous Plants in Virginia

The Cleopatra Project



Poisonous and Venomous Animals
in Virginia

Coming soon: Claudius Project - Poisonous Plants of Virginia

History from friend makes the diagnosis

- ▶ 9 y/o male presents with facial pain.
- ▶ He was in his normal state of health until the morning when he awoke from sleep and noted a diffuse rash over his face with a marked burning sensation of his skin.
- ▶ It has progressed through the day and involves only his face and neck and stops at his shirt neck line.
- ▶ He has had no fevers, his immunizations are up to date, he has no medical problems, and is on no medications.
- ▶ He denies any other complaints.





School

- ▶ His older brother's friend comes over to play and exclaims: "Hey, my brother looks just like your brother!"
- ▶ The previous day, while playing on the school playground, they watched a neighboring farm burning brush. Smoke from the fire blew over the area where they were watching.



POISON IVY, OAK, AND SUMAC: HOW TO TREAT THE RASH

WHAT SHOULD I DO IF I TOUCH A PLANT?

WHAT DOES THE RASH LOOK LIKE?

WHEN DOES THE RASH APPEAR?

HOW DO I TREAT THE RASH?

WHO GETS A RASH, AND IS IT CONTAGIOUS?

HOW CAN I PREVENT A RASH?

WHERE DO THESE PLANTS GROW?



TIPS FOR TREATING POISON IVY

A rash from poison ivy, poison oak or poison sumac is caused by an oil found in these plants called urushiol. When this oil touches your skin, it often causes an itchy, blistering rash. Most people can safely treat the rash at home.

! Caution

If you have any of the following, go to the emergency room immediately:

- Difficulty breathing or swallowing
- A rash around one or both eyes, your mouth, or on your genitals
- Swelling on your face, especially if an eye swells shut
- Itching that worsens or makes it impossible to sleep
- Rashes on most of your body
- A fever

These are signs of a severe reaction that require immediate medical care.

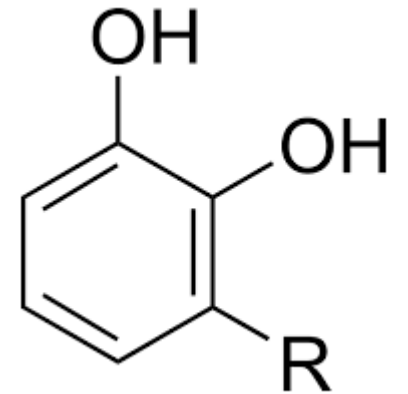
Toxicodendron dermatitis

► Etiology

- most common cause of allergic contact dermatitis in North America
- estimated that 50 to 75% of adults are allergic to urushiol

► Mechanism

- **urushiol**: oily substance responsible
- type IV hypersensitivity reaction
- rapidly absorbed due to its lipophilic nature and picked up by Langerhans cells in the epidermis, making additional efforts to wash or remove the compound ineffective after absorption.
- Initial exposure results in pruritus and erythema, followed by a papulovesicular eruption, edema, and oozing within 10 to 14 days.
- Aerosolized urushiol from forest fires or burning plant debris has caused airway inflammation or generalized dermatitis.



Toxicodendron dermatitis

► Treatment

- Initial management consists of immediate irrigation with soap and decontamination of clothing upon exposure
- Additional anecdotal options include cool, moist compresses, oatmeal baths, calamine lotion, and topical astringents.
- Topical and oral antihistamines
 - Hydroxyzine for itching
- Topical and oral steroids
 - Tapered dose of prednisone
 - 1 mg/kg/day for a max dose of 60mg/day and tapered weekly over three weeks

Toxicodendron radicans (Poison Ivy)



Photo Credit: Don Hearl
VMN Old Rag Chapter



Photo credit: Richard Stromberg
VMN Shenandoah Chapter



Photo credit: Richard Stromberg
VMN Shenandoah Chapter



Photo credit:
Richard Stromberg
VMN Shenandoah Chapter

Toxicodendron pubescens (Poison Oak)



Photo credit: Gary Fleming, DCR, VA



Photo credit: Gary Fleming, DCR, VA



Photo credit: Richard Stromberg
VMN Shenandoah Chapter



Photo credit: Karan A. Rawlins
University of Georgia, Bugwood

Toxicodendron vernix (Poison Sumac)



Photo credit: Alison Sowar
VMN Northern Neck Chapter



Photo credit: Alison Sowar
VMN Northern Neck Chapter



Photo credit: Gary Fleming DCR, VA



Photo credit: Gary Fleming
DCR, VA



“Black Dot (Spot) Poison Ivy”

- ▶ Black-spot poison ivy is a rare phenomenon and usually poses a diagnostic challenge.
- ▶ It usually presents after exposure to a higher concentration of uroshiol from Toxicodendron plants.
- ▶ Patients present with black-spot deposits on the epidermis with underlying poison ivy dermatitis.





