# VITAMIN D STATUS AND STRESS FRACTURES IN DIVISION III MALE CROSS COUNTRY RUNNERS

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## Introduction

- Estimates of stress fracture occurrence are as high as 21% among track and field athletes[1].
- One nutritional risk factor for stress fractures is poor vitamin D status[1].
- Vitamin D plays an important role in bone metabolism as well as other cellular processes and immune functions.
- The standard method for determining vitamin D status is to measure serum 25 – hydroxyvitamin D [25(OH) D] as it measures all sources of vitamin D [skin synthesis, dietary, or supplementary][2]. Values >75 nmol/L are considered optimal.
- Vitamin D status is not routinely measured perhaps due to the assumption that humans synthesize adequate amounts of 25 (OH) D with UVB [290 – 315 nm] sunlight exposure, and therefore dietary vitamin D intake is not critical.
- Vitamin D skin synthesis decreases during the winter months at latitudes >35° N or S due to inadequate UVB exposure[1].
- New research now challenges whether the current dietary recommendations are adequate.

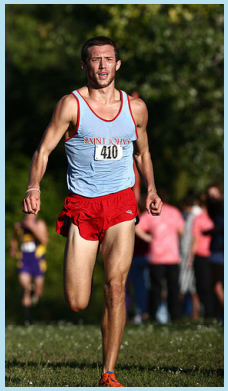
## Methods

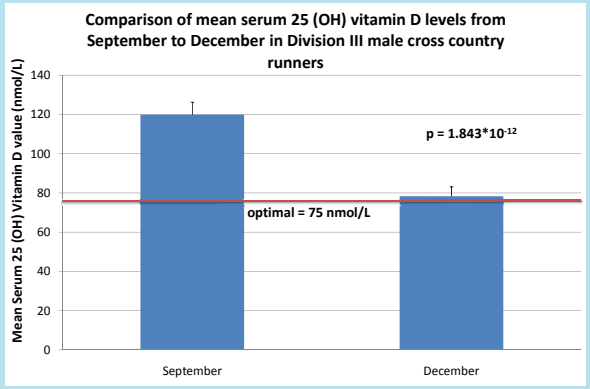
- The research was approved by the Institutional Review Board of the college and all subjects signed an informed consent prior to data collection.
- Male cross country subjects aged 18 – 22 [*n = 37*] completed three day diet records during the initial week of practice.
- Diet records were analyzed using Diet Analysis Plus 7.0.1 software for energy availability and nutrient intake.
- Body composition measurements and blood samples were collected during early September and early December.
- Serum was frozen at -80°C and later analyzed for levels of 25(OH) D using an ALPCO ELISA assay.
- Heel bone density was estimated using ultrasound with the Achilles InSight bone densitometer early in the season.

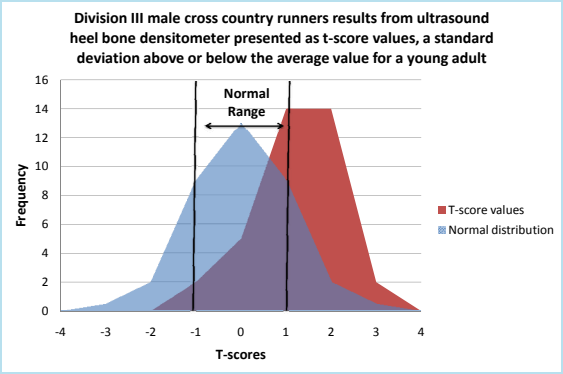
## Purpose

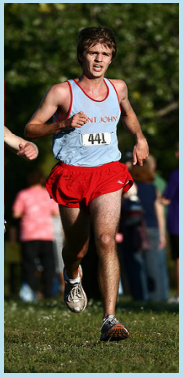
The purpose of this study was to evaluate vitamin D status [dietary vitamin D intake and serum levels of 25 (OH) D] and bone density in Division III male cross country runners.

## Results





## References:

1. Willis, K., Peterson, N., & Larson-Meyer, E. (2008). Should We Be Concerned About the Vitamin D status of Athletes? *International Journal of Sport Nutrition and Exercise Metabolism,* 18, 204-224 Retrieved April 2008 from PubMed.
2. Gozdzik, A., Barta, J., Wu, Hongyu., Wagner, D., Cole, D., Vieth, R., Whiting, S., & Parra, E. (2008). Low wintertime vitamin D levels in a sample of healthy young adults of diverse ancestry living in the Toronto area: associations with vitamin D intake and skin pigmentation. *BMC Public Health,* 8, 336 – 345 Retrieved February 2008 from PubMed.

## Results

- Mean dietary vitamin D intake during September was 7.2 µg/day ± 4.3 [AI (Adequate Intake) is 5 µg (200 IU)]. However, nine subjects failed to reach the AI, and one individual only obtained 13%.
- The September mean serum 25(OH)D value was 116 ± 42 nmol/L; only four (11%) subjects were <75 nmol/L.
- Mean serum values of 25(OH)D in December was 79 ± 28 nmol/L which was significantly lower ($p = 1.843 \times 10^{-11}$) than September values. Fourteen runners were <75 nmol/L by December.
- Mean calcium intake during the initial data collection was 1590 mg/day ± 500 [AI = 1000 mg/day].
- Results from the bone densitometer are presented as t-scores, a standard deviation above or below the average value for a young adult. Mean T-score values for bone density of all subjects fell within the normal range of -1 to +1; 14 subjects had t-score values of +1 to +2, 14 subjects were between +2 to +3, and 2 runners were above +3.
- 17% (n = 6) reported having sustained a current or prior stress fracture during the December data collection.

## Conclusions

- 38% of the runners had less than optimal serum vitamin D values by December.
- Despite adequate dietary intake of vitamin D on average, (assuming consistent diets) the serum 25 (OH) D levels dropped significantly in December – suggesting the need for higher dietary vitamin D or controlled UVB exposure during the winter months.
- Serum 25(OH) D values are the only way to know with confidence vitamin D status.
- Heel ultrasound bone density measurements are not a good predictor of stress fractures with this population.

## Acknowledgements

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