

# Urine fertilizer: 'Aging' effectively protects against transfer of antibiotic resistance

January 22 2020

---



Credit: CC0 Public Domain

Recycled and aged human urine can be used as a fertilizer with low risks of transferring antibiotic resistant DNA to the environment, according to new research from the University of Michigan.

It's a key finding in efforts to identify more sustainable alternatives to widely used fertilizers that contribute to water pollution. Their high levels of nitrogen and phosphorus can spur the growth of algae, which can threaten our sources of drinking water.

Urine contains nitrogen, phosphorus and potassium—key nutrients that plants need to grow. Today, municipal treatment systems don't totally remove these nutrients from wastewater before it's released into rivers and streams. At the same time, manufacturing synthetic fertilizer is expensive and energy intensive.

U-M leads the nation's largest consortium of researchers exploring the technology, systems requirements and social attitudes associated with [urine](#)-derived fertilizers.

Over the last several years, the group has studied the removal of [bacteria](#), viruses, and pharmaceuticals in urine to improve the safety of urine-derived fertilizers.

In this new study, researchers have shown that the practice of "aging" collected urine in sealed containers over several months effectively deactivates 99% of antibiotic resistant genes that were present in bacteria in the urine.

"Based on our results, we think that microorganisms in the urine break down the extracellular DNA in the urine very quickly," said Krista Wigginton, U-M associate professor of civil and environmental engineering, and corresponding author on a study published today in *Environmental Science and Technology*.

"That means that if bacteria in the collected urine are resistant to antibiotics and the bacteria die, as they do when they are stored in urine, the released DNA won't pose a risk of transferring resistance to bacteria

in the environment when the fertilizer is applied."

Previous research has shown that antibiotic-resistant DNA can be found in urine, raising the question of whether fertilizers derived from it might carry over that resistance.

The researchers collected urine from more than 100 men and women and stored it for 12 to 16 months. During that period, ammonia levels in the urine increase, lowering acidity levels and killing most of the bacteria that the donors shed. Bacteria from [urinary tract infections](#) often harbor antibiotic resistance.

When the ammonia kills the bacteria, they dump their DNA into the solution. It's these extracellular snippets of DNA that the researchers studied to see how quickly they would break down.

Urine has been utilized as a crop fertilizer for thousands of years, but has been getting a closer look in recent years as a way to create a circular nutrient economy. It could enable manufacturing of fertilizers in a more environmentally friendly way, reduce the energy required to manage nutrients at wastewater treatment plants, and create localized fertilizer sources.

"There are two main reasons we think urine fertilizer is the way of the future," Wigginton said. "Our current agricultural system is not sustainable, and the way we address nutrients in our wastewater can be much more efficient."

In their ongoing work, the U-M-lead team is moving towards agricultural settings.

"We are doing field experiments to assess technologies that process urine into a safe and sustainable [fertilizer](#) for food crops and other plants, like

flowers. So far, our experimental results are quite promising," said Nancy Love, the Borchardt and Glysson Collegiate Professor and professor of civil and [environmental engineering](#) at U-M.

The study is titled "Fate of Extracellular DNA in the Production of Fertilizers from Source-Separated Urine."

**More information:** *Environmental Science and Technology* (2020). [pubs.acs.org/doi/abs/10.1021/acs.est.9b04263](https://pubs.acs.org/doi/abs/10.1021/acs.est.9b04263)

Provided by University of Michigan

Citation: Urine fertilizer: 'Aging' effectively protects against transfer of antibiotic resistance (2020, January 22) retrieved 20 April 2024 from <https://phys.org/news/2020-01-urine-fertilizer-aging-effectively-antibiotic.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.