Cross reactivity with other plants

- ▶ Mango skin



- ▶ Pistachio shells (steamed or roasted)



- ▶ Cashew shells (steamed or roast



Unexpected complication in football

- ▶ A 10-year-old boy presented with a full thickness burn on his right pretibial area two weeks after 'falling onto leaves' while playing football.
- ▶ There was no trauma to the skin and he continued to play football. The following day, he noticed the skin on his pretibial area becoming 'pale white.'
- ▶ This was followed by eruption of skin blisters two days after the contact.

Unexpected complication in football

- ▶ The blisters were treated conservatively by his General Practitioner with dressings but failed to heal and progressed to a full thickness burn by two weeks.
- ▶ A 15 cm 6 cm dry eschar with satellite lesions was present on admission.
- ▶ The eschar was surrounded by a thin margin of erythema
- ▶ He was started on oral Clindamycin following advice from the Infectious Disease team. In addition, his leg was dressed with Intrasisite gel. Eumovate cream was applied to the surrounding erythematous skin edges



Figure 1 Full thickness burn on the right pretibial area showing eschar with satellite lesions and surrounding erythema on the wound edges.



Figure 2 Full thickness burn showing tissue necrosis with surrounding inflammation that required surgical debridement.

Giant Hogweed dermatitis

► Plant

- Not native to the United States. It originated in Southwest Asia, from where it was imported as an ornamental garden plant to Europe in the 19th century. It was first recorded in the United States in 1917 in an ornamental garden in New York.
- It is a biennial plant but is known to remain for multiple years in the rosette stage. When the plant develops sufficient root reserves the plant initiates flower formation.
 - In the first year the plant will grow a low rosette of leaves, at about 1 to 2 feet.
 - In the second, or sometimes the third year, it will develop fully with large, thick stems and flower heads reaching a total of 15 to 18 feet in height.

Giant Hogweed dermatitis

► Plant

- The plant flowers June to August.
- The flowers are small and white, growing in an umbrella-shaped umbel, and resembling the flowers of Carrot or Parsley, but are much larger, from 1 to 2½ feet wide.
- The leaves have an alternate arrangement on the stem, are deeply lobed, and can be up to 5 feet in diameter with a prominent sheath at the base of the stalk.
- The stems are hollow, 2 to 4 inches in diameter, with distinctive purple-red blotches and prominent white hair.
- The stems have a thick circle of hair at the base of the leaf stalk around the sheath.

Heracleum mantegazzianum (Giant Hogweed)



Photo credit: New York State
Department of Environmental
Conservation



Photo credit: New York State
Department of Environmental Conservation

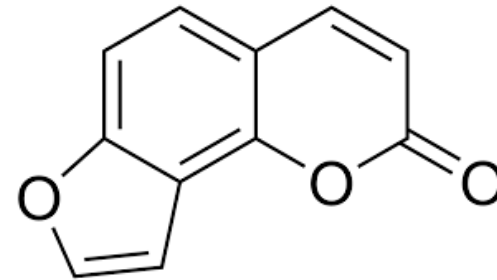


Photo credit: New York State
Department of Environmental Conservation

Giant Hogweed dermatitis

► Mechanism

- The sap of this plant contains **furocoumarin**, which in humans is strongly phototoxic.



- The phytochemicals enter the nucleus of epithelial cells and form a bond (crosslinking) with the DNA when exposed to UV, which causes cell death and causes inflammation via activation of the arachidonic acid cascade. The result is known as phytophotodermatitis.

Day 3



Day 5



Photo credit: Zamarra Kok,
The Netherlands



Phytophotodermatitis

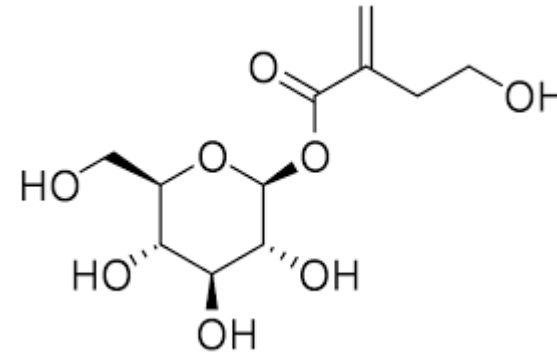
	Botanical name	Common names
Umbelliferae	<i>Ammi majus</i>	Queen Anne's Lace
	<i>Heracleum spondylium</i>	Cow parsnip
	<i>Heracleum mantegazzianum</i>	Giant hogweed
	<i>Pastinaca sativa</i>	Parsnip
	<i>Apium graveolens</i>	Celery
Rutaceae	<i>Citrus bergamia</i>	Lime
	<i>Dictamnus albus</i>	Gas plant, burning bush of Moses
Moracea	<i>Ficus carica</i>	Fig (from sap, not fruit)

