



HUMAN HEALTH AND PERFORMANCE

Exploring Space | Enhancing Life

Biomedical Laboratories

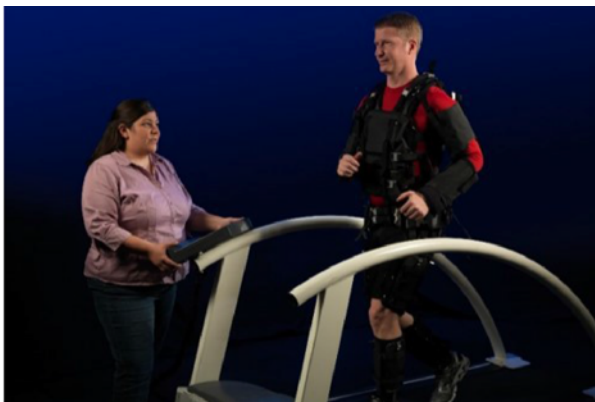
Understanding the Physiological Response of Humans to Extreme Environments

Our unique science laboratories conduct applied research as well as provide clinical testing and biomedical research expertise. Scientists and physicians conduct biomedical research on ISS as well as in spaceflight analog environments to better characterize the effects on human physiology while living and working in space and to evaluate candidate countermeasures.

World Renowned Skills and Unique Capabilities

The Johnson Space Center, a world leader in human spaceflight possesses unique knowledge, skills, and capabilities that can be applied to solving human health and performance challenges here on earth, particularly those related to operating in extreme and harsh environments.

NASA expertise is available in the areas of biomedical research and engineering, behavioral health, biostatistics, bone and mineral research, cardiovascular and vision, exercise physiology, microbiology, neurosciences, nutrition, immunology, pharmacotherapeutics and radiation biophysics. Research capabilities include numerous unique space environmental laboratory facilities.



Johnson Space Center

Biomedical Laboratory capabilities including expertise, skills, and knowledge are available to support terrestrial applications including extreme environments and aid in development of commercial crew flights.

Behavioral Health Research

Behavioral Health expertise and research environments are used to simulate extreme environmental conditions such as altered day and night cycles, disproportionate workloads, social isolation, and close living quarters. This provides insight on the impact these conditions have on human behavior and performance.

Bioanalytical Core Laboratories

The Bioanalytical Core Laboratories capabilities are equipped to provide enhanced cellular, physiological analytical research and analysis, (e.g., confocal and scanning electron microscopes, High Performance Liquid Chromatography (HPLC) and mass spectroscopy).

Bone and Mineral

The Bone and Mineral Laboratory has the capability to test requirements pertaining to bone density and body composition by measuring bone and mineral density using whole body dual energy X-Ray (DXA scanner) and peripheral quantitative computed tomography (pQCT scanner).

Cardiovascular and Vision

The Cardiovascular and Vision Laboratory has the capability and expertise to identify risks associated with spaceflight, conduct cardiovascular research using state of the art technologies and methods including Optical Coherence Tomography (OCT) w/ OCT Angiography, Electroretinogram (ERG), Pneumotometry (for Intra Ocular Pressure), Echocardiography, Vascular Imaging, Holter Monitoring, Orthostatic Tolerance measures, muscle volume testing, time series data analysis, and virtual guidance ultrasound.

Extra-Vehicular Activity (EVA) Physiology

The EVA Physiology Laboratory has the capability and expertise in prebreathe exercise prescriptions, to analyze and graphically present metabolic data rates for use by mission flight surgeons during EVAs, and to support hypobaric testing and simulations.

Exercise Physiology

Exercise Physiology has the expertise and facilities to support fitness-related crew medical testing, evaluate and validate exercise countermeasure hardware, protocols, and

conditioning programs for human health and performance maintenance, complete biomechanical assessments of crew during exercise, and generate and use modeling tools to improve exercise countermeasures.

Immunology

Immunology has the expertise and facilities to investigate and recommend countermeasures for the effects of extreme environments on human physiology including effects on the human immune system and on kidney stone formation.

Microbiology

The Microbiology team serves as a NASA-wide resource for microbial issues associated with living and working in extreme closed environments; requirements development; environmental monitoring (including enumeration, microbial characterization and identification); potable water analysis; crew diagnostics; food analysis; crew training; bio- safety review of payloads; and hardware and technology development. The laboratory also has the capability for microbial research associated with living and working in extreme closed environments through operational monitoring and investigative research.

Neurosciences

The Neurosciences Laboratory performs human subject data collection and analyses for ground- based and flight studies pertaining to functional neurological assessments that provide an objective test of neurosensory re- adaptation to Earth's normal gravity following prolonged weightlessness.

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Nutritional Biochemistry

The Nutritional Biochemistry Laboratory performs nutritional assessment techniques, including analyses of blood and urine samples for biochemical endocrine and other physiological markers, in addition to detailed dietary intake assessment.

Pharmacotherapeutics

The Pharmacotherapeutics Laboratory performs clinical pharmacology research and operations, conducts therapeutic drug monitoring, performs pharmaceutical stability assessments, maintains therapeutic database analysis and maintenance, and provides pharmacy information services and documentation.

Radiation Biology

Radiation Biology capabilities are used to view chromosome aberrations using fluorescence imaging microscopes and on-screen analysis of cells, and to capture images of mitotic spreads or stained whole cells using Cytovision software.



For the benefit of all