TACSM Abstract

Effects of Multiple Bouts of Long-duration Hindlimb Unloading and Recovery on Rat Plantaris Muscle

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ABSTRACT

Exposure to microgravity results in a rapid reduction of muscle mass. However, few studies exist designed to examine the effects of multiple long-term exposures to microgravity with alternating recovery periods on skeletal muscle. To determine what happens to the recovery of skeletal muscle when faced with subsequent unloading and recovery periods. Male Sprague-Dawley (6 mo) were assigned to the following groups as shown in figure 1 below: 28d hindlimb unloading (1HU), 28d HU session followed by a 56d recovery bout of normal cage ambulation at 1g (1HU+REC), 2 cycles of 28d HU with a 56d recovery period between unloadings (2HU), 2 cycles of 28d HU as in the 2HU group, but followed by an additional 56d recovery at 1g (2HU+REC), and an age- and housing-matched control group (CON). On the final day of the experimental period, plantaris muscles were excised and weighed. The 1HU+REC (0.548 ± 0.012), 2HU+REC (0.562 ± 0.015), and CON (0.550 ± 0.013) showed no statistical difference ($p>0.05$) between each other. The 1 HU (0.442 ± 0.020) and 2 HU (0.431 ± 0.011) groups were significantly less ($p<0.001$) than recovery and aged control animals but were not significantly different from each other. The results show that the plantaris muscle presented reduction of muscle mass with initial and subsequent exposures to microgravity. However, with the recovery period, animals were able to regain lost muscle mass, similar to age-matched controls. These findings would be relevant for astronauts participating in multiple long-duration missions throughout their career.

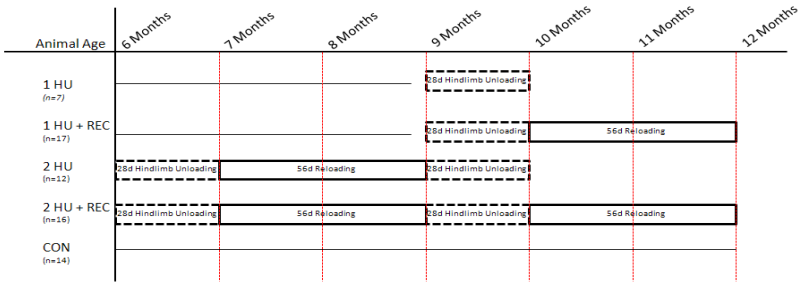

Figure 1: Study design. This timeline shows the five experimental groups detailed in the text as carried out through the 180 days study.