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## 30 DAYS OF REAMBULATION STIMULATES BONE MARROW RECONVERSION

**Abstract**

**Purpose:** Marrow adipose tissue (MAT) is an endocrine organ closely associated with acute and age-related chronic conditions such as osteoporosis, anemia, cardiovascular disease, obesity, diabetes, longevity, and cancer. Physiological and pathological processes, and pharmacotherapies can modulate MAT. However, the effect of reambulation following prolonged bed rest and of a dietary supplement intervention on MAT modulation is unknown. We investigate the effects of 60 days of 6 degrees head-down tilt bed rest (HDTBR), of reambulation for up to 2 years, and of a polyphenol dietary supplement on the lumbar vertebral fat fraction (VFF), a radiological measure of MAT in the lumbar spine.

**Methodology:** In a double-blind placebo-controlled prospective clinical trial, 20 health male participants (mean age:  $34.2 \pm 7.8$  years, mean BMI:  $23.6 \pm 1.6 \text{ kg/m}^2$ ) underwent 60 days of HDTBR. Participants either received a polyphenol dietary supplement with omega-3, selenium, and vitamin E, or a control diet. Five serial MR imaging of the lumbar spine were performed at 13 days before HDTBR, at 57 days of HDTBR, and at 30 and 360 days of reambulation. Three techniques were used: proton density (PD) (with and without fat saturation), phase sensitive DIXON, and MR spectroscopy (MRS).

**Results:** The polyphenol dietary supplement did not modulate VFF during HDTBR. 60 days of 6 degrees HDTBR did not modulate VFF as measured with all three MR techniques. VFF was lower than baseline after 30 days of reambulation with all three MR techniques. Using PD and DIXON sequences, VFF returned to baseline at 1 year of reambulation. Using MRS, VFF was still statistically lower than baseline at 1 year of reambulation.

**Conclusion:** Increased activity levels after prolonged bed rest stimulated bone marrow reversion. Lower MAT can improve bone tissue repair and hematopoietic production, making it a potential target for treatment of conditions experienced by both astronauts and patients on Earth.