Spaceflight may increase susceptibility to inflammatory bowel disease

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Here's the summary of a new research report appearing in the August 2015 issue of *The FASEB Journal*: Prolonged spaceflight may give you a nasty case of diarrhea. Specifically, when mice were subjected to simulated spaceflight conditions, the balance of bacteria and the function of immune cells in the gut changed, leading to increased bowel inflammation.

"Our study provides useful insights on the cross-regulation of the mucosal immune system, epithelial barrier and commensal bacteria not only in humans in spaceflight or analog, but also in humans on earth that undergo various stresses," said Qing Ge, Ph.D., study author from the Department of Immunology at Peking University Health Science Center in Peking, Beijing.

To make their discovery, Ge and colleagues used four groups of mice. The first and third groups were suspended for 14 days by the tail at a 15 degree head-down tilt with their hindlimbs suspended. Access to food and water was ensured using both water bottles and gel packs and food distributed around the floor of the cage. Animals demonstrated no adverse effects or pronounced weight loss. The second and fourth groups were normal. Starting from day seven, the third and the fourth groups were fed with three percent dextran sulfate sodium dissolved in drinking water to induce inflammatory bowel disease whereas the first and the second groups received plain water. Compared to the second ground control group, the first group with hindlimb suspension revealed altered composition of intestinal bacteria, decreased regulatory T cells,

increased neutrophils, and imbalance of pro- and anti-inflammatory cytokines in the colon tissues. The third group with hindlimb suspension had more severe pathology of inflammatory bowel disease when compared to the fourth control group. This includes more weight loss, more severe rectal bleeding and tissue damage and increased death rate in the hindlimb suspended mice after colitis induction.

"We already know that a trip to Mars and back may well have serious, possibly permanent, effects on the bodies of the astronauts," said Gerald Weissmann, M.D., Editor-in-Chief of *The FASEB Journal*. "Now we learn that the hidden passengers on that mission—the bacteria their gut—will be affected as well. This lends further credence to the fact that life on Earth, including the microbiome, evolved under gravity and needs it to thrive."

More information: Pingping Li, Junxiu Shi, Peng Zhang, Ke Wang, Jinglong Li, Hongju Liu, Yu Zhou, Xi Xu, Jie Hao, Xiuyuan Sun, Xuewen Pang, Yan Li, Hounan Wu, Xiaoping Chen, and Qing Ge. Simulated microgravity disrupts intestinal homeostasis and increases colitis susceptibility. *FASEB J.* August 2015 29:3263-3273; DOI: 10.1096/fj.15-271700

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