Florist complications

- ▶ A 40-year-old healthy female with no past medical problems presents with a complaint of rash to fingers.
- ▶ There was no trauma and she is taking no medications.
- ▶ She is employed as a florist.



Tulip Finger



► Etiology

- Tulip finger is a common occupational problem among florists attributed to an allergic contact dermatitis reaction

► Mechanism

- **Tuliposide A**, a glycoside of tulipalin A, is found in the epidermis of the flower bulb. The concentration of the allergen, tulipalin A is primarily found in the bulbs, stem, leaves, and petals in descending order.

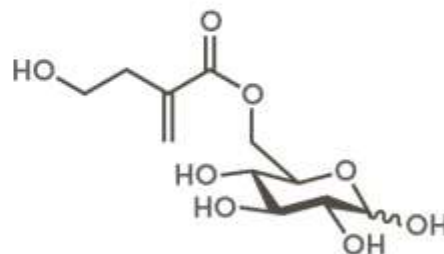
► Clinical

- Tulip finger typically presents as a scaling, dry, fissured, and erythematous plaque on the fingertips of the dominant hand. While type IV contact dermatitis is the most common presentation, type I reactions may occur.

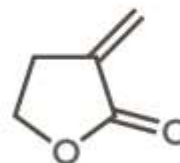
THE CHEMISTRY OF TULIPS AND TULIP FINGERS

WHAT ARE 'TULIP FINGERS'?

'Tulip fingers' is used to describe the allergic contact dermatitis that can afflict those who frequently handle tulip bulbs. It can also affect those who cut or pick the flowers. It can appear as redness, eczema, or pustules on their fingers and hands.



6-TULIPOSIDE A



TULIPALIN A

TULIPOSIDES & TULIPALINS

6-tuliposide A is one of several tuliposides found in tulips that can trigger allergic skin reactions. Another dermatitis-inducing compound is 6-tuliposide A's breakdown product, tulipalin A. In the plant tulipalins function as a defence against soil fungi.



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Camping & Insects

- ▶ A 26-year-old male presented with history of painful fluid filled lesions around the right eye of 2 days duration. He was apparently asymptomatic 2 days prior when, on waking up from camping, he complained of burning sensation associated with redness over the area around his right eye. In the next few hours, he noticed eruption of some fluid-filled lesions over the same area associated with pain.
- ▶ He consulted a general practitioner who diagnosed him as a case of herpes zoster ophthalmicus and started on tab acyclovir 800 mg five times daily but the lesions continued to progress.
- ▶ On detailed history taking, he revealed that while asleep, he felt something crawling over his left forearm and tried to remove it with his right hand. He noticed burning sensation and redness followed by eruption of fluid-filled lesions around his right eye, the next morning.”.

Camping & Insects

- ▶ Examination revealed a bulla, numerous tiny vesicles and crusts over erythematous and edematous upper and lower eyelids and the area around medial canthus of the right eye.
- ▶ Unaided ophthalmological examination revealed uninvolved cornea and conjunctiva with negative Hutchinson's sign (ophthalmic zoster with nasal tip involvement).
- ▶ There was no photophobia and vision in both eyes was normal.
- ▶ Examination of other body sites revealed involvement of right cubital fossa in form of 02 x erythematous crusted lesions suggestive of “kissing lesions”.





Pyrrta postica



Lytta nigrister



Pyrrta papalis



Lytta desfricola



Tetrodota elegans



Pyrrta alvuriana



Epicauta sp.



Epicauta rogersi



Eupompha elegans



Epicauta segmenta



Epicauta pardalis

Blister beetle dermatitis

► Insects

- Beetles causing this dermatitis belong to 3 families- Meloidae, Oedemereidae and Staphylinidae under the order Coleoptera.
- **Cantharidin** is the vesicant present in Meloidae and Oedemereidae; **pederin** is the chemical responsible for vesiculation in the family Staphylinidae (Rove beetles).

