

PRESS RELEASE

Rocket Launch for StellarHeal – Milestone for Future Wound Care in Space Flights and on Earth

Thursday, March 12, is the big day: A research rocket from the REXUS program launched into the stratosphere from the Esrange Space Center in Sweden, carrying the THRIVE module with components of the cell-based StellarHeal wound care material from Würzburg, Hanover, and Dresden. Preparations for the current rocket launch have been underway since last November, and now it's time to keep our fingers crossed that the experiments yield good results.

Why Wound Healing is a Challenge in Space Flight

Space is a challenging working environment. Wound healing is also difficult under space conditions. The lack of gravity disrupts cell organization and cell growth, while continuous radiation weakens the immune system. This can result in delayed healing, an increased risk of wound infection, and increased scarring. In addition, astronauts must be able to care for themselves easily and efficiently and be quickly ready for action again. The answer to these challenges is StellarHeal. Three renowned research institutions have joined forces on this topic: the Fraunhofer Institute for Silicate Research ISC in Würzburg, the Fraunhofer Institute for Toxicology and Experimental Medicine ITEM in Hannover, and the Dresden Institut für Luft- und Kältetechnik ILK.

StellarHeal – a New Wound Healing Concept

What is special about the StellarHeal concept? A hemostatic and completely bioresorbable fiber matrix is designed to prevent injured astronauts from bleeding to death and from complications during wound healing. In addition, it is designed to eliminate the need for dressing changes, thus helping to save payload on space flights. It is radiation-resistant and flexible enough to adapt to different wounds. It has a special coating that helps to stop bleeding quickly. In addition, living skin cells and macrophages are integrated to promote wound healing, fight infection, and prevent excessive scarring. StellarHeal combines several advanced developments from materials science, cryotechnology, and biotechnology into a novel application. Although the new wound healing concept is being developed for use in space, it could also have great potential on Earth, for example in the treatment of chronic wounds. But how do you test whether such a

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new material would even survive a rocket launch during its development? This is where the European REXUS program comes in.

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Swedish Rockets for European High-altitude Research Projects

The Esrange Space Center near Kiruna is located about 200 kilometers north of the Arctic Circle and is an important location for European space research. The German Aerospace Center (DLR) also regularly uses the spaceport there for rocket launches with experiments in zero gravity. Today, the joint REXUS program offers students in Europe a unique opportunity to conduct experiments under rocket launch conditions. For the StellarHeal project, technical assistant Ingrid Gensch from the Immune Cell Technologies working group at Fraunhofer ITEM and two master's students, Markus Münig and Jonas Pfister from Fraunhofer ISC and the Technical University of Würzburg-Schweinfurt, got involved and prepared an experiment for the REXUS flight as part of the THRIVE (Tissue Healing Research In-flight Viability Experiment) subproject. In a specially developed cooled transport module for organic and inorganic components, StellarHeal components will prove for the first time that they can survive a rocket launch and are therefore actually suitable for future space flights. Dr. Dieter Groneberg, who heads the StellarHeal project, outlines the challenge: "The new wound care concept combines cell components derived from stem cells, known as fibroblasts from skin organoids and macrophages, with cell-carrying materials made of silica-gel fiber fleece and a cryogel. We don't yet know how the individual components will behave under the extreme conditions of a rocket launch, so this is a very exciting black box experiment for us!"

Joint Research for a Big Goal

The Fraunhofer Institute for Silicate Research ISC has long been active in the field of material development for tissue engineering and wound care. The research group led by Dr. Dieter Groneberg is working on living skin models to investigate new healing possibilities and mechanisms of action. For StellarHeal, the Fraunhofer ISC team is developing skin organoids, from which so-called fibroblasts are obtained. These are intended to promote wound healing and help reduce scarring. The carrier material made of silica-gel fiber fleece also comes from Fraunhofer ISC's research and development department. This material for wound care is completely biodegradable in the body and, due to its chemical structure, is expected to be highly resistant to cosmic radiation. StellarHeal and the THRIVE subproject are part of the extensive NewSpace activities in Würzburg and Northern Bavaria, in which Fraunhofer ISC is significantly involved.

At the Fraunhofer Institute for Toxicology and Experimental Medicine ITEM in Hanover, researchers have established a stem cell technology platform that enables the production of functional immune cells for use in innovative wound healing therapies. At the heart of this development are novel tissue organoids, known as hemanoids, which

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replicate the physiological environment of a bone marrow niche, i.e., the environment in the bone marrow. These organoids are capable of continuously generating immune cells, such as macrophages, which play a crucial role in organ regeneration and wound healing. The underlying technology for deriving and producing macrophages from induced pluripotent stem cells (iPSCs) was developed by Prof. Dr. Nico Lachmann at Hannover Medical School and is now being transferred into application by him in a working group at Fraunhofer ITEM: As part of the StellarHeal project, the researchers are providing both the bone marrow organoids and the immune cells derived from them for space research.

