Fibroblast Growth Factor 23 in Long-Duration Spaceflight

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Background

Many nutritional factors influence bone, from the basics of calcium, vitamin D and phosphorus, to factors which affect acid/base balance (e.g., protein, sodium, potassium). Fibroblast growth factor 23 (FGF23) is a recently identified factor, secreted from osteocytes, which is involved in classic (albeit complex) feedback loops controlling phosphorus homeostasis through both vitamin D and parathyroid hormone (PTH) [1,2]. As osteocytes are gravity sensitive cells, it is important to determine the potential role of FGF23 during spaceflight. Elevated FGF23, secondary to dietary influences, may contribute to skeletal demineralization and kidney stone risk during spaceflight.

Methods

6 astronauts (n=6, 4 female, 2 male) on International Space Station Expeditions 23 through 36 (mission duration 127-193 days, flown between 2010 and 2013). Blood samples were collected using standard phlebotomy techniques as previously described [6].

Results

• FGF23 levels vary throughout the duration of flight there were no significant changes noted here.

• The negative correlation between serum FGF23 and serum 1,25-dihydroxyvitamin D is consistent with previous studies of FGF23’s action to regulate active vitamin D.

• Most astronauts take vitamin D supplements because deficiency is a chronic problem. Given FGF23’s regulatory association with 1,25-dihydroxyvitamin D, it should be further studied.

• The negative correlation between protein and FGF23 could be a result of higher total protein intake, known to have a higher phosphorus content. This is further supported by the trend towards a negative correlation between FGF23 and dietary phosphorus. The strength of the correlation between serum FGF23 and total protein intake even given low subject numbers suggests that further study is required.

Summary

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References


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