► Mechanism

- Cantharidin is a potent vesicant and irritant
- Cantharidin can sometimes contaminate alfalfa.

► History

- Preparations made from blister beetles have been used since ancient times as an aphrodisiac

Blister beetle dermatitis



Shorts & Hiking

- ▶ A group of teenagers were hiking in Shenandoah National Park in White Oaks Canyon on a hot summer day when they approached a waterfall.
- ▶ The group took-off running away from their adult leaders, plowing through the native plants to reach the cool water.
- ▶ Screams erupts from the groups when they began to experience intense pain emitting from their legs.





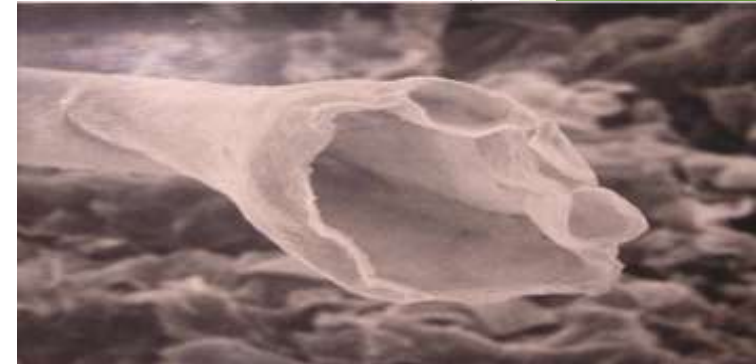
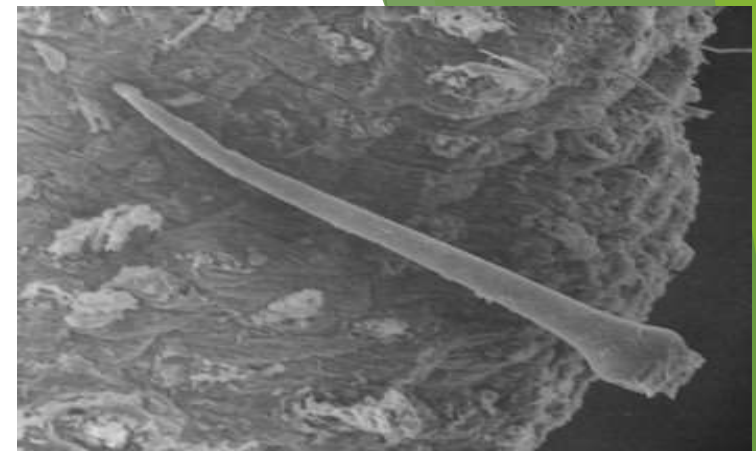
Urtica dioica (Stinging Nettles)

- Leaves are opposite each other on a long green stem
- Fines hairs on leaves cause irritation
- 3 to 7 ft tall perennial



Mechanism of Action

- ▶ Initial exposure give burning, stinging, and rash
- ▶ Nettle hairs contain fluid and are injected into skin.
- ▶ Fluid contains histamine, serotonin, acetylcholine
- ▶ Reaction may be a combination of the fluid and mechanical irritation of the hairs remaining in the skin



Treatment

- ▶ Don't spread around body
- ▶ Mostly anecdotal - goes away with time.
- ▶ Sage
- ▶ Mud
- ▶ Peppermint
- ▶ Toothpaste
- ▶ Tape for imbedded hairs?



Medical uses

Nettle has anti-inflammatory effects

Extract showed to have a protective effect on atherosclerosis in mice

One qualitative exploratory study suggested it was useful for chronic joint pain

- ▶ “It appeared as long as the nettle produced a sting with weals, it would have an analgesic effect”
- ▶ Similar effect as capsaicin?



Food

- ▶ Soaking in water removes the nettle fluid
- ▶ Tastes like spinach + cucumber



Real or Fake

- ▶ A 59-year-old female with a past medical history of an alcohol use disorder, polysubstance abuse, and malnutrition (BMI: 17.6) presents in June with a five-day history of a painful left lower extremity wound. The patient reported an insect bite to her left lower extremity while sleeping in a park with the development of immediate pruritus, redness, and mild swelling at the bite site. There was no history of trauma to the area.
- ▶ The next day, the patient developed a blister associated with pain and redness at the bite site. The pain was stabbing and of 9-10/10 in severity. Two days before the presentation, the blister ruptured and developed into a black eschar. The patient reported associated fever, diaphoresis, nausea, and multiple episodes of diarrhea daily for 3-4 days.