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The expertise of ILK Dresden as a partner in the StellarHeal project is based on many years of experience in the fields of low-temperature physics and refrigeration technology for the life sciences. A particular focus is on gentle cryopreservation, i.e., the undamaged freezing and thawing of cells. For the project, ILK Dresden has developed a unique carrier gel for the cryopreservation and application of therapeutic cells on a chemically defined, serum-free media basis. The development of this medium was extremely challenging: in addition to cryopreservation that preserves function, it must enable the survival, growth, and proliferation of therapeutic cells. These properties are particularly crucial for the treatment of wounds that are difficult to heal, as only living cells capable of division can contribute to rapid tissue regeneration.

What Happens After the Rocket Test?

The rocket launch and the THRIVE experiment serve to test a transport module for organic and inorganic building blocks of the novel wound healing method StellarHeal under extreme conditions. One of the sample sets will fly into space in the THRIVE module. The second will remain on Earth as a ground control and will be evaluated together with the returning samples. This will allow researchers to determine exactly which changes are due to transport and which are due to the conditions during the rocket flight.

The functionality of the actively cooled transport module will be validated and, at the same time, the resilience of the wound healing components developed by the StellarHeal partners during a REXUS flight will be evaluated. The test module protects the sensitive components from external thermal influences, records accelerations and temperature changes, and facilitates the analysis of potential damage to stem cells after return. The knowledge gained through THRIVE will form the basis for the future use of StellarHeal wound healing in manned space flight. "We are all very excited about the evaluation of the THRIVE module after the REXUS flight. This will give us important insights for further development work," says project manager Groneberg.

Pictures

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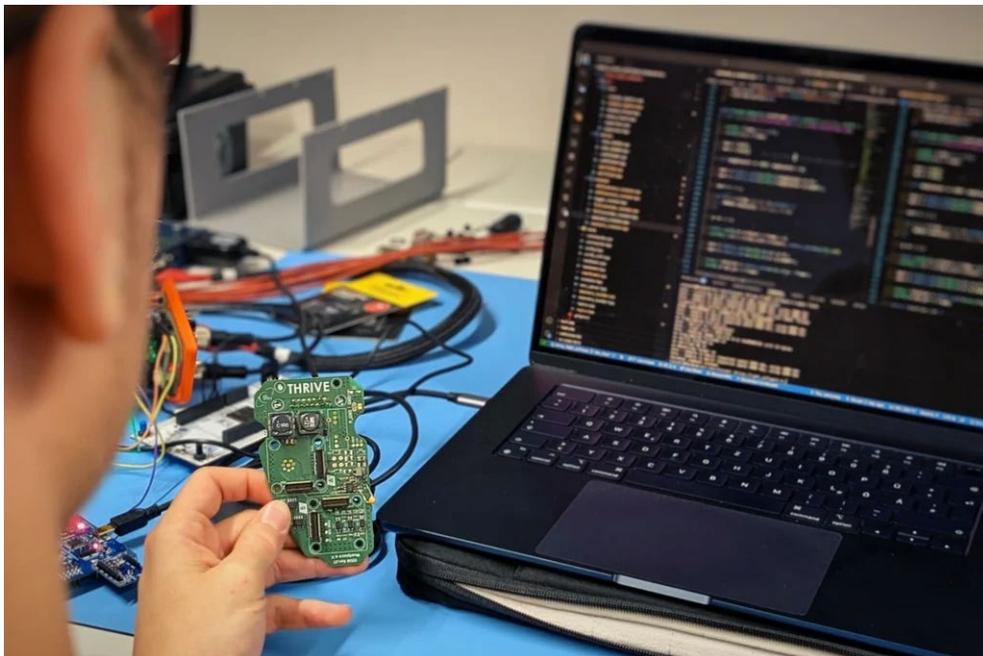
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A REXUS rocket launches from Kiruna in Sweden @ DLR



THRIVE software and hardware development
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Dr. Dieter Groneberg, Dr. Bastian Christ, and Prof. Nico Lachmann presenting StellarHeal at the kick-off event for the "200 Years of Josef v. Fraunhofer" anniversary year on February 25, 2026, in Berlin
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