MedicalXpress

How spaceflight ages the immune system prematurely

February 2 2015

As the world waits to see if Mars One can establish a human colony on Mars, scientists are working to determine the long-term consequences of living in low or no-gravity conditions, such as those that might exist on the trip to another planet. New research published online in *The FASEB Journal*, shows that spaceflight may be associated with a process of accelerated aging of the immune system. Specifically, researchers found that mice in low gravity conditions experience changes in B lymphocyte production in their bone marrow similar to those observed in elderly mice living in Earth conditions.

"This study shows that a model of spaceflight conditions could not only be used to test the efficacy of molecules to improve immune responses following a spaceflight in astronauts, but also in the elderly and bed-ridden populations on Earth," said Jean-Pol Frippiat, a researcher involved in the work from the Stress, Immunity and Pathogens Laboratory at Lorraine University in Vandoeuvre-lès-Nancy, France. "This model could also help understanding the aging of the immune system called immunoscenescence."

Frippiat and colleagues used a ground-based model called hindlimb unloading (or HU), that simulates some of the effects of spaceflight on mice. They analyzed both bone parameters and the frequency of cells that will give birth to B lymphocytes in the bone marrow of young mice, old mice and mice subjected during three weeks to hindlimb unloading. Comparison of these data revealed that bone changes and changes in the production of B lymphocytes in the bone marrow of HU mice were very

similar to those observed in old mice. This study shows that HU could be interesting to improve understanding of the relationship between bone remodeling and B cell production in the bones, both in the context of spaceflight and normal aging on Earth. This model could therefore be used to test and/or develop molecules and compounds to improve immune responses following spaceflight in astronauts or in elderly and bed-ridden populations.

"Getting to Mars and beyond promises to be a huge task, requiring contributions from almost every scientific discipline," said Gerald Weissmann, M.D., Editor-in-Chief of *The FASEB Journal*. "For biologists and medical researchers, knowing how altered gravity affect our immune system from challenges aloft can be already be studied on Earth. Fortunately for biologists, it's not rocket science."

More information: Chloé Lescale, Véronique Schenten, Dounia Djeghloul, Meriem Bennabi, Fanny Gaignier, Katleen Vandamme, Catherine Strazielle, Isabelle Kuzniak, Hervé Petite, Christine Dosquet, Jean-Pol Frippiat, and Michele Goodhardt. Hind limb unloading, a model of spaceflight conditions, leads to decreased B lymphopoiesis similar to aging. *FASEB J.* February 2015 29:455-463; DOI: 10.1096/fj.14-25977