

First study to show that pesticides can induce morphological changes in vertebrate animals

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(PhysOrg.com) -- The world's most popular weed killer, Roundup, can cause amphibians to change shape, according to research published today in [Ecological Applications](#).

Rick Relyea, University of Pittsburgh professor of biological sciences in the Kenneth P. Dietrich School of Arts and Sciences and director of Pitt's Pymatuning Laboratory of Ecology, demonstrated that sublethal and environmentally relevant concentrations of [Roundup](#) caused two species of amphibians to alter their morphology. According to Relyea, this is the first study to show that a pesticide can induce morphological changes in a vertebrate animal.

Relyea set up large outdoor water tanks that contained many of the components of natural wetlands. Some tanks contained caged predators, which emit chemicals that naturally induce changes in tadpole morphology (such as larger tails to better escape predators). After adding [tadpoles](#) to each tank, he exposed them to a range of Roundup concentrations. After 3 weeks, the tadpoles were removed from the tanks.

“It was not surprising to see that the smell of predators in the water induced larger tadpole tails,” says Relyea. “That is a normal, adaptive response. What shocked us was that the Roundup induced the same changes. Moreover, the combination of predators and Roundup® caused the tail changes to be twice as large.” Because tadpoles alter their body shape to match their environment, having a body shape that does not fit

the environment can put the animals at a distinct disadvantage.

Predators cause tadpoles to change shape by altering the stress hormones of tadpoles, says Relyea. The similar shape changes when exposed to Roundup suggest that Roundup may interfere with the hormones of tadpoles and potentially many other animals.

“This discovery highlights the fact that [pesticides](#), which are important for crop production and human health, can have unintended consequences for species that are not the pesticide’s target,” says Relyea. “Herbicides are not designed to affect animals, but we are learning that they can have a wide range of surprising effects by altering how hormones work in the bodies of animals. This is important because amphibians not only serve as a barometer of the ecosystem’s health, but also as an indicator of potential dangers to other species in the food chain, including humans.”

More information: For two decades, Relyea has studied community ecology, evolution, disease ecology, and ecotoxicology. He has authored more than 80 scientific articles and book chapters and has presented research seminars around the world. For more information about his laboratory, visit www.pitt.edu/~relyea/ .

Provided by University of Pittsburgh

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