

Early-life exposure of frogs to herbicide increases mortality from fungal disease

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The combination of the herbicide atrazine and a fungal disease is particularly deadly to frogs, shows new research from a University of South Florida laboratory, which has been investigating the global demise of amphibian populations.

USF Biologist Jason Rohr said the new findings show that early-life exposure to [atrazine](#) increases frog [mortality](#) but only when the frogs were challenged with a [chytrid fungus](#), a pathogen implicated in worldwide amphibian declines. The research is published in the new edition of *Proceedings of the Royal Society B*.

"Understanding how stressors cause enduring health effects is important because these stressors might then be avoided or mitigated during formative developmental stages to prevent lasting increases in [disease susceptibility](#)," Rohr said.

The study was conducted by Rohr and Lynn Martin, Associate Professors of USF's Department of Integrative Biology; USF researchers Taegan McMahon and Neal Halstead; and colleagues at the University of Florida, Oakland University, and Archbold Biological Station.

Their experiments showed that a six-day exposure to environmentally relevant concentrations of atrazine, one of the most common herbicides in the world, increased frog mortality 46 days after the atrazine exposure, but only when frogs were challenged with the chytrid fungus. This increase in mortality was driven by a reduction in the frogs'

tolerance of the infection.

Moreover, the researchers found no evidence of recovery from the atrazine exposure and the atrazine-induced increase in disease susceptibility was independent of when the atrazine exposure occurred during tadpole development.

"These findings are important because they suggest that amphibians might need to be exposed only to atrazine briefly as larvae for atrazine to cause persistent increases in their risk of chytrid-induced mortality," Rohr said. "Our findings suggest that reducing early-life exposure of amphibians to atrazine could reduce lasting increases in the risk of mortality from a disease associated with worldwide amphibian declines."

Until this study, scientists knew little about how early-life exposure to stressors affected the risk of infectious diseases for amphibians later in life.

"Identifying which, when, and how [stressors](#) cause enduring effects on disease risk could facilitate disease prevention in wildlife and humans, an approach that is often more cost-effective and efficient than reactive medicine," Rohr said.

The findings are also the latest chapter in research Rohr and his lab has conducted on the impact of atrazine on amphibians. These findings are consistent with earlier studies that concluded that, while the chemical typically does not directly kill amphibians and fish, there is consistent scientific evidence that it negatively impacts their biology by affecting their growth and immune and endocrine systems.

More information: rspb.royalsocietypublishing.org/doi/10.1098/rspb.2013.1502

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