

Acronym: Repository

Title: National Aeronautics and Space Administration Biological Specimen Repository

Principal Investigator(s):

Curator

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Sponsoring Agency: National Aeronautics and Space Administration (NASA)

Increment(s) Assigned: 16, 17, 18, 19, 20

Brief Research Summary (PAO): The National Aeronautics and Space Administration Biological Specimen Repository (Repository) is a storage bank that is used to maintain biological specimens over extended periods of time and under well-controlled conditions. Samples from the International Space Station (ISS), including blood and urine, will be collected, processed and archived during the preflight, inflight and postflight phases of ISS missions. This investigation has been developed to archive biosamples for use as a resource for future space flight related research.

Research Summary:

- The International Space Station (ISS) provides a platform to investigate the effects of microgravity on human physiology prior to lunar and exploration class missions. The storage of crewmember samples from many different ISS flights in a single repository will be a valuable resource with which researchers can study space flight related changes and investigate physiological markers.
- The development of the National Aeronautics and Space Administration Biological Specimen Repository will allow for the collection, processing, storage, maintenance, and ethical distribution

of biosamples to meet goals of scientific and programmatic relevance to the space program. Archiving of the biosamples will provide future research opportunities including investigating patterns of physiological changes, analysis of components unknown at this time or analyses performed by new methodologies.

Detailed Research Description: The National Aeronautics and Space Administration Biological Specimen Repository (Repository) will collect, store and distribute samples to future investigators involved in space flight related human life sciences investigations. Blood samples will be collected by venipuncture during the preflight, in-flight and postflight phases of this investigation. One 4.5-ml plasma tube and one 5-ml serum tube will be collected from each participating crewmember during each of the scheduled sessions. These sessions are scheduled once preflight, in-flight on flight days 15, 30, 60, 120 and 180 and during two sessions scheduled for 3-5 days and 30 days following return to Earth.

Void-by-void urine will be collected and pooled into a 24-hour pool. Urine will be collected during the same session times as scheduled for the blood draws. Biosample collections will be coordinated with the existing medical requirements or research activities to minimize the number of needle sticks, urine collections and inconveniences to the crewmember.

All inflight samples will be stored at ultra low temperatures in the Minus Eighty-Degree Laboratory Freezer for ISS (MELFI) to maintain the highest quality and integrity possible. The overall project philosophy is to collect, process and store samples to ensure the widest possible range of analyses can be carried out on samples in the future.

Project Type: Payload

Images and Captions:



ISS refrigerated centrifuge used during blood processing of the Repository samples. Image courtesy of NASA, Johnson Space Center.



Flight hardware used for blood and urine collection of Repository samples.

Operations Location: ISS Inflight

Brief Research Operations:

- Preflight, crewmembers will provide 9.5-ml of whole blood and a 24-hour urine collection (L-30 to 45 days).
- Inflight, crewmembers will setup the blood and urine collection hardware. Crewmembers will then perform the morning fasting blood collection (9.5-ml) and begin the 24-hour urine collection. The blood is processed and all samples are recorded and the samples stored in the ISS Minus Eighty-Degree Laboratory Freezer for ISS (MELFI) for return to Earth.

- Postflight, crewmembers will provide 9.5-ml of whole blood and a 24-hr urine collection during two postflight sessions (one session occurring approximately R+3-7 and at R+30 days).

Operational Requirements: All ISS crewmembers are eligible to participate in this protocol. Sample sessions will occur on flight days 15 (+/-5 days), and 30, 60, 120, and 180 (+/-14 days). Blood collection will occur following an overnight fast. Samples will be returned to Earth for storage in the Repository.

Operational Protocols: The crewmember will draw blood and collect urine samples during the scheduled sessions. The blood samples will be processed in the refrigerated centrifuge and then stored in the MELFI. Urine will be collected void-by-void for twenty-four hours and samples stored in the MELFI. Samples will be identified via bar codes and the data downlinked to Earth.

Review Cycle Status: PI Reviewed

Category: Human Research and Countermeasure Development for Exploration

Sub-Category: Integrated Physiology

Space Applications: The development of the National Aeronautics and Space Administration Biological Specimen Repository will allow for the collection, processing, storage, maintenance, and ethical distribution of biosamples to meet goals of scientific and programmatic relevance to the space program. Archiving of the biosamples will provide future research opportunities including investigating patterns of physiological changes, analysis of components unknown at this time or analyses performed by new methodologies.

Earth Applications: Advances in space biomedical research often lead to medical advances to better serve terrestrial patients. Future research investigations to help ensure the health and safety of crewmembers and enable exploration class missions may provide significant health benefits to patients on Earth.

Manifest Status: Continuing

Supporting Organization: Exploration Systems Mission Directorate (ESMD)

Previous Missions: Repository is the first investigation of this kind performed in microgravity.

Last Update: 06/18/2008