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Medical Care for Humans in Space (3)

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REVIEW OF MENSTRUAL BLOOD-DERIVED CELL THERAPY TO SUPPORT ASTRONAUTS IN
LONG-TERM SPACE MISSIONS.**Abstract**

Stem cell transplant is currently in its early age but offers great potential to prevent or treat damages such as muscle atrophy or tissue damage due to exposure to radiation. This is specifically interesting for space flights where, due micro-gravity, astronauts experience up to a 20 percent loss of muscle mass on spaceflights lasting five to 11 days, as well as the increased exposure to ionized radiation. Menstrual blood-derived stem cells have shown a lot of potential for cell therapy because of their multilineage differentiation, self-renewal, and secretion of growth factors. Their plasticity and safety for cell therapy is specifically interesting in the context of long-term space missions and multi-planetary civilisation. Currently, female astronauts decide to pause their periods during their missions as the current apparatus in spacecrafts are not adapted to specific female hygiene such as menstruations. Whilst urine and faecal matter are collected in separate 'liquid' and 'solid' compartments to be re-used and transformed, it is essential to take the advantage of a natural and regular process of stem cell production. This would be the first research intersecting menstrual blood-derived stem cells research and regenerative life support systems. This literature review will explore the pipeline from menstruation blood collection, conception of the apheresis machine and the transplant of the isolated stem cells, all in the context of space flights. The outcome of this work is a research agenda for every step of the pipeline in order to develop an end-to-end apparatus for menstrual-blood derived stem cell therapy in spacecraft utilization. This is a foundational research for combining regenerative medicine and regenerative life support systems to support long-term space exploration. Please note that this work is submitted under the Space Generation Advisory Council's auspices as part of the research conducted within the Space Exploration Project Group.