

Urinary acid excretion can predict changes in bone metabolism during space flight

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Mitigating space flight-induced bone loss is critical for space exploration, and a dietary countermeasure would be ideal. We present here preliminary data from a study where we examined the role of dietary intake patterns as one factor that can influence bone mineral loss in astronauts during space flight. Crewmembers (n=5) were asked to consume a prescribed diet with either a low (0.3-0.6) or high (1.0-1.3) ratio of animal protein to potassium (APro:K) before and during space flight for 4-d periods. Diets were controlled for energy, total protein, calcium, and sodium. 24-h urine samples were collected on the last day of each of the 4-d controlled diet sessions. 24-h urinary acid excretion, which was predicted by dietary potential renal acid load, was correlated with urinary n-telopeptide (NTX, Pearson R = 0.99 and 0.80 for the high and low APro:K sessions, respectively, $p < 0.001$). The amount of protein when expressed as the percentage of total energy (but not as total grams) was also correlated with urinary NTX (R = 0.66, $p < 0.01$). These results, from healthy individuals in a unique environment, will be important to better understand diet and bone interrelationships during space flight as well as on Earth. The study was funded by the NASA Human Research Program.