

Bacteria serves tasty solution to global plastic crisis

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Researchers have discovered that the common bacteria *E. coli* can be deployed as a sustainable way to convert post-consumer plastic into vanillin, a new study reveals.

Vanillin is the primary component of extracted vanilla beans and is responsible for the characteristic taste and smell of vanilla.

The transformation could boost the [circular economy](#), which aims to eliminate [waste](#), keep products and materials in use and have positive impacts for [synthetic biology](#), experts say.

The world's [plastic](#) crisis has seen an urgent need to develop new methods to recycle polyethylene terephthalate (PET) - the strong, lightweight plastic derived from non-renewable materials such as oil and gas and widely used for packaging foods and convenience-sized juices and water.

Approximately 50 million tons of PET waste is produced annually, causing serious economic and environmental impacts. PET recycling is possible, but existing processes create products that continue to contribute to [plastic pollution](#) worldwide.

To tackle this problem, scientists from the University of Edinburgh used lab engineered E. coli to transform terephthalic acid—a molecule derived from PET—into the high value compound vanillin, via a series of chemical reactions.

The team also demonstrated how the technique works by converting a used plastic bottle into vanillin by adding the E. coli to the degraded plastic waste.

Researchers say that the vanillin produced would be fit for human consumption but further experimental tests are required.

Vanillin is widely used in the food and cosmetics industries, as well as the formulation of herbicides, antifoaming agents and cleaning products. Global demand for vanillin was in excess of 37,000 tons in 2018.

Joanna Sadler, first author and BBSRC Discovery Fellow from the School of Biological Sciences, University of Edinburgh, said: "This is the first example of using a biological system to upcycle plastic waste into a valuable industrial chemical and this has very exciting implications for the circular economy.

"The results from our research have major implications for the field of plastic sustainability and demonstrate the power of synthetic biology to address real-world challenges."

Dr. Stephen Wallace, Principle Investigator of the study and a UKRI Future Leaders Fellow from the University of Edinburgh, said: "Our work challenges the perception of plastic being a problematic waste and instead demonstrates its use as a new carbon resource from which high value products can be obtained."

Dr. Ellis Crawford, Publishing Editor at the Royal Society of Chemistry, said that "this is a really interesting use of microbial science at the molecular level to improve sustainability and work towards a circular economy. Using microbes to turn waste plastics, which are harmful to the environment, into an important commodity and platform molecule with broad applications in cosmetics and food is a beautiful demonstration of green chemistry."

More information: Joanna C. Sadler et al, Microbial synthesis of vanillin from waste poly(ethylene terephthalate), *Green Chemistry* (2021). [DOI: 10.1039/D1GC00931A](https://doi.org/10.1039/D1GC00931A)

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