Real or Fake

► Social history was pertinent for smoking one pack per day for 20 years, occasional cocaine usage, and heavy alcohol use, drinking a fifth of vodka daily for 11 years. The patient denied any history of IV drug use or skin popping. The patient denied any travel history, and she lives in SW Virginia only. The patient denied any other past medical history including diabetes mellitus, hypertension, cardiovascular disease, and chronic obstructive pulmonary disease (COPD). The patient was not on any antiplatelet or antithrombin therapy.

Real or Fake

- ▶ On examination, the patient had a necrotic wound on the lateral aspect of the left lower third of the leg, measuring 5 x 10 centimeters, associated with swelling, erythema, and warmth extended to the dorsum of the foot (Figure).
- ▶ There was significant tenderness associated with palpation. Laboratory workup was unremarkable. The urine drug screen was positive for cocaine, opiates, benzodiazepines, and cannabinoids.
- ▶ Due to concern for staph infection or necrotizing infection and the patient's history of substance use, the patient was started on broad-spectrum antibiotics including IV Aztreonam 1 gm Q8 hours, vancomycin 1000 milligrams (mg) once, and clindamycin 600 mg Q8 hours. CT demonstrated diffuse subcutaneous edema with fat stranding, suggestive of cellulitis, but was negative for necrotizing fasciitis or osteomyelitis. A methicillin-resistant *Staphylococcus aureus* (MRSA) screen and the blood culture were negative. Vancomycin and aztreonam were discontinued, only IV clindamycin was continued.





Loxosceles reclusa (Brown Recluse)

► Insects

- Brown recluse spiders are light brown, with darker legs that are slender and covered in fine hairs.
- The heart-shaped cephalothorax, the combined head and thorax (midsection), displays the characteristic dark brown violin-shaped marking.
- The bodies of females are 1 cm ($\frac{3}{8}$ in) long and 0.5 cm ($\frac{3}{16}$ in) wide; males are slightly smaller and have longer legs.
- While most spiders have eight eyes, the brown recluse has six.

Loxosceles reclusa (Brown Recluse)

► Where are they found?

- The infrequently-seen brown recluse inhabits dark, cluttered, undisturbed areas, such as closets, attics, basements, garages, and outbuildings. As such, packed-away shoes, clothing, and linens should always be inspected before use.
- Its native range extends from southeastern Nebraska to southernmost Ohio and south into Georgia and Texas.
- Although Virginia is outside of this area, accidental introductions may occur from the transportation of items originating in areas where populations exist.

Loxosceles reclusa (Brown Recluse)

► Mechanism

- **Sphingomyelinase D** - responsible for the dermonecrotic lesions
- Most envenomizations are minor with no dermonecrosis, but a small number of brown recluse bites produce loxoscelism a condition where the skin around the bite dies. While loxoscelism usually manifests as a skin condition (cutaneous loxoscelism), it can also include systemic symptoms like fever, nausea, and vomiting (viscerocutaneous loxoscelism). In very rare cases, hemolysis and DIC are reported.

NOT RECLUSE—A Mnemonic Device to Avoid False Diagnoses of Brown Recluse Spider Bites

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The notoriety of the brown recluse spider, *Loxosceles reclusa*, has resulted in many dermatological conditions being misdiagnosed as the bite of this arachnid. These misdiagnoses occur throughout North America and are of concern especially in American states and Canadian provinces where no brown recluse populations are known to exist.

About 40 medical conditions have been or could be misdiagnosed as recluse bites. A sampling of these misdiagnoses includes infections caused by *Staphylococcus aureus*, *Bacillus anthracis*, *Borrelia burgdorferi*, *Sporothrix schenckii*, the herpes zoster virus, and even lymphoproliferative conditions such as lymphomatoid papulosis.¹ Because past medical reports of loxoscelism often did not adhere to the principles of evidence-based medicine, these erroneous reports artificially increased the list of signs associated with loxoscelism, decreasing diagnostic accuracy.

As most patients cannot find an offending spider, and a diagnostic recluse venom test is only recently available, loxoscelism is typically diagnosed clinically. Considering the abundance of recluse bite misdiagnoses still being reported, the medical community would benefit from an approach describing the most common skin signs for misdiagnoses mistaken for loxoscelism. With that in mind, we have developed a mnemonic device—NOT RECLUSE—that summarizes findings not typical of recluse envenomation and should help eliminate unlikely diagnoses. This has been developed through the first and third authors' combined 50 years of experience as Missouri dermatologists observing hundreds of cases of loxoscelism and the second author's analysis of false reports of spider bites.

