

The following article has been reprinted from *New Scientist*, 9 July 1994

## POISON FROGS EAT POISON PREY

Some of the most potent toxins known are found in the skins of frogs from Central and South America. This is why indigenous peoples use them to make poison arrows. Everyone assumed that these so-called "arrow-poison frogs" made the toxins themselves. Now, however, it looks as if they obtain at least some of them from their food.

Arrow-poison frogs are a group of small, brightly coloured amphibians that live on the forest floor. When they are threatened, glands in their skin exude secretions that are so toxic that a tiny smear can kill a horse. Oddly, however, frogs kept in zoos soon lose their toxicity.

John Daly of the National Institutes of Health in Bethesda, Maryland, noticed that some components of the frogs' chemical cocktails either occur in insects in leaf litter or else have chemical precursors that do. He wondered whether the toxins, many of which were alkaloids, had a dietary component.

Daly and his team tested the idea in Panama, the home of *Dendrobates auratus*, a very well-studied arrow-poison frog. The researchers caught *D. auratus* tadpoles, raised them to adulthood in indoor enclosures, then divided them into two separate test groups. One group were fed fruit flies, which contain no toxic alkaloids, while the other was raised on arthropods collected from the leaf litter of the surrounding forest.

After seven months, Daly and his team extracted alkaloids from the frogs' skins. When they analysed them, they found that frogs raised on fruit flies had virtually no alkaloids, just like zoo specimens. By contrast, frogs raised on leaf-litter had substantial amounts of several alkaloids (*Journal of Chemical Ecology*, vol 20, p 943).

Of the 21 alkaloids identified by Daly's team, 18 were shared with adult *D. auratus* caught in the Panamanian forest. The alkaloid precocinelline was also found in beetles of the forest floor, pyrrolizidine in ants, while several other alkaloids were found in millipedes. Daly's results offer the intriguing possibility that these frogs may be preferentially choosing toxic insects as prey.

The group identified several chemicals in invertebrates of the leaf litter which may be precursors for some of the alkaloids secreted by the frogs. It also found that the frog skins contain other toxins that are unique to them, so they must also be synthesising their own poisons.

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