Distributed by UW News Service, October 20, 2025

Link to original story: <https://www.uwplatt.edu/news/got-milk-uw-platteville-professors-turn-spoiled-dairy-sustainable-plastic>

**Got milk? UW-Platteville professors turn spoiled dairy into sustainable plastic**

Written by Christine Bellport, University of Wisconsin–Platteville

In an unexpected yet brilliant twist on recycling and innovation, two University of Wisconsin-Platteville professors have found a way to turn dairy waste into a key ingredient for eco-friendly 3D printing. A newly approved patent, titled *“Development of Bio-Composite Materials for 3D Printing Using Milk Proteins,”* has opened the door for spoiled milk to reduce the environmental footprint of 3D printing materials—and pour milk money into the pockets of Wisconsin dairy farmers.

“Who would have thought 3D printing and dairy protein could be combined to create a new material?” quipped Dr. Joseph Wu, associate professor of chemistry. “My hope is that it will help both the 3D printing industry and dairy farmers in Wisconsin.”

A three-pronged approach explains why Dr. John Obielodan and Wu began their research: the need to reduce economic waste; the fact that petroleum-based plastics are non-biodegradable and pose environmental and health hazards; and the potential to use casein and whey from spoiled dairy products to make plastic materials.

“This breakthrough highlights the kind of forward-thinking research happening at UW-Platteville,” said Dr. Tammy Evetovich, chancellor of UW-Platteville. “Dr. Obielodan and Dr. Wu represent the very mission of our university and how we support and encourage innovation. Their work not only advances sustainable, biodegradable materials for 3D printing but also offers eco-friendly alternatives to petroleum-based plastics that can help sustain our planet for generations to come.”

Repurposing proteins from dairy waste into useful products could reduce dependency on petroleum-derived polymers. An added benefit is that it could provide a new revenue stream for dairy farmers, positively impacting rural communities in Wisconsin.

**From waste to worth**

The inspiration behind the research came during the early days of the COVID-19 pandemic, when supply chain disruptions led to significant dumping of milk across the country.

“We knew dairy products contain proteins like casein and whey,” observed Obielodan, professor and chair of the Department of Mechanical and Industrial Engineering. “We asked ourselves, ‘Why can’t this milk, instead of being wasted, be turned into something valuable?’”

That simple question sparked a five-year journey of experimentation, development and persistence. The effort culminated in WiSys being awarded a U.S. patent for a novel method of transforming dairy waste into usable plastic—a breakthrough with global significance as the widespread use of non-biodegradable, petroleum-based plastics remains a major concern.

“Many single-use plastics end up in oceans, where they are ingested by marine animals—eventually entering our food chain,” noted Obielodan. “The full impact on human health is still unknown. Additionally, producing synthetic plastics pollutes the environment and releases greenhouse gases. Biomaterials offer a more sustainable alternative, turning natural and waste materials into useful polymers with fewer environmental and health risks.”

It's a wise way to make use of otherwise waste materials. At first glance, milk and 3D printing might not seem like a natural pair. But thanks to the inventiveness of these two researchers, dairy byproducts like casein and whey are now being transformed into sustainable materials used in high-performance 3D printing.

**Not as easy as it sounds**

Turning spoiled milk into high-performance 3D printing filament wasn’t as easy as pouring a glass. The biggest challenge was determining what form of protein would better serve the intended purpose.

“We needed to figure out what kind of protein, and in what form, would yield the best results,” Obielodan explained. “We started by creating our own proteins, then tested some commercially available ones before finding the one that gave the best results. These proteins were used with existing 3D printing materials.”

Figuring out the right mix of ingredients for the polymer was another important part of the study, since the amounts used affect how strong and flexible it turns out. This meant some adjustments had to be made to get the best results. UW-Plattville students also got a firsthand look at how this advancement in 3D printing evolved.

"We involved students and hired them to help set up the experiment,” said Wu. “They had to break the protein down and try to purify it. We included both chemistry and mechanical engineering students."

**Milking innovation: Where ideas meet investment**

It took belief and resources to anchor Wu and Obielodan’s theories and create an opportunity to potentially change the world of 3D printing.

“We have to thank the Dairy Innovation Hub,” exclaimed Wu. “They provided the seed money that allowed us to investigate. We couldn't have done this without them."

Their research began with a two-year, $50,000 grant from the Dairy Innovation Hub, which served as the foundation for the project. [The Dairy Innovation Hub](https://dairyinnovationhub.wisc.edu/) is a state-funded initiative in Wisconsin that connects three University of Wisconsin campuses — UW-Platteville, UW-Madison and UW-River Falls — to support research, teaching and outreach related to dairy. Additional funding followed, bringing the total support from the Hub to approximately $180,000. This project was one of the very first grants supported by the Hub.

“As farmers and innovators, we believe in the quality and power of milk,” said Maria Woldt, program manager for the Dairy Innovation Hub. “It’s really inspiring to see researchers like Dr. Wu and Dr. Obielodan finding alternative uses for this safe, high-quality, natural and sustainable product.”

**A tasty step toward sustainability**

This development is more than just clever; it’s a powerful example of circular economy thinking. By reusing what would otherwise be food waste, the innovation reduces the environmental footprint of 3D printing materials while also lowering costs for manufacturers and hobbyists alike.

"I love invention, and I practice what I teach,” asserted Wu. “In my classes, I tell students to learn the concepts and then connect the dots. That’s exactly what I’m doing here. No one saw it coming—3D printing and dairy protein merging into a revolutionary material. It’s all about making unexpected connections, ones that could not only advance the 3D printing industry but also support Wisconsin’s dairy farmers."

The next step would involve further development of the technology and the transfer of intellectual property to industry partners for commercialization.

“Looking ahead, a variety of products could be made using proteins derived from milk,” declared Obielodan. “From 3D printing filaments to other engineered materials, the possibilities are wide-ranging.”

By taking a waste product and converting it into a useful, eco-friendly material, the invention checks every box: sustainable, innovative and socially impactful.

“As farmers, we work to avoid waste, and the motivation behind this project aligns with that core value,” remarked Woldt. “We are thrilled that after a little more than five years we helped move an innovative idea forward that will lead to additional uses for milk. Tangible examples like this show we are delivering on that promise.”

So, next time you pour a glass of milk or slice some cheese, remember that the product might one day help print your next phone case, a part for a car, or even a custom medical device. Thanks to the pioneering work of two UW-Platteville professors and researchers, the future of 3D printing could be dairy powered. That’s good news for the planet and great news for Wisconsin’s dairy farmers.