

Fertilizer chemicals linked to animal developmental woes

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Fertilizer chemicals may pose a bigger hazard to the environment - specifically to creatures that live in water - than originally foreseen, according to new research from North Carolina State University toxicologists.

In a study published in the Aug. 27 edition of [PLoS One](#), the NC State researchers show that water fleas take up nitrates and nitrites - common chemicals used primarily in agriculture as fertilizers - and convert those chemicals into [nitric oxide](#). Nitric oxide can be toxic to many organisms.

The study shows that water fleas introduced to fertilizer chemicals in water were plagued with developmental and reproductive problems consistent with nitric oxide toxicity, even at what would be considered low concentrations.

This raises questions about the effect these chemicals may have on other organisms, says Dr. Gerald LeBlanc, professor of environmental and molecular toxicology at NC State and the corresponding author of the paper describing the results. He adds that additional research will be needed to explore those questions.

LeBlanc says that some of the study's results were surprising.

"There's only limited evidence to suggest that animals could convert nitrates and nitrites to nitric oxide, although plants can," he says. "Since animals and plants don't have the same [cellular machinery](#) for this

conversion, it appears animals use different machinery for this conversion to occur."

LeBlanc was also dismayed at seeing [toxic effects](#) at low chemical concentrations.

"Nitrite concentrations in water vary across the United States, but commonly fall within 1 to 2 milligrams per liter of water," he says. "We saw negative effects to water fleas at approximately 0.3 milligrams per liter of water."

Harmful effects of nitric oxide included developmental delay - [water flea](#) babies were born on schedule but were underdeveloped; some lacked appendages important for swimming, for instance.

LeBlanc now plans to identify the mechanism behind nitric oxide's toxic effects; evaluate the relationship between nitrite and nitrate concentrations in the environment and developmental toxicity; and consider possible risks to humans.

"It's not possible to eliminate nitrates and nitrites from our lives - they do wonders in agricultural crop production," LeBlanc says. "But we can take measures to ensure that the benefits of these chemicals outweigh their risks by keeping them out of surface waters."

More information: "Intracellular Conversion of Environmental Nitrate and Nitrite to Nitric Oxide With Resulting Developmental Toxicity" Bethany R. Hannas, Parikshit C. Das, Hong Li and Gerald A. LeBlanc, North Carolina State University Published: Aug. 27, 2010, in *PLoS One*.

Provided by North Carolina State University

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