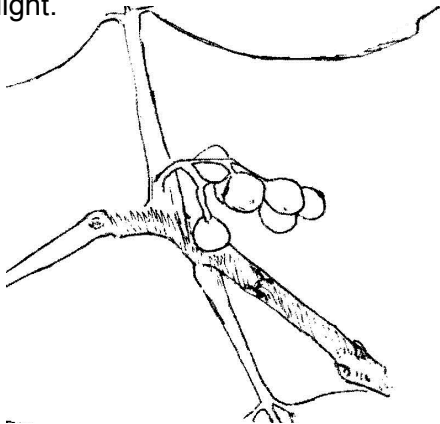


Why does poison ivy exist?

Like every organism that has come to exist, poison ivy has an ecological niche. It is a pioneer plant--growing quickly in disturbed areas and acting as a ground cover which makes space for slower species to develop. It has an extensive rhizomal root system which can aid in preventing erosion. While poison ivy often climbs trees, it tends to be less aggressive than many invasive climbing vines and rarely kills an otherwise healthy tree as it reaches for the light.

Many birds and other animals enjoy the high fat drupes in the late summer and thereby spread the seeds.



Why is it so hard to identify? How does one learn?

Poison ivy can look a lot of ways, and a lot of plants can look a bit like poison ivy. Its size, shape, color, and growing patterns vary between individuals and throughout the season. Its variation is so pronounced that over time, 30 to 40 different species of poison ivy have been named, only to be recently reduced to one species, *Toxicodendron radicans*. Common "telltale" characteristics, like its three leaflets, are shared by many plants native to the same areas.

A call for tips from some poison ivy identifying friends pointed to a few helpful traits. Many use the mitten shaped side leaflets as a clue- the two outside leaflets tend to have a "thumb" on the outer edge and the center leaflet often has that shape on both sides. Sometimes the leaflets may all be more toothed or even smooth-edged, though! The glossy leaves are another hint, though this is most pronounced early in the growing season and may not be present at all. Another noteworthy trait is the center leaflet has a longer stem than the other two. It is rare to notice the fruits because they are often hidden by the leaves, but the white color of the berries is another strong clue you're looking at poison ivy. The more you practice identifying, the easier it will get to pick this plant out in a crowd, in spite of the different ways it can present. Good luck out there!

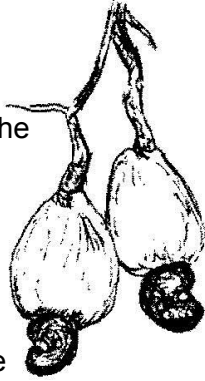
Does the plant benefit from its rash giving properties?

We wondered whether the toxic oil (called urushiol) was thought to have evolved as a defense against consumption or trampling. This would have led to more questions--why would it develop a defense mechanism with such a long reaction time? How could that be effective? In fact, it is not thought to have evolved for this reason, but as a protection against microbial infection. The oil seals holes the plant may get from insect bites or other tears. It isn't even released from an intact plant- though the poison ivy skin is tender and easy to break. The rash we get is just a side effect of the plant protecting itself from disease.

Who are its relatives? Do they have urushiol?

Several plants are under the same genus, Toxicodendrons (literally “poison tree,” though poison ivy is notably not a tree). Poison oak, poisonsumac, and Chinese lacquer trees also fall under this category. They all contain urushiol; lacquer is known to cause a dermatitis reaction in folks who work with it.

Toxicodendrons are in the cashew family, called Anacardiaceae. (The name Anacardium, originally from the Greek, refers to the nut which is outwardly located (ana means “upwards” and -cardium means “heart”).) Mangoes and pistachios are in this family, too, among others. The cashew and mango are safe to eat but do contain urushiol in other parts of the plants.

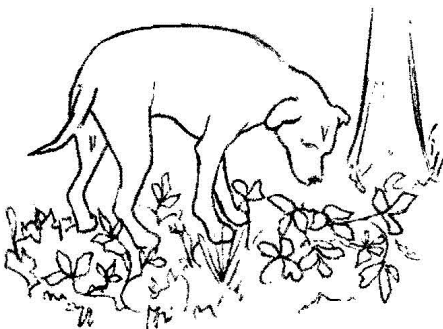


How long does urushiol last on fomites?

