

Hungry bugs and disappearing bioplastics hold key to ending plastic waste crisis, say scientists

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Scientists are working with microbes found in Australia's unique ecosystem to create bioplastics which break down in land, soil and water.

The research aims to tackle one of the most pressing global issues—single-use plastic food packaging: a significant feature of the plastic waste crisis and a special focus for Plastic Free July.

Western Australian industries and consumers are calling for answers to the [plastic](#) waste crisis, and the Bioplastics Innovation Hub (BIH), a [joint venture](#) between Murdoch University and CSIRO, is responding with the development of a bioplastic alternative that simply vanishes over time—leaving no trace on land or in water.

The BIH brings together experts in microbiology, [molecular genetics](#), [synthetic biology](#) and biochemical engineering with advanced manufacturing to develop bioplastics alternatives.

One of the most pressing global issues is single-use plastic food packaging: a significant feature of the plastic waste crisis and a special focus for Plastic Free July.

A 2021 study revealed that more than 80% of [food product](#) packaging in Australia went to landfill and was unable to be placed in home recycling bins.

BIH director Professor Daniel Murphy said creating "completely compostable products" for the food industry was a priority, and working with industry partners would lead to a more seamless transition from the lab to the shelves.

"A key product that industry is asking for is a compostable lining for recycled paper or cardboard-based food packaging," Professor Murphy said.

"In the market currently, for example, there are some packaging products made from waste materials that are compostable. However,

they can only be used for foods with outer layers such as eggs and fruit.

"Foods without a natural protective layer require packaging to have a plastic lining to be 'food safe.' If this lining was made from bioplastic, it would meet industry requirements, be welcomed by consumers looking for greener alternatives, and leave no lasting legacy in the environment."

Professor Murphy said some of the Hub's most promising research uses microorganisms native to WA, which could help to create a robust circular economy.

The need for this research, and an alternative to fossil fuel-based plastics, has never been more urgent as concerns around environmental and health impacts have grown. Recent research by Murdoch University has found, for example, that agricultural soils now hold around 23 times more microplastics than oceans.

"Synthetic plastics break down into microplastics—and those microplastics can move through the water, they can move through the food chain, they even move through the atmosphere through clouds," Professor Murphy said.

"We're looking at plastics that are biodegradable and environmentally benign as in they're not having any impact on the environment. And that's really important because otherwise we'll continue to have a build-up of plastic in terrestrial environments on land and in the oceans—which is obviously not what we want for future generations."

And the answer to the green alternative may come from within WA's unique environment, with WA scientists using microbes found in local environments to make these bioplastics.

BIH researcher and Ph.D. candidate Harrison O'Sullivan is among those

working with these naturally occurring microbes.

"At the moment, we're working with some pretty cool bacteria we've pulled out of the environment ... Australia-made as you might say," Mr. O'Sullivan said.

"A lot of these microbes are living in a wild state. They don't often know where their next food is going to come from—so, in circumstances where they have a lot of extra food, what they'll do is begin storing organic molecules within the cell, and then we recover these molecules to make the [bioplastic](#) material."

In the State Government's 10-Year Science and Technology Plan 2025-2035, a research priority and focus area is "recycling for a circular economy."

Addressing challenges such as decarbonization, [food security](#) and biodiversity decline through [scientific research](#) is a focus of the plan, with Western Australia relying on its own strength and capability to solve these problems.

BIH environmental microbiologist Dr. Sakshi Tiwari said the Hub's goals were just as ambitious for industry and the community.

"We are hoping to reach a level where bioplastics and biopolymers reach every household. I believe it's a longer-term plan but will be our end goal," she said.

Provided by Murdoch University

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