

Poison Ivy: Taking the Itch Out of the Rash

by
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Part I – Encounters with Poison Ivy

The year: 1412

Warning among the Onondaga Indians living in the mountains of New York.

“Beware of the ko-hoon'ta (stick that makes you sore)!”

The year: 1607

Message from John Smith from the newly founded Jamestown Colony to England.

“The poisoned weed is much in shape like our English Ivy, but being touched, causeth rednesse, itching, and lastly blisters, that which howsoever after a while passe away of themselves without further harme, yet because for the time they are somewhat painful, it hath got itselfe an ill name, although questionlesse of no ill nature.”

The year: 2010

Urgent message from Julie, a first-year student attending college in Florida, to her mother.

“Mom! Last Friday I finished writing a long paper and wanted to get away. So on Saturday a group of us went hiking. We followed trails along streambeds and all through the woods. But now it is Tuesday and I am miserable! I wish that I had not gone. My legs are covered in a rash with blisters that are ready to pop. The itching is out of control. I don't understand. What should I do? Help!!!”

Questions

1. If you have encountered poison ivy, where did you find it?
2. What symptoms are caused by poison ivy?
3. Describe why poison ivy is able to live in very different habitats—the cold mountains of New York, the coastal forests of Virginia, and along streambeds in Florida.
4. Propose a reason why poison ivy produces this reaction in humans since it was in North America even before the Indians came.

Part II – The Mystery of the Blisters Unfolds

In the phone conversation with her mother, Julie wanted some sympathy and good advice, but her mother merely laughed.

“Julie,” her mother explained, “You probably brushed against poison ivy while hiking through the woods. I remember as a little girl you would regularly get into poison ivy while playing outside. A few days later, you would have a rash on your legs and arms and be miserable.”

Julie asked, “Do we have it in California? I don’t remember getting this awful rash at home!”

“No,” her mother replied. “I haven’t seen it since we moved here.”

Meanwhile, text messages were flying among the students who went on the hike. Who had the most blisters? What can relieve the itching? Joe, however, was not complaining. He was an international exchange student from Spain and had no symptoms. He was pleased. “I must be immune to poison ivy,” he bragged to his friends.

Since Julie had lived in California for most of her life, she did not know much about this plant and wanted to know more—what it was, what caused her discomfort, and how long the rash would last.

She decided to do some research on poison ivy using the Internet. A lot of information was available: how to recognize it, how to get rid of the plant in your yard, and, most importantly, what types of cures are best for the itch.

Excited, she made a list of facts about poison ivy to share with her friends who went on the hike. Here are some facts about poison ivy that Julie compiled:

1. An oil, called urushiol, is found within all plant parts. It is the ultimate cause for the symptoms.
2. When the skin brushes the plant, the leaves bruise and release urushiol. This chemical binds quickly and tightly to the skin’s outer cells.
3. These cells now appear foreign to the body.
4. The immune system then launches a chain reaction to create defensive cells that will recognize urushiol the next time it enters the body.
5. At the next exposure, these new defensive cells launch an attack on the urushiol. It takes about two days before the skin shows the effects of the immune system’s response.

Julie made a quiz to see how much they knew about poison ivy. You should take the quiz as well (see next page). Include the reason to explain your decision for each.



Figure 1. Symptoms caused by poison ivy.

Image credit: Poison ivy rash by Flickr contributor jovino, licensed in accordance with CC BY-NC-SA 2.0, photo obtained from <http://www.flickr.com/photos/jovino/3429557649/>

Julie's Quiz

1. *The leaves of poison ivy burn the skin on contact.*

- TRUE
- FALSE

EXPLANATION:

2. *You can catch poison ivy from someone else.*

- TRUE
- FALSE

EXPLANATION:

3. *Merely petting a dog that recently walked through a patch of poison ivy can produce a reaction.*

- TRUE
- FALSE

EXPLANATION:

4. *Because Joe did not react to poison ivy, he is immune to the plant's oil.*

- TRUE
- FALSE

EXPLANATION:

5. *After scratching the blisters, the rash can spread elsewhere on the body.*

- TRUE
- FALSE

EXPLANATION:

6. *Washing the exposed skin with water just after contact will prevent the reaction.*

- TRUE
- FALSE

EXPLANATION:

7. *There is a way to prevent the symptoms.*

- TRUE
- FALSE

EXPLANATION:

Part III – Finding a Treatment

Julie and her friends met for dinner later that week. Their rashes were no longer itching uncontrollably and they were laughing about their troubles. All of them had been to the local stores to find lotions to relieve their symptoms. None worked great since the rash and blisters did not go away, but a few treatments dried up the blisters and stopped some of the itching.

