Chemist develops spray to detect poison oak's toxic oil

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The last time Rebecca Braslau got a bad case of poison oak, she found herself pondering the chemical structure of urushiol, the toxic oil in poison oak and its relatives, poison ivy and poison sumac (all species of Toxicodendron).

"I thought: I'm a chemist. I should be able to do something about this," said Braslau, a professor of chemistry and biochemistry at the University of California-Santa Cruz.

Now her lab has developed a spray that can be used to detect urushiol on clothes and equipment, and potentially on skin, allowing people to wash off the oil before it causes an itchy, blistering skin rash.

Exposure to tiny amounts of urushiol is enough to cause this allergic reaction in susceptible people, and about 70 percent of U.S. adults are clinically allergic to urushiol or would become allergic if exposed enough times.

Although Braslau said she doesn't think there are toxicity concerns with any of the components of the spray, toxicology tests would be required before it could be approved for use on the skin.

"Of course, it would be great if we could deactivate the oil, but just being able to see it is useful because then you can wash it off," she said. "People can keep getting exposed from items with the oil on them. About 10 percent of firefighters have to take time off work due to

poison oak, and some of that is from exposure to oil that gets on their equipment."

Braslau's team described their spray in a paper published by the Journal of Organic Chemistry (online August 2012; in print January 2013). The spray reacts with urushiol to produce a fluorescent glow detectable under an ultraviolet "black light."

Chemically, urushiol belongs to a class of compounds known as catechols, which have a characteristic ring structure. Urushiol has a long greasy tail or "sidechain" attached to the ring, and different mixtures of urushiols with slightly different sidechains are found in the various Toxicodendron species.

Braslau's spray detects the catechol ring structure. It contains a mixture of compounds, including a "profluorescent" compound in which the fluorescence of a dye molecule is quenched, and reaction with urushiol allows the dye to light up.

The formula has been patented, but Braslau said more work is needed to make it into a marketable product. She is also interested in developing it into a technique to detect catecholamines, which include physiologically important molecules such as dopamine and epinephrine.

Braslau's work on this project has not been funded by any major grants, aside from a small starter grant from her university. Her lab is continuing to do some work on it, mostly experimenting with different dyes. Developing it into a commercial product, however, will require an investor willing to fund additional research, she said.

"I do hope it will be available some day, because poison oak causes a lot of suffering. I've had really bad cases myself, and it has a big impact on people who work outdoors," she said.

Workers' compensation data, for example, indicate that poison oak accounts for more than 10 percent of lost-time injuries in the U.S. Forest Service.

In addition to Braslau, UCSC undergraduate Erin Lilie and graduate students Frank Rivera III and MariEllen Cottman contributed to this research and are co-authors of the paper.