

# New process turns waste chicken feathers into biodegradable plastic

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Chicken feather-based plastics could be used to manufacture all kinds of products, from plastic cups and plates to furniture. Credit: Hariadhi

Nearly 3 billion pounds of chicken feathers are plucked each year in the United States -- and most end up in the trash. Now, a new method of processing those feathers could create better types of environmentally-friendly plastics.

"[Chicken feathers](#) are one of those materials that is still basically waste,"

said Yiqi Yang, a researcher at the University of Nebraska-Lincoln and one of the authors of the new research. Feathers are mostly made of keratin, the [protein](#) that's responsible for the strength of wool, hair, fingernails, and hooves, he added. So they "should be useful as a material."

Past efforts to create plastic from feathers resulted in products that didn't hold up mechanically or weren't completely water-resistant, said Yang's University of Nebraska colleague Narendra Reddy, who also worked on the project.

To make the new plastic, the researchers started with chicken and turkey feathers that had been cleaned and pulverized into a fine dust. They then added chemicals that made the keratin molecules join together to form long chains -- a process called polymerization. The team presented their work March 24 at a meeting of the American Chemical Society in Anaheim, California.

The plastic they made was stronger than similar materials made from starch or soy proteins, and it stood up to water. Moreover, high temperature treatment of the feathers at the start of the process would blast out any possible contamination, such as from bird flu, according to Reddy.

The new material is a thermoplastic. "We can use heat and melt it to make different products," said Reddy. Heating it to a modest -- for industrial manufacturing -- 170 degrees Celsius allows the plastic to be molded into some desired shape, and it can be melted and remolded many times. Unlike most thermoplastics, which are petroleum-based, chicken-feather plastic uses no fossil fuels, the researchers said.

The feather-based plastic could be used for all kinds of products, from plastic cups and plates to furniture. In addition to making use of feathers

that would otherwise end up in landfills, it is highly biodegradable.

This and other new sources of plastic may signal a shift in the way people think about packaging, said Walter Schmidt, a scientist with the Department of Agriculture's Agricultural Research Service in Beltsville, Md., who works on making a different kind of plastic from feathers. "With foods, almost everyone understands half-life and shelf-life. No one expects milk in the fridge to be good three months after purchase."

Yet we rarely think of packaging in the same way, said Schmidt. "Stuff floats around in the ocean [or] is mixed in landfills that stay there for generations. A far better solution is to make less mess in the first place and to have that material naturally recycle in a reasonable amount of time." Although feathers are known to be tough, he added, there are no archeological sites containing reservoirs of feathers, showing that they break down over time.

The usefulness of any biopolymer, like the feather plastic, depends on the cost and versatility of the end product, said Schmidt, adding that when the price of oil increases, bio-alternatives become more attractive.

As concerns over the environment and shortages of raw materials grow, creative thinking about waste products takes on greater importance. "Think of a Styrofoam coffee cup," said Schmidt. "It is used for maybe 10-15 minutes and discarded; one can dig up a Styrofoam cup from a landfill 200 years from now, wash it out, and reuse it. This is an example of a lousy design." A better design is an ice cream cone: "The container lasts a little longer than the ice cream in it."

Although more work is needed to bring the new plastic into large-scale production, chicken feathers could soon be moving from the coop to the cup.

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