

Plastic gobbling enzymes in worm spit may help ease pollution

October 4 2022, by Patrick GALEY



Plastic waste on the banks of the polluted Las Vacas River, in Chinautla, Guatemala.

Enzymes found in the saliva of wax worms can degrade one of the most common forms of plastic waste, according to research published

Tuesday that could open up new ways of dealing with plastic pollution.

Humans produce some 400 million metric tons of plastic waste each year despite international drives to reduce [single-use plastics](#) and to increase recycling.

Around a third is polyethylene, a tough plastic thanks to its structure, which traditionally requires heating or radiation before it starts to break down.

There have been several studies showing that microorganisms can release enzymes that start the [degradation process](#) on polyethylene, but the process has until now taken months each time.

But those contained in the saliva the wax worm moth (*Galleria mellonella*) can act in only a few hours, Tuesday's research showed.

Researcher Federica Bertocchini, an avid beekeeper, said she originally stumbled on the idea that this small caterpillar had unusual powers when storing honeycombs a few years ago.

"At the end of the season, usually beekeepers put some empty beehives in a storage room, to put them back in the field in the spring," she told AFP.

"One year I did that, and I found my stored honeycombs plagued with wax worms. In fact, that is their habitat."

Bertocchini cleaned the honeycombs and put the worms in a [plastic bag](#).

When she returned a short time later she found the bag "riddled with holes".

Plastic-munching grub

Wax worm caterpillar found to be able to breakdown plastic pollution

New study published in Nature Communications October 4, 2022

- ▶ The **wax moth** lays its eggs in beeswax
- ▶ Its larvae, **wax worms**, feed on beeswax
- ▶ **Researchers noted the worms could eat through plastic waste**

They previously tested the effect of applying a mashed up paste of worms on to plastic

Polyethylene C_2H_4

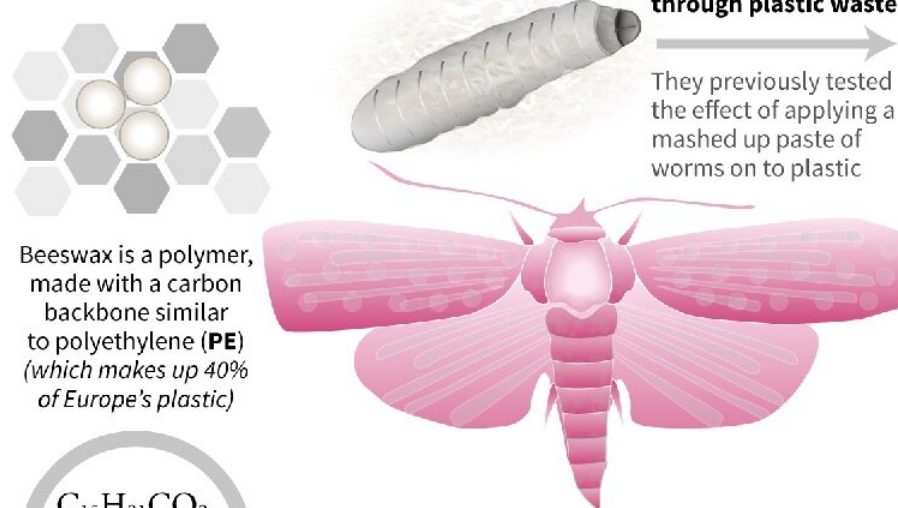
The paste was found to breakdown plastic faster than any fungus or bacteria is able to

Latest study

Two enzymes have been identified within the saliva, found capable of breaking down PE into small polymers


Beeswax is a polymer, made with a carbon backbone similar to polyethylene (**PE**) (which makes up 40% of Europe's plastic)

$C_{15}H_{31}CO_2$
 $C_{30}H_{61}$
(Approximate formula)



Galleria mellonella
Commercially raised as maggots for fish bait and aquarium food

Source : Sanilus-Verdes, Colomer-Vidal et al; Wax worm saliva and the enzymes therein are key to polyethylene degradation by *Galleria Mellonella*

AFP 

Plastic-munching grub.

Poured over plastics

"That raised the question: is it the result of munching or there is a chemical modification? We checked that, doing proper lab experiments, and we found that the polyethylene had been oxidized," she told AFP.

In her latest research Bertocchini, from Madrid's Margarita Salas Center for Biological Studies (CIB) and her colleagues analyzed proteins in the

wax worm saliva and identified two enzymes that could break polyethylene down into small polymers in only a few hours at [room temperature](#).

Writing in the journal *Nature Communications* they explained how they used another worm's saliva as a control experiment, which produced no degradation compared with the wax worm.

Bertocchini said her team were still trying to figure out precisely how the worms degraded the plastic.

While the study authors stressed that much more research was needed before Tuesday's findings could be implemented at any meaningful scale, there were a number of possible applications.

"We can imagine a scenario where these enzymes are used in an [aqueous solution](#), and liters of this solution is poured over piles of collected plastic in a waste management facility," said Bertocchini, who said her team were still trying to figure out precisely how the [worms](#) degraded the plastic.

"We can also imagine small amounts that can reach more [remote locations](#), like villages or small islands, where waste facilities are not available."

She said that further down the line the solution could be used in individual houses, where each family could degrade their own [plastic](#) waste.

More information: A. Sanluis-Verdes et al, Wax worm saliva and the enzymes therein are the key to polyethylene degradation by *Galleria mellonella*, *Nature Communications* (2022). [DOI: 10.1038/s41467-022-33127-w](https://doi.org/10.1038/s41467-022-33127-w)

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Citation: Plastic gobbling enzymes in worm spit may help ease pollution (2022, October 4)
retrieved 27 April 2024 from
<https://phys.org/news/2022-10-plastic-gobbling-enzymes-worm-ease.html>

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