Weedkiller in waterways can change frogs' sex traits

By David A. Fahrenthold
Washington Post Staff Writer
Tuesday, March 2, 2010

A new study has found that male frogs exposed to the herbicide atrazine -- one of the most common man-made chemicals found in U.S. waters -- can make a startling developmental U-turn, becoming so completely female that they can mate and lay viable eggs.

The study, published online Monday in the Proceedings of the National Academy of Sciences, seems likely to add to the attention focused on a weedkiller that is widely used on cornfields. The Environmental Protection Agency, which re-approved the use of atrazine in 2006, has already begun a new evaluation of its potential health effects.

Its manufacturer, Swiss agri-business giant Syngenta, says research has proven that the chemical is safe for animals and for people, who could be exposed to trace amounts in drinking water.

But in recent years, a series of scientific studies have seemed to show atrazine interfering with the hormone systems that guide development in fish, birds, rats and frogs. In many cases, the result has been "feminized" males, with behaviors or body parts more like those of females.

The new study, led by Tyrone Hayes, a professor at the University of California at Berkeley, appeared to show an even more drastic transformation: Some male frogs became female, in everything but their genes.

Hayes's study examined a group of 40 African clawed frogs, all of which carried male chromosomes. When they were tadpoles, he put them in water tainted with 2.5 parts per billion of atrazine -- still within the EPA's drinking water standards.

About 10 percent of the frogs that developed in the water became "functionally female," Hayes said. The eggs they produced after mating hatched; the offspring were all male, because both parents contributed male genes.

The other 90 percent of the exposed frogs retained some male features, Hayes said, but often had lower testosterone levels and fertility. When competing for female frogs' attentions, atrazine-treated males frequently lost out to males that hadn't been treated.

Hayes said the problem could be that atrazine is absorbed through the frogs' skin and turns on a gene that, in male frogs, should stay off. It produces an enzyme that converts testosterone into estrogen, flooding the frog's body with the wrong chemical signals.

He said the findings should raise alarms about human health.

"It's a chemical . . . that causes hormone havoc," Hayes said. "You need to look at things that are affecting wildlife, and realize that, biologically, we're not that different."

Hayes's findings run counter to the EPA's most recent ruling on the subject, in 2007. After reviewing scientific evidence -- including earlier work by Hayes that seemed to indicate other troubling changes in

frogs -- the EPA concluded that there was no evidence atrazine was causing adverse impacts on the amphibians' development.

On Monday, Syngenta officials said the EPA's finding should settle the issue.

"They were quite convinced that the question of whether atrazine affects frogs' sexual development is answered," said Tim Pastoor, Syngenta's principal scientist. "And that answer is no, it doesn't."

Syngenta officials referred a reporter to Keith Solomon, a professor at the University of Guelph in Canada, who said he had questions about Hayes's work. He said no other studies, including those on African clawed frogs living near atrazine-laden fields in Africa, found this level of effect.

Hayes's work may be "irrelevant in the big picture" because it hasn't been repeated elsewhere, Solomon said. He said he had received funding from Syngenta for previous research, but that it had not biased his work.

Atrazine, first approved in the United States in 1958, has been used to keep weeds from crowding out young corn plants as they grow. Studies show it has washed off farm fields with the rain, and become pervasive in U.S. streams.

In the Washington region, atrazine has been found in the Potomac, Monocacy and Shenandoah rivers, where investigators are trying to determine whether it is related to male bass in the Potomac found to be growing eggs.

On area farms, atrazine is an important tool of corn growers, said Lynne Hoot of the Maryland Grain Producers Association. But Hoot said atrazine is used less today: About 70 percent of corn and soybeans grown in the state are genetically designed to work better with the herbicide Roundup.

Atrazine is "still very important," she said.

Reference website:

http://www.washingtonpost.com/wp-dyn/content/article/2010/03/01/AR2010030102331.html