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Author: Dr. Laura Drudi
McGill University, Canada

Dr. Marlene Grenon
University of California, San Francisco (UCSF), United States

WOMEN'S HEALTH IN SPACEFLIGHT

Abstract

With the retirement of the Space Shuttle in 2011, it is likely that our society will experience an increase in space tourism activities with a push from the commercial sector. In as such, the number of women flying in space may increase. The increasing commercial activities may translate into less stringent selection criteria for space travel, which has implications for occupational space medicine. This paper aimed to review the state of knowledge with regards to physiological and clinical problems related to women's health during spaceflight, with the secondary goal to identify areas where research efforts should be directed.

The PubMed literature was reviewed for articles relevant to the field of "women" and "female" in "microgravity" , "weightlessness" , "spaceflight" , "bed rest" and "simulated microgravity" in English/French. Discussions with microgravity investigators supplemented the published articles. The information obtained from these sources were analyzed to summarize the state of knowledge and identify areas that would benefit from directed research efforts.

22 articles were identified meeting the above-defined criteria. Areas of research included neurovestibular issues, cardiopulmonary physiology, bone and muscle physiology, immunology, behavioral health, and urogynecological and reproductive issues. Gender issues for spaceflight remain an area that is relatively unexplored. Few women have participated in flight- and ground-based space life science studies and are often pooled with male astronauts, thus limiting many observations. Spaceflight gender discrepancies in motion sickness haven't been studied. Most women traveling to space experience orthostatic intolerance upon returning to Earth, which may be due to differences in female cardiovascular stress response. Muscle loss appears to be paralleled in men and women. Immunosuppression in spaceflight may be related to bone marrow suppression but no studies investigated gender differences. Behavioral studies demonstrate gender issues in psychosocial dynamics in spaceflight. There appears to be greater urinary tract infections in women in space associated with decreased consumption of food and water. Finally, germ cell viability is an issue with ovaries and testes being very sensitive to radiation damage, which may further influence the reproductive health of astronauts.

Orthostatic intolerance has so far been the main area targeted in flight- and ground-based investigations. Reproductive and radiation physiology will require attention as the endeavors to space exploration continue. With upcoming changes in space access offered by commercial space activities, research related to women's health in microgravity should become one of the priorities for safe space exploratory efforts.