



Growing platelets on silk to keep blood supplies flowing

EU-funded researchers are using silk-based bone marrow “factories” to grow platelets in the lab, helping to lower our dependence on limited donor blood supplies.

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Every day, hospitals rely on platelet transfusions to stop bleeding, support cancer treatment and help patients recover from surgery and serious illness. Yet one of medicine’s most essential blood products is also among its most fragile.

Unlike red blood cells, which can be stored for several weeks, platelets last just a few days. They also have to be kept at room temperature, which increases the risk of contamination and complicates storage and transport. That leaves hospitals in a constant race to keep supplies flowing, and dependent on the availability of donors.

To ease this pressure, a group of EU-funded researchers are working on an unusual solution. They are producing platelets outside the human body using silk fibroin, a protein derived from silkworms.

“We produce platelets in the lab to overcome this limitation and face the growing demand,” said Professor Alessandra Balduini, a haematologist and researcher in the Department of Molecular Medicine at the University of Pavia, Italy, and one of the lead researchers behind the work.

The platelet challenge

Balduini and colleagues from across Europe have been working on three interconnected EU-funded research projects, piecing together the tools needed to reliably manufacture platelets in the lab.

Platelets are tiny, disk-shaped cell fragments that help blood clot and stop bleeding. They are used routinely in hospitals, particularly for cancer patients undergoing chemotherapy, which can sharply reduce the body’s natural platelet production. They are also used in emergency rooms and surgical wards.

Currently, hospitals and blood banks rely almost entirely on donors. According to the World Health Organization, around 118 million blood donations are collected globally every year. But platelet supplies remain difficult to maintain because the products expire so quickly.

“The bottleneck for platelets is that they can be preserved just for five days,” Balduini explained. Supply can also fluctuate significantly throughout the year. Donation rates often fall during summer holidays, while major disruptions such as pandemics can quickly strain national blood systems.

Adding to the complexity, around 15 % of platelet transfusions require specially matched tissue types, making shortages even harder to manage.

For years, researchers around the world have been trying to develop laboratory-grown platelets as a more stable and controllable alternative. But recreating the body’s natural platelet production system outside the human body has proved remarkably difficult.

Recreating bone marrow in the lab

Inside the human body, platelets are produced in the bone marrow by large cells called megakaryocytes. These cells release platelets into the bloodstream in response to highly specific biological and mechanical signals. Replicating that process outside the body is far from straightforward.

“Many labs are trying to develop platelets for transfusion purposes, but it’s not so easy,” said Dr Hana Raslova, research director at the Gustave Roussy Institute near Paris and one of Balduini’s partners on the SilkPlatelet project.

One of the biggest challenges is reproducing the complex structure of bone marrow itself. Bone marrow contains several specialised microenvironments, or “niches”, which help regulate how blood cells grow and develop.

To recreate those conditions, researchers turned to an unexpected material: silk fibroin, a protein derived from silkworm cocoons.

As part of the EU-funded SilkFUSION initiative, which ran from 2017 to 2022, Balduini and her colleagues developed a silk-based bioreactor designed to mimic the environment inside human bone marrow. Silk fibroin is strong, flexible and biocompatible, making it particularly well-suited to reproducing the soft structure of living tissue.

“Silk is one of the few materials that can be used for bone marrow and platelets,” Balduini explained. “You want a material that can support the process without affecting the functionality, and silk can do this.”

The artificial bone marrow allowed researchers to begin testing whether platelets could be produced reliably outside the body.

Building a platelet factory

In the follow-up SilkPlatelet initiative, which ended in December 2025, researchers pushed the concept further. Using stem cells, they generated megakaryocytes inside the silk bioreactor system, or bone marrow “factory”.

The researchers also worked to improve the efficiency of platelet production, including the use of genetically modified stem cells.

“The process is quite expensive, but we are using the genetically modified stem cells to produce more platelets from fewer cells, so by improving platelet production we optimised the price of the whole technology,” explained Raslova.

Although the work remains experimental, the researchers say the technology is steadily moving closer to clinical reality. The bone marrow bioreactor is already being tested by pharmaceutical companies and research groups interested in future medical applications.

Looking beyond transfusions

The work has also opened up broader possibilities beyond platelet transfusions alone.

In the SILKink initiative, which ran until May 2026, the researchers developed a silk-based “bio-ink” that can be used to 3D-print highly accurate models of bone marrow tissue in different shapes and sizes.

These printed tissues could help scientists study blood diseases, test new drugs and better understand how stem cells behave in different biological environments.

The long-term ambition behind these three projects is significant: to move platelet supply away from a system heavily dependent on donors and vulnerable to shortages towards one capable of producing platelets reliably on demand.

For that to happen, today’s experimental systems will need to grow into a large-scale, clinically ready production line – something the researchers are still working towards.

Although it will likely be several years before these lab-derived platelets reach transfusion clinics, researchers are optimistic.

“We are confident that in the near future, it will be possible to produce platelets for a range of clinical applications,” said Raslova.

Before that happens, the researchers must demonstrate that laboratory-grown platelets are safe, effective and scalable enough for routine clinical use. Small animal tests have been successfully conducted and clinical application is the next step.

“We still have to understand the proof of principle and scale up to clinical application, but EU funding has been critical in helping us move forward,” said Balduini.

For patients who rely on regular platelet transfusions, that could eventually mean fewer disruptions to treatment. For medical workers, it could offer a way to strengthen one of healthcare’s most fragile supply chains.

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- [SilkFUSION \(CORDIS\)](#)

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