AMINO ACID SUPPLEMENTATION REDUCES MUSCLE PROTEIN LOSS DURING 28-DAY BEDREST

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Prolonged space flight facilitates a loss of skeletal muscle mass and can negatively impact physical function. Amelioration of this response is essential for successful prolonged missions. We sought to determine if essential amino acid and carbohydrate (EAA-CHO) supplementation during 28 days of strict bedrest could provide an anabolic stimulus capable of offsetting the catabolic response associated with prolonged inactivity. Primary outcome measures included determination of: i) regional lean and fat mass (DEXA: dual energy x-ray absorptiometry), ii) maximal (1RM) leg extension strength, and iii) skeletal muscle amino acid kinetics. Immediately prior to and following 28 days of bedrest, multiple femoral arterio-venous (A-V) blood samples were obtained during a primed (2.0μmol/kg) constant infusion (0.05μmol/kg/min) of L-[ring-2H5]phenylalanine. Muscle protein kinetics were calculated over an 18 hr period during which the control group (CON), (n=6 males), (38.1±3.4yrs, 178.8±1.4cm, 86.1±4.3kg) received a calorie controlled mixed liquid meal (Boost Plus ®: 57% carbohydrate, 27% fat, 14% protein) every 5hrs (08:30, 13:30, 18:30). Between meals (11:00, 16:00, 21:00), the experimental group (EXP), (n=6 males), (35.4±3.7yrs, 180.5±1.2cm, 86.5±4.3kg) also consumed a drink containing 15g EAA and 45g CHO. During bedrest, the same controlled feeding/supplement regimen was maintained with regular foods replacing the Boost Plus ® drinks. During bedrest, bodyweight was maintained in the EXP group (+0.1±0.3kg) but fell in the CON group (-2.4±0.5kg). Lean leg mass was also maintained in the EXP group (+0.2±0.3kg), but not in the CON group (-0.4±0.1kg). Bedrest reduced 1RM leg extension strength in all subjects, however the decrement was more pronounced in the CON group (EXP: -8.8±1.4kg vs. CON: -17.8±4.4kg). Amino acid supplementation improved 18hr phenylalanine net balance both before and after 28 days of bedrest (pre: 7.18±2.05; post: 3.40±2.09 nmol phe/min/100ml leg vol). In contrast, the CON group remained in negative net balance (pre: -4.96±1.22; post: -6.07±3.49 nmol phe/min/100ml leg vol). During the 28 days of inactivity, EAA-CHO supplementation stimulated net muscle protein synthesis resulting in the maintenance of muscle mass. However, the conservation of muscle mass alone did not fully preserve muscle strength. It appears likely that some neuromuscular stimulus is also required to maintain muscle strength and function.