Why the scarlet velvet ant's sting is so painful to so many different species

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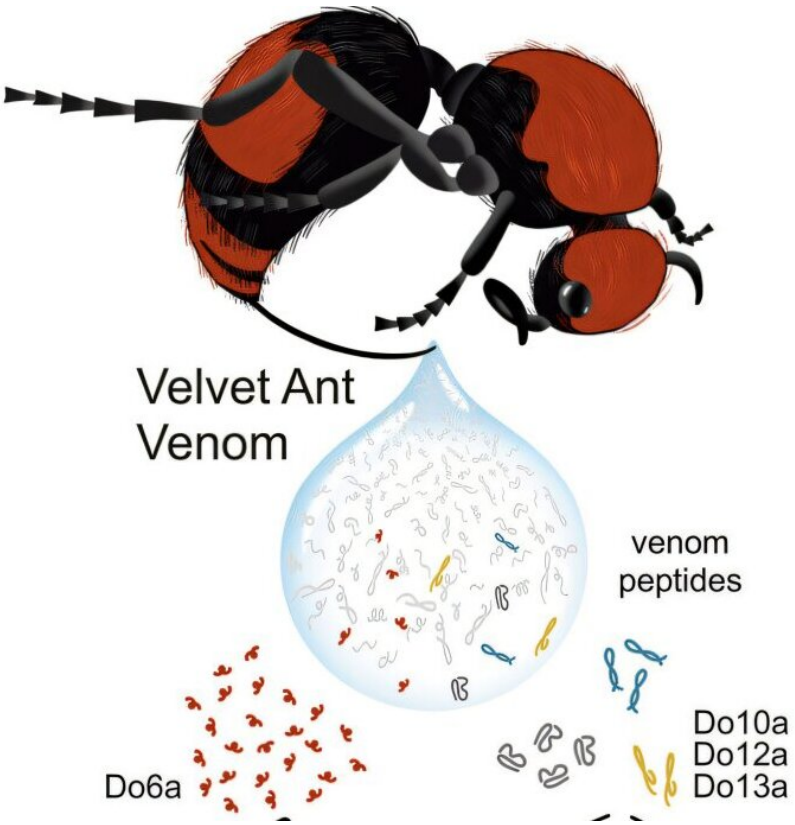

Credit: *Current Biology* (2025). DOI: 10.1016/j.cub.2024.11.070

A team of biologists, neurologists and chemists at Indiana University has discovered why the velvet ant's sting is so painful to so many different types of creatures. In their paper published in *Current Biology*, the group

describes their study of all of the peptides found in the insect's venom.

The scarlet velvet ant is very well known for its extremely painful sting. Less well known is that the velvet ant is not actually an ant at all—it is a type of wingless parasitic wasp. The insect's venom has been found to be painful to a host of creatures, ranging from mammals, to birds, amphibians, and reptiles—such an ability suggests that at one time, the insects had a wide range of predators. Because such an ability is not often seen in the animal kingdom, the researchers decided to investigate how it works.

The effort by the team involved collecting multiple samples of the venom from several donors and then taking a closer look at all 24 of the peptides it contains. Prior research has shown that peptides in venom are almost always the chemicals responsible for the painful symptoms caused by stings. To learn more about each peptide, they created synthetic versions of each, which allowed for easier testing.

Testing of the peptides was done by injecting them individually into test subjects, such as fruit flies and mice. In so doing, they found that the reason the velvet ants' venom is so effective against so many different types of creatures is that it contains different peptides for different victims. For example, they found one, Do6a, that was effective in fruit flies. They also found that some creatures, such as mammals, get a double dose of pain, courtesy of two peptides—Do13a and Do10a.

The researchers suggest their findings show that some creatures were likely more of a threat to the velvet ants than others—tailored peptides, they suggest, such as Do6a, indicate the need for a particular target. They conclude by suggesting their work is likely the tip of the iceberg—it seems likely that many creatures have the ability to inflict pain on a wide variety of other creatures; they just have not yet been identified.

More information: Lydia J. Borjon et al, Multiple mechanisms of action for an extremely painful venom, *Current Biology* (2025). DOI: 10.1016/j.cub.2024.11.070