

Concurrent Session 17

The skeletal response to prolonged sun deprivation in Antarctic conditions

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Background - Lack of exposure to solar ultra violet radiation (UVR) results in decreased synthesis of vitamin D, with low serum levels associated with increased bone turnover and bone loss.

Objective - To investigate the skeletal response to solar UVR deprivation on healthy adults (n = 57) aged 38.6 yrs (range 21.0 – 61.2 yrs) during their wintering employment in Australia's Antarctic program.

Design - Longitudinal observational study. Anthropometry was measured at baseline and dietary intake at 6 months. Blood samples were taken at baseline and quarterly there on, and analysed for vitamin D and markers of bone turnover (OC; osteocalcin), formation (PINP; procollagen Extension Peptide) and resorption (Beta X Laps; Beta Cross laps).

Outcomes - Mean (\pm SE) height; 180.2 \pm 1.4 cm, weight 85.7 \pm 4.5 kg and calcium intake 755 \pm 52 mg/day were recorded.

| | Baseline | 3 mths | 6 mths | 9 mths | 12 mths |
|-----------------|----------|--------|--------|--------|---------|
| Vit. D (nmol/l) | 55.2 | 39.8* | 37.9* | 39.6* | 44.2* |
| OC (ng/ml) | 23.0 | 24.5 | 23.4 | 22.6 | 25.3 |
| P1NP (ng/ml) | 49.8 | 49.2 | 52.3 | 52.7 | 56.1 |
| Beta XL (ng/ml) | 0.312 | 0.344 | 0.320 | 0.332 | 0.339* |

*Different to Baseline

Serum Vitamin D levels at 3 months were significantly lower than baseline, and remained lower for the year ($P < 0.01$). Bone resorption was higher at 12 months compared to baseline ($P < 0.06$). Time since arrival (TSA - duration of sun deprivation) was negatively correlated with vitamin D levels ($r = -0.41$, $P < 0.001$), and positively correlated with bone resorption ($r = 0.18$, $P < 0.07$). After accounting for calcium intake TSA was positively correlated with OC ($P < 0.01$) and P1NP ($P < 0.05$).

Conclusions - Short-term sun deprivation negatively impacts on bone, especially in extreme environments. The long-term detriment to bone is still to be determined.

Diet and mood state

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Background - There is some limited data indicating that dietary intake may alter mood states, but most of this is anecdotal. A number of dietary factors have been associated with reduction in blood pressure, which could, in part be related to positive effects on general mood states.

Objective - To determine if urinary excretion of particular minerals is associated with different mood states and if changing to one of the test diets DASH type diet (high fruits, vegetables and low fat dairy products) (OZDASH), a low salt, high fruit/vegetable diet (LNAHK) or a high calcium diet (HC) has an effect on mood state.

Design - Subjects completed an abbreviated 37-item version of the Profile of Mood States weekly throughout a 14-week dietary study. Each person consumed two different types of diets for 4 weeks, preceded by a 2 week control diet and performed 24-hr urine collections fortnightly.

Outcomes - For the 62 subjects who completed all tasks, throughout the study, there was a significant inverse association with 24-urinary excretion of calcium and potassium with depression ($r = -0.26$ $P < 0.05$, $r = -0.25$ $P < 0.05$), calcium and fatigue ($r = -0.29$ $P < 0.01$) and a positive association for sodium and vigour ($r = 0.39$ $P = 0.01$). When assessing the change in urinary electrolytes, moving from the control diet to one of the test diets, there was a significant reduction in tension and anger with all diets (OZDASH (n=93) $P < 0.05$, LNAHK (n=43) $P < 0.01$ and HC (n=47) $P < 0.01$), a reduction in fatigue on the OZDASH and HC ($P < 0.01$), a reduction in confusion on the OZDASH and LNAHK ($P < 0.05$) and a reduction in depression on the HC diet ($P < 0.05$) there were no differences in the vigour scores on any diet. The HC diet had the lowest anger and depression scores and both the OZDASH and HC diet reported lower fatigue scores.

Conclusion - These findings strongly suggest that mood is related to mineral metabolism. Dietary change may affect mood state, particularly the inverse association of calcium and potassium to depression/fatigue. These findings should be treated with caution but strongly suggest further replication studies are warranted.