Studying human skin in space – Soyuz mission takes SKIN B to the ISS

29 March 2013

German researchers investigate the influence of space on our largest organ

Human skin is an organ with many functions; it regulates, among other things, the water balance and temperature of the body, it prevents the entry of pathogens, protects the body from ultraviolet radiation and serves as a sensory organ. But how does it react to the harsh conditions of space? Researchers at the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) are seeking answers to these questions with the SKIN B experiment, funded by DLR Space Administration.

The experiment started its journey to the International Space Station (ISS) from the Baikonur Cosmodrome in Kazakhstan at 21:43 CET on 28 March 2013, carried by the Soyuz TMA-08M spacecraft with the crew of ISS Expedition 35. Using a new fast-rendezvous flight profile, the Soyuz arrived at the ISS on 29 March at 03:28 CET, after less than six hours (four orbits). After docking, the new crewmembers entered the Russian Poisk module at 05:35 CET. Until now, the duration between launch and arrival at the ISS was about two days..

Confirming the results of the previous SkinCare experiment

From June 2013, the SKIN B experiment will closely examine the influence of microgravity on human skin; it will be installed in the European Columbus Laboratory on the ISS. Among the participants will be the Italian ESA astronaut Luca Parmitano, who will fly to the ISS in May, as a member of Expedition 36. Dry or flaky skin and itching, as well as headaches and balance problems, can be a particular burden for astronauts while in space: “Studies carried out by NASA show that skin problems rank first among health issues in space; these include delays in wound healing and allergic reactions to materials. However, these changes have not yet been studied systematically,” says Katrin Stang, SKIN B project manager at DLR Space Administration.

This will complement the SkinCare experiment, carried out by German astronaut Thomas Reiter as part of the 2006 Astrolab mission to the ISS. “SKIN B aims to confirm the changes observed in the 2006 experiment, verifying the results with a minimum of three and a maximum of five test subjects,” explains Stang. Ulrike Heinrich of the Universität Witten/Herdecke in North Rhine-Westphalia, Germany, is directing the scientific experiment. She adds: “The skin is not the only subject being studied – it will not be regarded in isolation, although it is at the centre of the study; those organs that are lined with epithelial tissue and the connective tissues will also be studied, since early-stage lesions may provide clues about other systemic diseases.”

Documenting moisture content, water loss and skin elasticity

The skin on the inside of the astronauts’ forearms will be examined up to eight times during their stay on the ISS, as well as before and after their flight. “We will check the moisture content of the skin and its water loss using special instruments; a small camera will document the changes in the surface of the skin,” says Stang. Before and after the astronauts’ missions, researchers at the Universität Witten/Herdecke will take additional measurements of the capillary blood flow, referred to as microcirculation, as well as the deep structure of the skin and its elasticity.

The results from the SkinCare pilot experiment have shown that, during a six-month stay on the ISS, the skin of an astronaut undergoes changes similar to the aging process in humans on Earth. The surface structure becomes coarser (lichenification), the elasticity decreases and the

various layers of the skin – the stratum corneum, epidermis and dermis – age as well. These changes appear to be reversible, because after a year the condition of the skin returns to normal.

Studying the effect of anti-aging treatments at an accelerated pace

Scientists also hope to use SKIN B to find out about changes that occur to blood vessels and the physical load on internal and external organs in microgravity. “If the results from SkinCare are confirmed, the skin aging process and the effectiveness of anti-aging treatments could be tested at an accelerated pace on board the Space Station,” suggests Stang.

The instruments for SKIN B were modified by Kaiser-Threde GmbH for DLR Space Administration and qualified for use in space. The European Space Agency is responsible for the transport of SKIN B to the ISS, training the astronauts and for operational activities in the Columbus laboratory module.

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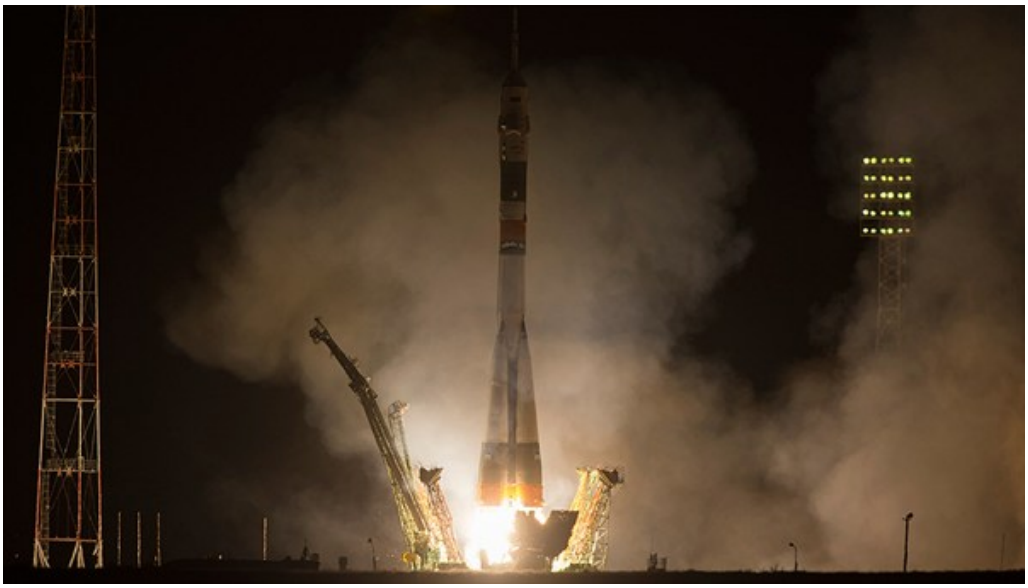
Liftoff of the Russian Soyuz launcher carrying SKIN B on 28 March 2013 from Baikonur Cosmodrome



The Russian Soyuz TMA-08M spacecraft taking the astronauts of Expedition 35 to the ISS also carried the SKIN B experiment, which is being overseen by German researchers. The launch vehicle lifted off from the Baikonur Cosmodrome in Kazakhstan at 21:43 CET on 28 March 2013. A new fast-rendezvous flight profile allowed the spacecraft to dock with the ISS in only six

hours (four orbits), rather than the more usual two days; docking took place on 29 March at 03.28 CET. At 05:35 CET, the new crewmembers entered the Russian Poisk module to which the Soyuz had docked.

Credit: NASA / Carla Cioffi.

Using a Tewameter® to measure water loss from the skin

A Tewameter® being used to measure water loss from the skin. The measuring probe is part of the SKIN B experiment on the ISS. This will investigate the effect of microgravity on human skin.

Credit: Kayser-Threde GmbH / DLR.

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