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'Super-Enzyme' Speeds Up Breakdown of Plastic, Researchers Say

A new cocktail of enzymes that degrades plastic faster is a step to fully recycling soda bottles and other waste, British and American researchers said this week.

By Isabella Kwai

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A new cocktail of enzymes that speeds up the degradation of plastic offers a step forward in finding a new form of recycling that is faster, is more affordable and works on a larger scale than current methods, British and American researchers said this week.

The "super-enzyme" could be employed to break down plastic bottles much more quickly than current recycling methods and create the raw material to make new ones, according to the scientists. And it may make it easier to repurpose the material.

"This is a very exciting development for plastics recycling and environmental stewardship," said Jim Pfaendtner, a professor of chemistry at the University of Washington.

An estimated 359 million tons of plastic is produced annually worldwide, with at least 150 million tons of it sitting in landfills or in the environment.

Once prized for their durability, plastics may take up to 450 years to degrade in the ocean, if they do at all, according to the National Oceanic and Atmospheric Administration. Much of it breaks down into tiny shards known as microplastics that have been found in marine life, ocean water and in the guts of humans.

Researchers have been increasingly searching for solutions, including biodegradable plastic.

As the world confronts climate change and the need to burn far less fossil fuel, oil and gas companies looking for alternatives for an oversupply are turning to manufacturing more plastics like PET, one of the most popular plastics in the world. It is found in soda bottles, synthetic clothing and packaging.

The study, published on Monday in the journal PNAS from a team of scientists at the University of Portsmouth and the National Renewable Energy Laboratory and other U.S. institutions, focuses on a combination of two enzymes derived from a bacterium discovered in Japan in 2016. The scientists found that this bacterium could break down PET.

In 2018, the team had success breaking down plastic using one of the two enzymes. But when the second enzyme is added, students found, the process works six times as fast.

"You get the original building blocks back," explained Prof. John McGeehan, director of the Center for Enzyme Innovation and co-leader of the team. And those building blocks can then be used over again.

These scientists are not alone in the race to find a quicker and cheaper way of breaking down plastic.

In a major breakthrough earlier this year, researchers with the Toulouse Institute of Sciences and Carbios, a French bio-industrial company, published findings in Nature of another enzyme that degraded PET within 10 hours. Alain Marty, chief scientific officer at Carbios, said his company's process was more efficient for "the infinite recycling of PET" and was already at a "pilot industrial stage."

The process developed by Mr. McGeehan's team is slower: Recycling a plastic bottle could still take days or weeks. They are now exploring pre-softening the plastic and other alternatives to get the degradation time down to hours. They are also hoping to scale up their operations.

Since the study's publication, GlaxoSmithKline, a British pharmaceutical company has offered the team use of fermenters in a nearby penicillin production plant.

Even with breakthroughs in recycling, a problem remains: How to get the plastic to recycling plants in the first place. Experts have said much of the barrier to recycling PET and other plastic wastes lies in recovering it from the ocean and responsibly managing waste.

"We created this problem in the first place," said Mr. McGeehan.

Still, he said, it is nice that nature may have provided a solution.

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