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# Microgravity experiments may help lighten the load of joint diseases

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Going into space might wreak havoc on our bodies, but a new set of microgravity experiments may help shed light on new approaches for treating cartilage diseases on Earth. In a new research report published in the June 2015 issue of *The FASEB Journal*, a team of European scientists suggests that our cartilage—tissue that serves as a cushion between bones—might be able to survive microgravity relatively unscathed. Specifically, when in a microgravity environment, chondrocytes (a main component of cartilage) were more stable and showed only moderate alterations in shape and structure when compared to their Earthbound counterparts. This was particularly the case for those also exposed to growth factors and specific nutrients. For those of us on the ground, the success of the growth factors and nutrients suggests that it might be possible to halt cartilage degradation or even reverse it with improved nutrition and/or new drugs.

"Research under microgravity helps us in many ways to understand the complex processes of life and as an excellent example of the gravity-dependent mechanisms that underlie cartilage diseases," said Daniela Gabriele Grimm, M.D., a researcher involved in the work from the Department of Biomedicine, Pharmacology at Aarhus University in Aarhus, Denmark. "We hope to find new strategies to prevent and to treat cartilage damages not only in astronauts, but also in patients on Earth."

To make this discovery, Grimm and colleagues used three different groups of human chondrocytes for the flight experiment. The first group

of chondrocytes was cultured and fixed to preserve the cells in their current state, without further alterations of morphology and metabolism, in the laboratory on the ground. The second and the third groups were cultured on the ground and taken on board an aircraft, which flew a total of 31 parabolas. During each of the parabolas the cells were exposed to a period of weightlessness. While the second group was fixed during the parabolic flight after the first parabola, the third group was fixed after the last parabola. After the flight, the samples from all three groups were collected on the ground in the laboratory and used for analyses.

"As our nation grows both in age and weight, the need to address cartilage breakdown will increase as well," said Gerald Weissmann, M.D., Editor-in-Chief of The FASEB Journal. "This important study suggests a mechanism used by the body to maintain cartilage integrity in the face of microgravitational stress. What works for cartilage in space promises to help us moving on the turf."

**More information:** Ganna Aleshcheva, Markus Wehland, Jayashree Sahana, Johann Bauer, Thomas J. Corydon, Ruth Hemmersbach, Timo Frett, Marcel Egli, Manfred Infanger, Jirka Grosse, and Daniela Grimm. Moderate alterations of the cytoskeleton in human chondrocytes after short-term microgravity produced by parabolic flight maneuvers could be prevented by up-regulation of BMP-2 and SOX-9. *FASEB J.* June 2015 29:2303-2314; DOI: 10.1096/fj.14-268151

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