N - Numerous

A typical recluse bite is a single focal lesion.² Bites most often result from a defensive response when a spider is compressed or crushed. Occasionally 2 bites may occur. Contemporaneous widely separated dermo-necrotic lesions are a highly unlikely result of recluse bites. Differential diagnoses: multiple lesions indicate contagious bacterial infection, herpes zoster, pyoderma gangrenosum, poison ivy or poison oak, and arthropod bites (eg, fleas, bedbugs, and various mites).

O - Occurrence

The most common circumstance surrounding occurrence of a recluse bite involves disturbance of a secluded recluse spider. Often it may be hiding in a box in a closet, attic or garage, or in clothing long unused or left on the floor. Alternately, the recluse may have crawled into a bed; upon awakening, the sleeper notices the lesion. Differential diagnoses: lesions occurring after gardening suggest sporotrichosis.

T - Timing

Credible bites outside the April to October recluse activity season in North America are unlikely.³ Uncommonly, recluses may be encountered when disturbing secluded areas during the winter holiday season.

R - Red Center

Recluse venom causes immediate destruction of the capillary bed with resulting ischemia. Thus, the central area of a recluse bite will be pale, blue-white, or purple and only rarely, with mild bites, will be red. (Peripherally, erythema due to cytokine response⁴ is routinely observed.) Differential diagnoses: a lesion with an inflamed red central area is more likely another arthropod bite or sting, streptococcal cellulitis, or even an uncommon bacterial infection such as anthrax.

E - Elevated

Recluse bites are flat or slightly sunken. A central lesion area raised more than 1 cm above the normal skin is not a recluse bite; any elevation makes a recluse bite unlikely. Differential diagnoses: a raised area is more likely another arthropod bite or sting or a bacterial infection such as *S aureus* (Figure).

C - Chronic

Only the largest recluse bites are not healed in 3 months. Only 1 of 25 bites with a positive brown recluse venom enzyme-linked immunosorbent assay and only 2 wounds in a series of 19 documented bites exceeded 3 months' healing time.^{4,5} Differential diagnoses: incomplete healing within 3 months or within 3 weeks for small bites suggests pyoderma gangrenosum, nonmelanoma skin cancer, or other causes of ulceration such as tularemia.

L - Large

The most dynamic recluse bites typically do not exceed 10 cm.⁶ Although peripheral erythema may extend several times this distance from the injury, there is no credible documentation of very large areas of necrosis. Recluse venom appears to cause a deeper and more severe reaction in morbidly obese people, likely due to circulatory insufficiency in adipose tissue. Differential diagnoses: a wound more than 10 cm wide suggests pyoderma gangrenosum.

U - Ulcerates Too Early

Recluse bites do not typically ulcerate until 7 to 14 days postenvenomation. Differential diagnoses: if ulceration (or crusting) occurs within 7 days, consider infection or pyoderma gangrenosum for ulceration, or anthrax for crusting.



Photo credit: Matt Bertone
NC State University



Photo credit: Matt Bertone
NC State University



Photo credit: Matt Bertone
NC State University

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Loxosceles reclusa (Brown Recluse)

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E - Exudative

Recluse bites are not initially exudative,² moist, or purulent (exceptions: bites on eyelids and toes); although, at the bite site, a small blister filled with clear or reddish fluid may manifest. Pus formation indicates bacterial infection and is the first negative sign excluding a loxoscelism diagnosis.³ Additionally, it has been strongly argued that spiders do not vector bacteria.⁷ Differential diagnoses: if a wound exudes pus, then bacterial infection, particularly *S aureus* (Figure), should be considered with a nonspider etiology. If a weeping wound extends deep to the subcutaneous fat, pyoderma gangrenosum can be suspected, especially on lower extremities.

If 2 or more of the NOT RECLUSE signs are present, a recluse bite is even less likely. As Philip Anderson, MD, noted after studying over 1000 loxoscelism cases, "None are nodular or red in the center like wasp stings."² Another common combination is red and exudative; previously, we remarked upon seeing infection diagnosed as loxoscelism in Canada that it was "too red, too wet" (Richard S. Vetter, MS, oral communication, 2004) to be a recluse spider bite. In our experience, the most common condition misdiagnosed as a recluse spider bite is *S aureus* infection which may show multiple NOT RECLUSE signs such as the crusted, purulent, elevated lesion in Figure.

