

Women, space travel and infection: bed-rest study investigates female immune response on extended missions

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A bed-rest study with female participants will help scientists understand changes to the immune response and decreased resistance to infection in space.

Investigators with the National Space Biomedical Research Institute (NSBRI) are researching the immune system as part of the Women's International Space Simulation for Exploration (WISE), a collaborative venture that includes NASA, the European Space Agency, the Centre National D'Études Spatiales (French Space Agency) and the Canadian Space Agency. The study is being carried out by the French Institute for Space Medicine and Physiology (MEDES) in Toulouse, France.

“It is clear from existing data that space flight conditions alter immune responses,” said Dr. Gerald Sonnenfeld, a researcher on the NSBRI's Immunology, Infection and Hematology Team. “Space has such limited access; to research the immune response, we use a bed-rest model because it provides conditions similar to space conditions – fluid shift to the head and a lack of weight-bearing on the lower limbs.”

Changes in immunity could have serious effects on an astronaut's ability to resist infection and the development of tumors. Possible causes for a compromised immune system include exposure to radiation and the effects of microgravity. With current expeditions to the International Space Station for extended periods and future exploration missions to the moon and Mars, astronauts will be exposed to chronic radiation that

could result in serious health problems.

To help unravel the infection-resistance issue, Sonnenfeld is researching the overall impact of the body's immune response under space-like conditions. Through tests taken before, during and after bed rest, he will gauge whether participants' white blood cells divide normally and whether messengers of the immune system, called cytokines, are produced. Sonnenfeld also will study the frequency by which latent viruses are reactivated and whether participants mount an immune response to a harmless vaccine, phiX174, that is introduced during the study.

“In the past, most bed-rest studies for immunity have been carried out on men. It is significant to be part of the international WISE study because scientists and the space community want valid conclusions about effects on women,” said Sonnenfeld, who is also vice president for research at Binghamton University, State University of New York.

The study involves 24 healthy, non-smoking female volunteers between the ages of 25 and 40. Candidates in the first phase came from the Czech Republic, Finland, France, Germany, Great Britain, The Netherlands and Poland. Recruitment for another 12 volunteers, who are needed for the second campaign, is currently ongoing (www.medes.fr). Each subject is assigned to one of three groups, which include bed rest, bed rest with a series of exercises targeting the lower body, and bed rest with a nutritional supplement. Participants lie with their heads tilted six degrees below horizontal so that their feet are slightly higher than their heads.

During the study, researchers begin by collecting physiological data to serve as a baseline. Blood samples, urine samples and saliva swabs are taken at specified intervals during the 60 days of bed rest. After the bed-rest period, similar tests are taken for comparison. Participants will

return to measure how their bodies recovered for up to three years.

“The data garnered by this study is not only historic, it will be valuable in international efforts to plan long-duration missions,” Sonnenfeld said. “It could help determine how exercise and nutritional countermeasures for other space flight-induced problems including bone and muscle loss influence the immune system, making researchers better able to coordinate solutions to the challenges of human space flight.”

Sonnenfeld’s team also is composed of Dr. Janet Butel of Baylor College of Medicine, Dr. William Shearer of Texas Children’s Hospital and Baylor College of Medicine, Dr. David Niesel of the University of Texas Medical Branch at Galveston, and Drs. Michel Abbal and Antoine Blancher of the Université Paul Sabatier in Toulouse.

Source: National Space Biomedical Research Institute

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