

Making clothes from milk

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Credit: Piotr Łohunko

In the EU, residents waste an estimated 88 million tonnes of food every year, according to the latest estimates. That is roughly 170 kilogrammes per person. But what if scientists could turn some of that waste into useful products?

A significant proportion of food [waste](#) is dairy. WRAP, a U.K. charity that helps individuals and organisations reduce waste, says that 20 percent of the estimated 1.7 million tonnes of annual waste created during food manufacturing in the U.K. is dairy, second in volume only to meat and fish. It is, however, possible to turn dairy waste into a surprising new material: fibres that can be spun and woven to make textiles.

Beda Ricklin, CEO of Swicofil, a yarn and fibre company based in Switzerland that sells [milk](#) fibres produced by manufacturers in China, says that milk fibre is "a very smooth and soft product" that is mainly used for clothing worn close to the skin, like socks and underwear.

Ricklin says milk fibre socks are "very nice to wear, like cashmere or silk." These luxury fibres, he adds, are the best conventional comparisons to milk.

Milk fibre isn't new. It was being used for clothing and household items during the 1930s and 1940s as a substitute for wool. Later, cheaper synthetics like nylon became more popular.

Milk fibre belongs to a class of bio-based, man-made fibres known as regenerated protein fibres. It is made from the protein casein, which can be separated from sour milk. Casein is dissolved in a solution and then forced through a spinneret – a device that resembles a shower head – to produce long strands, which are then stretched, heated and chemically treated to increase their strength and stability.

In the past, unpleasant chemicals such as formaldehyde were used to strengthen the fibres. Today, most milk fibres are blended with the chemical binder acrylonitrile, which is also the main component of acrylic yarn.

"Formaldehyde is certainly not something you find in milk fibre today," says Ricklin. The fibres sold by Swicofil have been granted the international Oeko-Tex Standard 100 certification, which means they are free of various chemicals that are harmful to humans and the environment.

According to Ricklin, the fibre feels very nice, is good at wicking moisture from the body and has great insulation properties, but he adds that it has a limited market due to its cost. For comparison, polyester costs around \$1 to \$2 per kilogramme, while milk fibre is approximately \$25 to \$35, although this is cheaper than other luxury fibres like silk.

In Germany, one producer claims to have developed a technique for creating milk fibres that uses only natural ingredients. Microbiologist, fashion designer and founder of Qmilk, Anke Domaske, first became interested in milk fibre when her stepfather developed allergies following a cancer diagnosis and struggled to find clothes he could wear.

Domaske was looking for a chemical-free, pesticide-free fabric. "When I first heard about milk fibre, I was very enthusiastic, because milk is natural and healthy," she explains. "But when I found out that the manufacturing process uses lots of chemicals, I was very disappointed."

Domaske says that her process creates a fibre that is "so natural you can eat it."

She adds, "It is also antibacterial, flame retardant, and temperature regulating." Additionally, it can be washed at 60°C.

Qmilk's fibre is produced using waste from German dairies. "In Germany, over two tonnes of milk is wasted every year because it isn't suitable for human consumption," says Domaske.

According to Domaske, a kilogramme of milk [fibre](#) can make approximately six T-shirts, while two tonnes is enough to make a T-shirt for every person in America – all 323 million of them – although currently, she only makes dresses.

Kay Politowicz, co-founder of Textiles Environment Design (TED) at Chelsea College of Arts in London, says, "New protein fibres are going to be a great addition to the world of sustainability," as they offer "the possibility of a renewable starting and a recyclable endpoint for materials that actually feel good and perform in the ways you need."

She says, however, that there will always be detractors. People who question whether we should be using waste milk and argue that we should not base an industry on waste that should not occur. Nonetheless, the waste is there. "You can have an idealist target and you can be practical—it is about finding that balance," explains Politowicz.

According to WRAP, 200,000 tonnes of the 340,000 tonnes of milk wasted during the manufacturing of dairy products in the U.K. is avoidable. Leaving 140,000 tonnes of waste that may be unavoidable.

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