The oil from poison ivy can travel on anything it touches, and it can stay there for a long time. The oil can remain potent for several years. We read one anecdote about gloves that had been exposed and left for a year, then washed, and were responsible for a rash after someone used them. The oil can also stay in the plant long after it dies, so watch out for dead gloves, too.

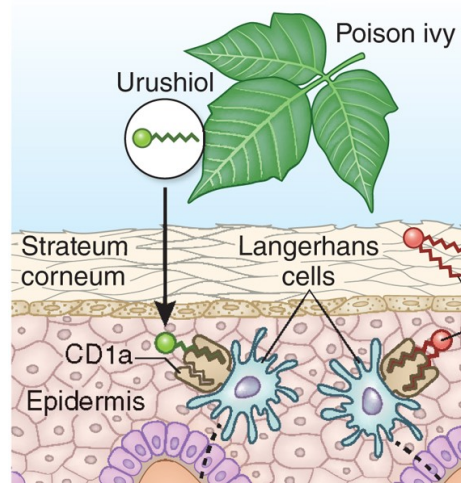
Why haven't I gotten it from the dog?

Luck? It seems like it is actually pretty common to pick up urushiol from a dog or other pet tramping through poison ivy and then touching human skin. Like other surfaces, the oil can stay on the fur of animals and be transferred to unsuspecting people.



So why do humans get a rash?

An unlucky coincidence! A 2016 study found that there is a specific molecule expressed by the skin's immune response (Langerhans) cells, called CD1a, whose structure just so happens to be the right shape for binding to urushiol antigens. As a result, most people are allergic to the urushiol oil, and react to it with a rash where the oil touches the skin.



From Nature Immunology

Why does it take so long for the rash to develop?

There are four types of allergic reactions and this one is type 4, known as a cell-mediated reaction, resulting in delayed dermatitis. Langerhans cells bring antigens to present to the body's T-cells. T lymphocytes pour out inflammatory signal substances called cytokines. These call in armies of white blood cells called monocytes, which become macrophages. The macrophages become activated by the cytokines and attack everything in the vicinity, and can cause severe tissue damage. This complicated, multi-step process can take several days.

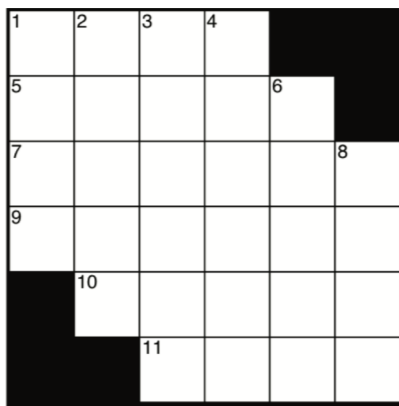
Why do the reactions get worse with repeated exposure?

The allergic response may not even show up with one's first exposure and tends to get more severe as they have more exposures. The immune system gets “better” at recognizing the substance and the practiced response can be more effective (at attacking one's own skin). When first exposed, the

body responds by readying t-cells specific to attacking urushiol, so next time the response can be way stronger!

Do other animals react to urushiol? Why or why not?

Mostly, other animals have no adverse effects when exposed to urushiol. In fact, the CD1a molecule connection had been previously unnoticed because lab mice, like most other animals, do not express CD1a. Luckily, Harvard professor Dr. Florian Winau, who had been studying CD1 molecules for a decade, came across the structure of urushiol molecules and thought “hey, that might fit.” They then used mice genetically engineered to express CD1a and found that it did. This begins to explain why poison ivy is only known to be a problem for us and a few other CD1a-expressing primate species (and guinea pigs, for some reason).



ACROSS

- 1 Former genus name of poison ivy
- 5 Rowed
- 7 Fruits of poison ivy
- 9 Six-line stanza of poetry
- 10 Hobbits' habitat
- 11 Rapper in "Law & Order"

DOWN

- 1 Some retinal cells

- 2 Long-eared hoppers
- 3 Japanese word for the Chinese lacquer tree, and root word of its toxic oil
- 4 Word before tank or shock
- 6 Eponymous tractor manufacturer
- 8 Editor's note literally meaning "let it stand"

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