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Simulating Microgravity and Space Radiation With a Rotary Cell Culture System (RCCS)

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Abstract

A Rotary Cell Culture System (RCCS) has been developed to simulate the combined effects of microgravity and radiation on living cells. The RCCS will be used to study these effects on mice, cardio muscle and skeletal cells to understand effects of long duration missions in space. A RCCS has a rotating cylindrical chamber containing a solution of cells suspended in a viscous fluid. To simulate microgravity the chamber is rotated, and the cells fall through the fluid reaching terminal velocity. However, as the cells fall the chamber rotates resulting in a continuous state of "free fall". During this free fall, the cells experience very little net force, as viscous drag and centripetal forces are adjusted to counter balance gravitational forces, therefore simulating microgravity experienced in space. The new system incorporates 3-6 rotating chambers which can be inserted into the Space Survivability Test (SST) Chamber allowing simultaneous exposure to a penetrating beta radiation from a Sr90 source.

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