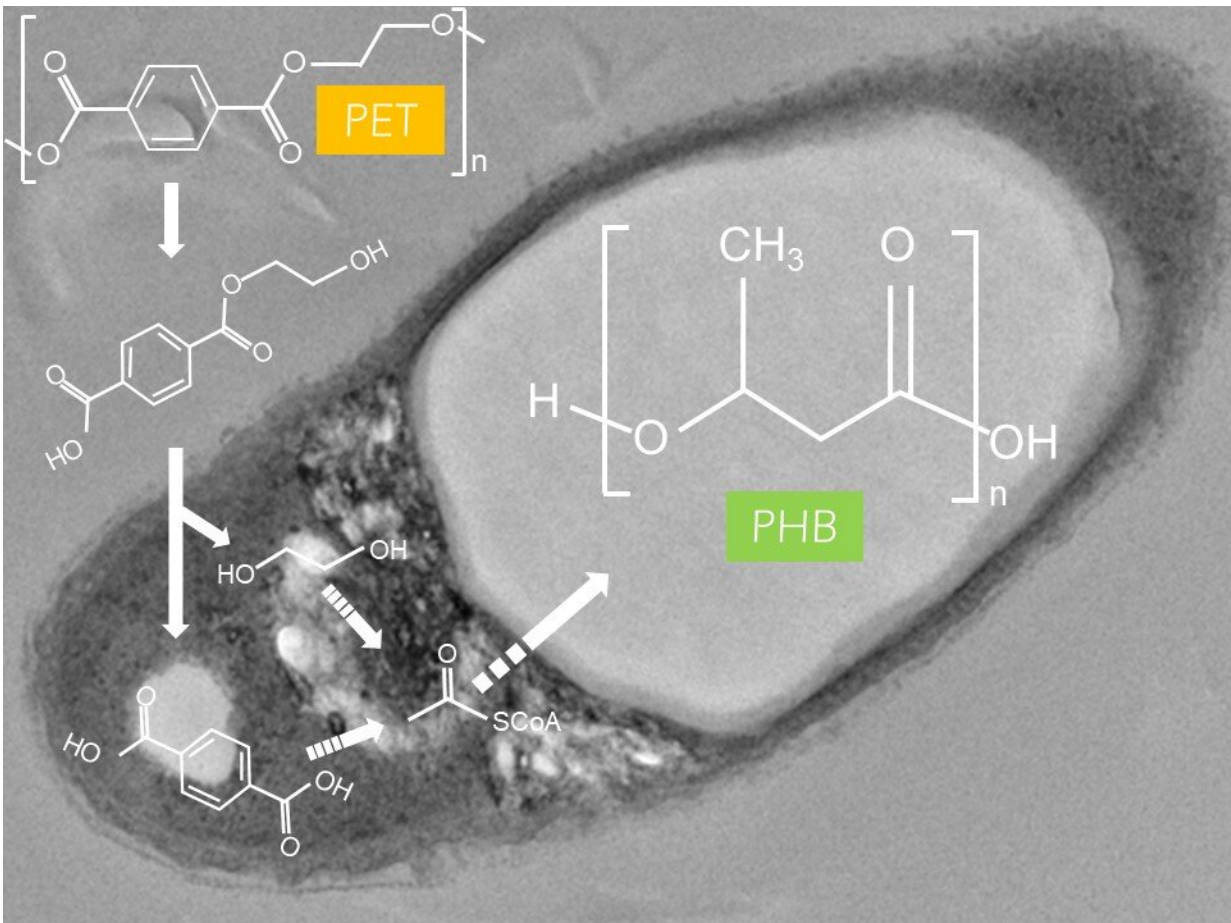


How a bacterium may help solve the plastic pollution crisis

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I. sakaiensis grown on poly(ethylene terephthalate) (PET) accumulates poly(3-hydroxybutyrate) (PHB). Credit: Shosuke Yoshida

Plastic pollution is one of the most pressing environmental issues of our time. The accumulation of petroleum-based plastics is having devastating effects on our environment, wildlife and human health. In a recent study published in *Scientific Reports*, researchers from Nara Institute of Science and Technology revealed a bacterium that is not only able to degrade difficult-to-recycle petroleum-based plastics but can also sustainably produce more environmentally friendly biodegradable plastics.

Petroleum-based plastics, including poly(ethylene terephthalate) (PET), are extensively used in [everyday products](#), such as single-use [plastic bottles](#), textiles and food wrappers. While such products are disposed of rapidly after use, they persist in the environment for hundreds of years. The [plastic pollution](#) resulting from our throw-away culture has now exceeded manageable levels and is overwhelming the planet's ability to deal with it. The environmental impacts are becoming increasingly obvious, with wildlife and human health increasingly threatened.

Although reducing the manufacture of unnecessary single-use plastics and improving waste management systems will help ease the [pollution](#) crisis, our reliance on the convenience of plastic products is unlikely to be abated any time soon. Researchers are therefore looking at alternative approaches to "clean up" the more persistent plastics from our environment and it appears that microbes may offer some promising solutions.

"Certain bacteria harbor the necessary enzymes to degrade PET, the most problematic plastic environmentally," explains senior author Shosuke Yoshida. "Our research has shown that the bacterium *Ideonella sakaiensis* converts PET into poly(3-hydroxybutyrate) (PHB), a type of poly(hydroxyalkanoate) (PHA) plastic that is biodegradable," he continues.

This finding is particularly promising because it addresses two current problems for the sustainability of plastics: degrading the most persistent form of petroleum-based plastic while sustainably producing biodegradable plastics.

"We believe that this discovery could be significant in tackling plastic pollution," Yoshida states, "as we show that the PET-degradation and PHB-synthesis pathways are functionally linked in *I. sakaiensis*. This might provide a novel pathway where a single bacterial species breaks down difficult-to-recycle PET plastics and uses the products to make biodegradable PHA plastics."

Given the overwhelming challenge of dealing with worldwide [plastic](#) pollution, this novel bacterial approach may be a significant part of the solution.

More information: Ryoga Fujiwara et al, Direct fermentative conversion of poly(ethylene terephthalate) into poly(hydroxyalkanoate) by *Ideonella sakaiensis*, *Scientific Reports* (2021). [DOI: 10.1038/s41598-021-99528-x](#)

Provided by Nara Institute of Science and Technology

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