Rash with alcohol following foraging

- ▶ A 47-year-old male with no medical history had eaten a meal of seven self-picked and sautéed mushrooms (cooked for more than 15 min). Four hours later, 5 min, after drinking 0.5 l beer he experienced a hot facial flush, developed diffuse flushing, and tachycardia 110/min. He went to the local hospital. His laboratory tests were all normal.
- ▶ The symptoms disappeared spontaneously after 90 min. However, a sip of beer the next day and the day after produced facial flushing again.
- ▶ The mushroom was identified by the mycologist..

Coprinus atramentarius (Inky caps)

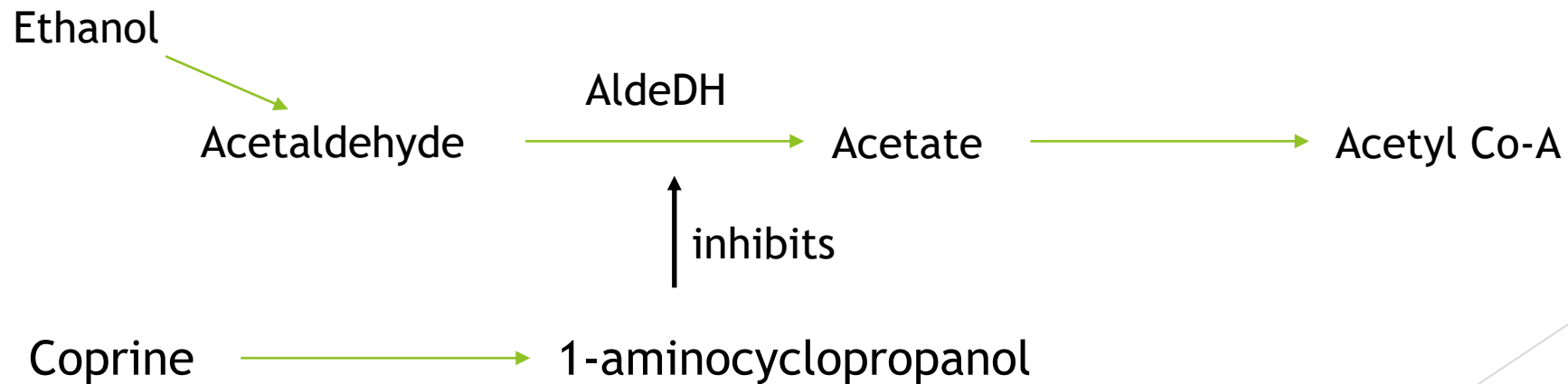


Coprinus atramentarius (Inky caps)

► Etiology

- **Coprine**
- Coprinus syndrome - inhibits aldehyde dehydrogenase

► Mechanism



Coprinus atramentarius (Inky caps)

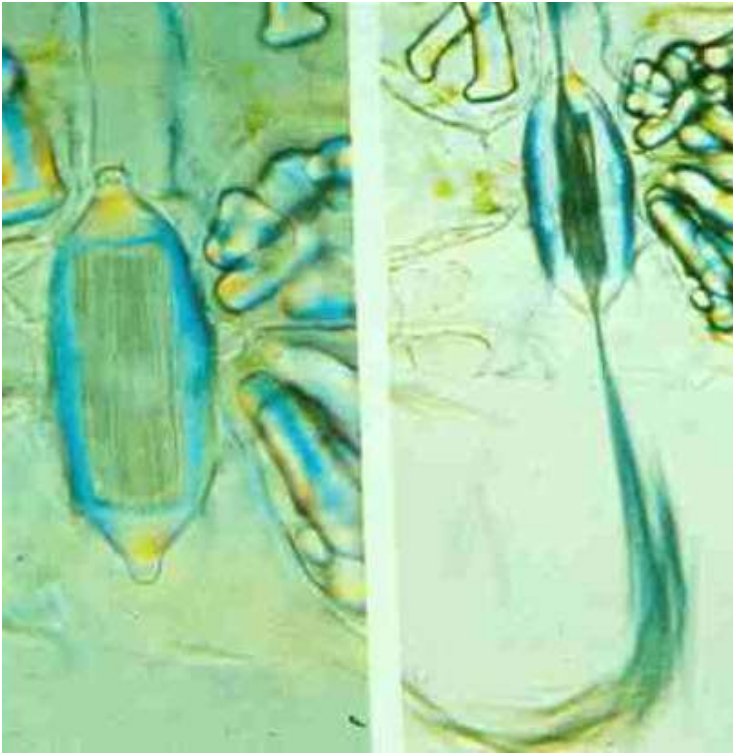
▶ Clinical

- ▶ Onset: 5 minutes to 2 hours after ethanol ingestion
- ▶ Erythema diffusely
- ▶ Nausea, vomiting
- ▶ Tachycardia, hypotension
- ▶ Parathesias

