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Testing Cellular Cultures in Simultaneous Simulated Reduced-Gravity and Radiation Space Environments[1] ANYA NIELSON, ALEXANDRA NELSON, ERYN HANSEN, LORI CALDWELL, JR DENNISON, ELIZABETH VARGIS, Utah State University, MATERIALS PHYSICS GROUP, PHYSICS DEPARTMENT, UTAH STATE UNIVERSITY COLLABORATION, BIOLOGICAL ENGINEERING DEPARTMENT, UTAH STATE UNIVERSITY COLLABORATION — An apparatus was developed to test the effects of space-like reduced-gravity and radiation environments on biological cells. The modified rotary cell culture system (RCCS) has been used to expose mice muscle and skeletal cells to prolonged reduced-gravity and radiation, either separately or simultaneously, to simulate conditions during extended space travel. The apparatus has five cylindrical vessels rotated by a motor driven chain. The cells grown on polystyrene microspheres suspended in a viscous neutral-buoyant fluid within the vessels reach terminal velocity as they fall; the rotation of the vessels prevents the cells from ever settling, inducing a state of constant "free-fall." Viscous drag and centripetal forces counter the effects of gravity and buoyant forces producing very little net force on the cells and thus simulating a low gravity environment. This apparatus is designed specifically for insertion in the USU Space Survivability Test (SST) chamber equipped with a 0.2 to 2.5 MeV beta radiation Sr^{90} source. Interchangeable graphite shielding produce specific average radiation dose rates cells. The simultaneous rotation of the vessels and exposure to the Sr-90 source provides a terrestrial method to observe space like conditions on cells.

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