One particular treatment that Julie kept seeing on the Internet was related to an herbal remedy containing jewelweed, a native plant (Figure 3). A natural and organic approach to control the symptoms seemed appealing. It was also one that her mother told her she had used at nature camp.

“Just rub the leaves of jewelweed where you touched the poison ivy,” the camp counselors had recommended, “then you will not get the rash. It is easy to find since it grows in the same places as poison ivy. This remedy was passed down from the first Americans, the Indians.”

Julie told herself that she had better learn to recognize the plant because she did not plan on staying in her room for the rest of her life!



Figure 2. Leaves of poison ivy.



Figure 3. Jewelweed.

Your job is to use the scientific method to plan an experiment to determine if jewelweed is an effective treatment.

First, develop a hypothesis that includes a justification and prediction.

Second, plan the experiment. These questions will help you:

- (a) How will poison ivy be applied?
- (b) What part of jewelweed should be used for treatment—the flowers, the leaves, the stems, all parts of the plant?
- (c) How will jewelweed be applied?
- (d) Who will be tested?
- (e) How will they be tested?
- (f) What are the controls?
- (g) What variables must be considered?
- (h) What type data should be collected?
- (i) How will those results be analyzed?

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Part IV – The Scientific Experiment

Long, Ballentine, and Marks (1997) decided to find out if the widespread claims that jewelweed can control the poison ivy rash was true. They could not just rub the poison ivy leaves on people and then rub the area with jewelweed. A plan had to be developed so the experiment could be repeated by others.

Controlling for the treatment with poison ivy was easy. To simulate brushing against the plant in nature, they prepared a standard solution of urushiol. But the active ingredient of jewelweed was not known, so a purified chemical was not available. The jewelweed extract was prepared by boiling fresh stems for 30 minutes, diluting the mixture with water, and placing it in small bottles. An identical set of bottles was also filled with water. The participants received a set of two bottles, one of jewelweed extract and one of water, as takeaways so they could administer the treatments themselves. They did not know which bottle contained the jewelweed extract and which the water (or control), although the researchers knew.

Ten participants or subjects were recruited. All were known to develop an allergic reaction based on a preliminary test. Each received the urushiol solution on two areas, one on each forearm. The urushiol solution remained on the skin for four hours, and then the arms were washed with soap and water. They left with their two bottles and were instructed to apply one of the solutions to the affected area of a single arm four times a day beginning on day 2. The other solution was to be applied to the other arm. On days 2, 3, 7, and 9 the treated areas were evaluated using a scale from 0 (no reaction) to 7 (the most severe reaction) (Table 1).

Table 1. Descriptions of the symptoms by score.

<i>Score</i>	<i>Reaction</i>
0	No reaction
1	Erythema (reddish skin) with itching
2	Erythema with edema (swelling) and itching
3	Same as 2 but with 25% or less of the test site with blisters
4	Same as 2 but 25%–50% blistering
5	Same as 2 but 50%–75% blistering
6	Same as 2 but 100% coverage with blisters
7	Same as 2 but with ruptured blisters

On each day the symptoms were observed, scores for the 10 subjects were recorded and analyzed. The reaction range line for each day shows the median (middle) score and the maximum and minimum scores (Figure 4, next page). The box on each line is the IQR (interquartile range or the range in which 50% of the scores reside).