▶ Treatment

- ▶ Supportive

Calcium Oxalate Crystals





Anticholinergics



Jimson Weed
(Datura stramonium)

Anticholinergics



**Deadly Nightshade
(*Atropa bella-donna*)**







Arm circumference increased by 4 cm in 1 hour



Day 2





Day 5

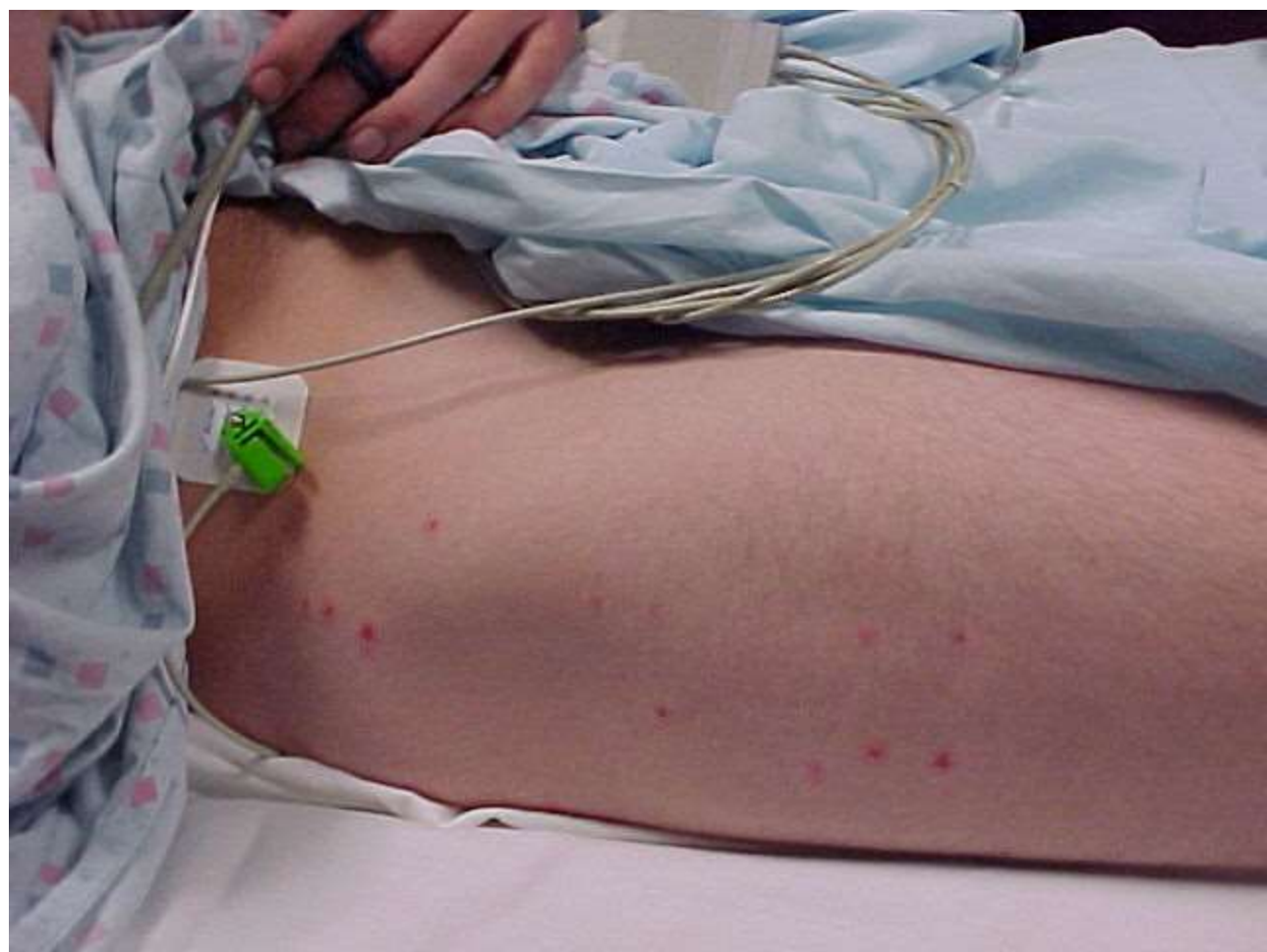


Day 6





















Arm circumference increased by 4 cm in 1 hour



Day 2





Day 5



Day 6





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