Salamanders Suffer Delayed Effects Of Common Herbicide

Mar. 26, 2007 — Pollution from a common herbicide might be causing die-offs in stream salamanders, according to biologists who say findings from their long-term study raise concerns over the role of atrazine in global amphibian declines.

The results also suggest that while impacts of the herbicide, atrazine, may not show up in short-term studies, even extremely low concentrations of the chemical may be deadly to amphibians in the long run.

"We are concerned that most studies used to make pesticide registration decisions and to derive safe concentrations last for about four days," said Jason R. Rohr, research associate at the Penn State Institutes of Energy and the Environment. "They often do not consider recovery processes, persistent effects of chemical exposure, or interactions among individuals within and between species that can affect our estimates of safe chemical concentrations."

Atrazine is one of the most widely used pesticides in the United States, and possibly the world. It is relatively long-lived and is even found at the poles. According to the U.S Environmental Protection Agency, it is one of the most common contaminants in ground and surface water.

Rohr and his colleagues Timothy M. Sesterhenn, doctoral candidate, Brent D. Palmer, associate professor, and Tyler Sager, doctoral candidate, all at the University of Kentucky, Lexington, exposed streamside salamander larvae to either 4, 40, or 400 parts per billion of atrazine until metamorphosis, the stage where the water-dwelling salamanders lose their gills and develop lungs that enable them to breathe in air. Scientists then tracked their survival to near reproductive age.

Results from the study, which lasted about 500 days, indicated that the two highest concentrations increased salamander mortality during exposure. However, this mortality benefited the survivors who experienced lower competition-related mortality after metamorphosis.

Nevertheless, this recovery from atrazine exposure paled in comparison to the persistent effects of atrazine that continued to cause mortality after exposure ceased, said researchers. Compared to salamanders not exposed to atrazine, *survivors of the atrazine exposure had significantly lower survival 421 days after being exposed. In other words, effects of early exposure to the chemical were showing up over the long term, such that the net effect of atrazine exposure was even worse later in life than it was while the animals were being exposed. (emphasis added - SK)*

"The biggest surprise was that it took nearly a year to detect the effects of atrazine at 4 parts per billion, which is just 1 part per billion above the maximum allowable level in drinking water set by the U.S Environmental Protection Agency," said Rohr, who presented his findings at a recent workshop organized by the U.S Geological Survey in St. Louis, Missouri.

"What this tells me is that we need to consider the long-term effects of chemicals, and that exposure to atrazine during formative stages might have permanent effects on these salamanders that increases their risk of mortality," he added.

While the mechanism by which atrazine causes elevated mortality remains unclear, Rohr says other scientists have evidence suggesting that this pesticide is an endocrine disruptor.

Such chemicals disrupt the production of hormones that are vital to normal bodily functions. Concentrations of atrazine as low as 0.1 parts per billion have been shown to cause male frogs to develop both male and female organs by altering their production of sex hormones.

Findings from Rohr's study, which was funded by the U.S Environmental Protection Agency, National Science Foundation, and the Kentucky Academy of Sciences, could have implications for global amphibian declines.

"Salamanders, and amphibians in general, are crucial to ecosystems, as both predators and prey. They can be seen as bioindicators of environmental stress and harbingers of risk to other animals as well as humans," explained Rohr, also affiliated with Penn State's Center for Infectious Disease Dynamics.

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