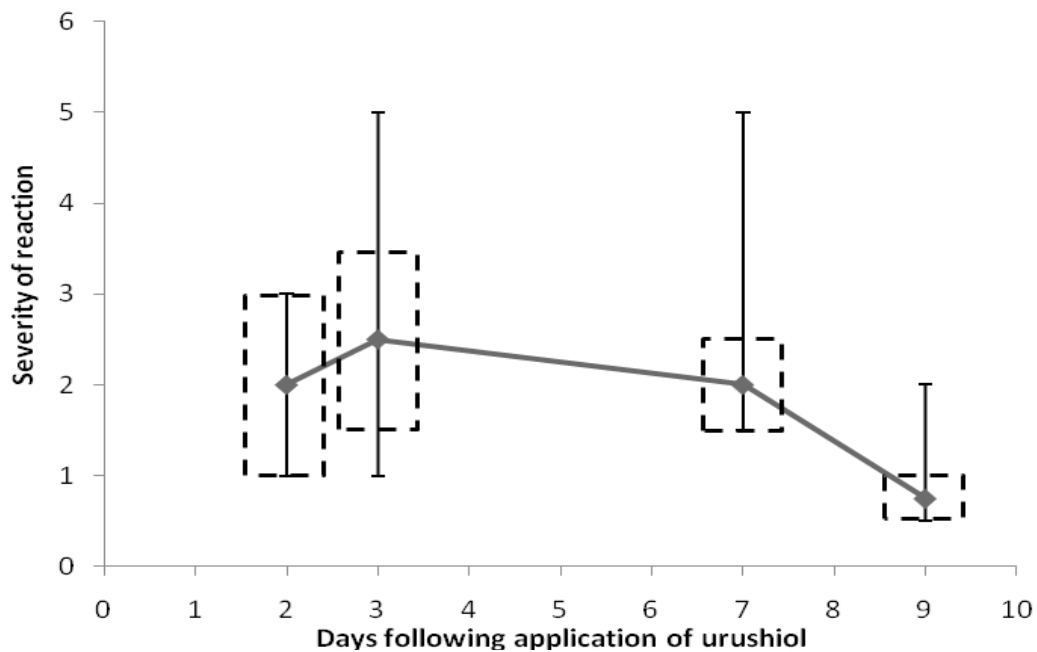


Figure 4. Reactions of the control treatment on days 2, 3, 7 and 9 following contact with urushiol. Median, maximum, and minimum values are plotted along with the interquartile range (box) on the reaction range lines. (Graph based on data presented in Table 1 of Long, Ballentine, and Marks, 1997.)

Questions

- Using the median scores, describe the change in symptoms' severity throughout the course of treatment.
- On Figure 4 predict new median points on the reaction lines for days 2, 3, 7, and 9 that support the two conditions described below:
 - The jewelweed extract improved the symptoms. Place a square on the reaction range line (or on a line that extends from the reaction range line) for each day.
 - The jewelweed extract had no effect on the symptoms. Add an X to the reaction range line (or on a line that extends from the reaction range line) for each day.

Part V – Does the Jewelweed Treatment Work?

The median scores for the jewelweed-treated areas were compared with those of the control (Figure 5). The IQRs were not included because they were similar for the two data sets.

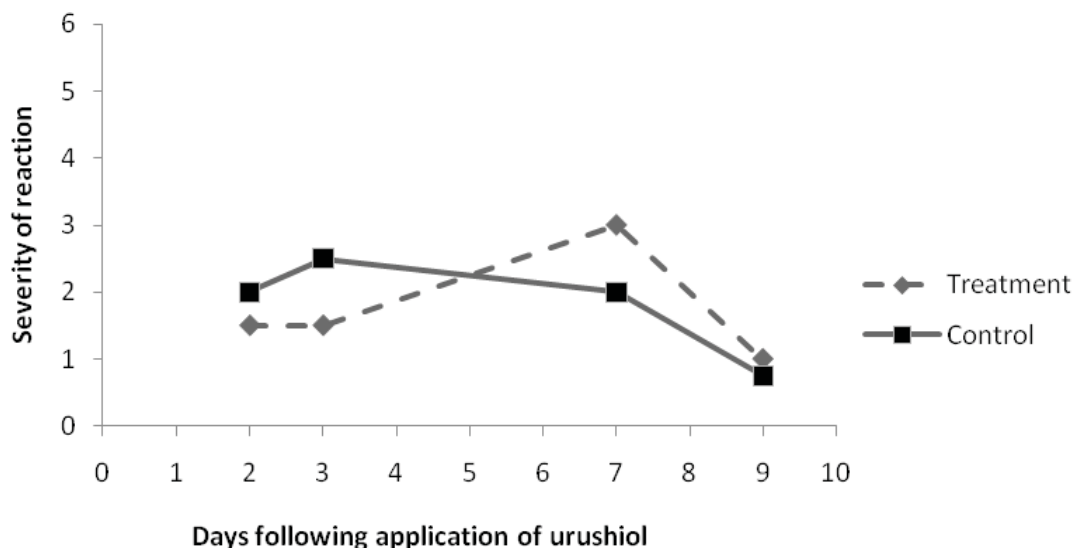


Figure 5. The severity of reaction using either jewelweed extract or water to treat the rash. Control (solid line); treatment with jewelweed extract (dotted line). (Graph redrawn after Figure 2 in Long, Ballentine, and Marks, 1997.)

Questions

1. Do these results support the claim that application of jewelweed is a good treatment for symptoms caused by poison ivy? Explain.
2. If you were walking in the woods and found yourself in a patch of poison ivy, does this experiment let you know if you should rub the affected area with jewelweed? If not, plan an experiment that would let you know what to do in this case.



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