The Use of Microgravity Simulators for Space Research

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The spaceflight environment is known to influence biological processes ranging from stimulation of cellular metabolism to possible impacts on cellular damage repair, suppression of immune functions, and bone loss in astronauts. Microgravity is one of the most significant stress factors experienced by living organisms during spaceflight, and therefore, understanding cellular responses to altered gravity at the physiological and molecular level is critical for expanding our knowledge of life in space.

Since opportunities to conduct experiments in space are scarce, various microgravity simulators and analogues have been widely used in space biology ground studies. Even though simulated microgravity conditions have produced some, but not all of the biological effects observed in the true microgravity environment, they provide test beds that are effective, affordable, and readily available to facilitate microgravity research.

A Micro-g Simulator Center is being developed at Kennedy Space Center (KSC) to offer a variety of microgravity simulators and platforms for Space Biology investigators. Assistance will be provided by both KSC and external experts in molecular biology, microgravity simulation, and engineering. Comparisons between the physical differences in microgravity simulators, examples of experiments using the simulators, and scientific questions regarding the use of microgravity simulators will be discussed.