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8 August 2005

Frogs and Ants Share Poison Recipe

The tiny poison frogs of Madagascar and the Americas get their chemical weapons from toxic compounds known as alkaloids. A new study shows that distantly related frogs in the two regions obtain identical alkaloids from ants and other arthropods, suggesting that similar chemical defenses can evolve independently.



Yellow means stop. The skin of South American golden poison frog (*Phyllobates terribilis*) contains enough toxin to kill 100 people.

CREDIT: Valerie Clark

group of bitter-tasting organic compounds that includes strychnine and nicotine. Because most poison frogs can't manufacture their own alkaloids, the source of their toxins was, until recently, a mystery. Last year, researchers discovered that poison frogs in Panama most likely get their alkaloids by consuming toxic ants and a species of millipede.

The four families of poison frogs--found in Australia, Madagascar and Central and South America--harbor some of the world's deadliest animals. One thumb-sized species from Colombia holds enough poison in its skin to kill 10 humans. The frogs' toxic punch comes from alkaloids, a

Could similar arthropods be the source of alkaloids for other poison frog species elsewhere in the world? To find out, a team led by Valerie Clark, a graduate student now at Cornell University in Ithaca, New York, tested frogs and arthropods collected from Madagascar. Of 81 alkaloids they detected in the frogs, seven also showed up in the amphibians' arthropod prey, suggesting that these frogs, like their Panamanian counterparts, get their toxins from their diet. Although the Malagasy frogs and their arthropod prey are not closely related to those in Central and South America (with the exception of one millipede and possibly one ant species), the frogs shared 75 percent of their alkaloids. The fact that these shared alkaloids are not found in other members of the Malagasy and American frog families suggests that they did not evolve this method of chemical defense from a common ancestor. Rather, it seems that poison frogs in the two regions have independently evolved the use of the same arthropod-derived alkaloids in chemical defense, the team reports online this week in *Proceedings of the National Academy of Sciences*.

"The fact that the chemicals are more-or-less the same is striking," says Thomas Eisner, a chemical ecologist at Cornell University. "It's a remarkable case of convergence" that shows just how ingenious organisms are in the way they "play around with chemicals."

--FIONA PROFFITT

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