THE PREVALENCE OF SUBOPTIMAL VITAMIN D STATUS IN A RANDOMLY SELECTED COHORT OF COLORADO FIREFIGHTERS

Gerard Guillory, M.D. and Michael Mutzel, M.Sc.

Abstract: Vitamin D insufficiency has been associated with increased risk of CVD, various cancers, autoimmune disease and type 2 diabetes. Despite adequate sun exposure, individuals inhabiting metropolitan areas display a high prevalence of vitamin D insufficiency as determined by serum levels of 25(OH) vitamin D less than 32 ng/mL. The purpose of this study was two fold: 1) to assess the serum levels of 25(OH) vitamin D and prevalence of vitamin D deficiency in a cohort of 20 firefighters that work and reside in the Denver metro region and 2) perform follow up lab work after eight weeks supplementation with a microemulsified liquid vitamin D-3 preparation. The initial baseline blood levels of 25(OH) vitamin D were assessed and the study subjects were advised to take 4,000 IU/daily (2 drops) of the vitamin D3 preparation for eight weeks. After the eight week supplemental period serum levels were retested to establish the percent increase in the 25(OH) vitamin D blood levels. The average initial 25(OH) vitamin D blood level and eight week post test blood levels was 27.02 ng/mL and 54.01 ng/mL respectively. Pretest 75% of the study subjects were defined as deficient (below 32 ng/mL) and only 25% were deficient after 8 weeks of supplementation with the liquid emulsified vitamin D-3. The average percent increase in serum 25(OH) vitamin D levels was 106%.

Conclusion: Suboptimal vitamin D status is prevalent in Denver Firefighters and 8 week of 4,000 IU/daily supplementation with a micro-emulsified liquid vitamin D-3 preparation increased blood levels on average 106%.

Introduction

Vitamin D deficiency is a serious medical condition that has been associated with an increased risk of developing cardiovascular disease, type 2 diabetes, hypertension, various cancers and autoimmune diseases. Vitamin D insufficiency occurs at epidemic levels in many industrialized countries, where exposure to sunlight tends to be limited and diets tend not to include sufficient amounts of foods naturally rich in vitamin D. During 2009, Dr. Guillory tested more than 1,200 of his patients and found that roughly 90 percent had sub-optimal vitamin D levels, as determined by serum 25(OH) vitamin D levels below 32 ng/mL. Dr. Guillory achieved great success in treating this with Bio D Mulsion, a microemulsified preparation made by Biotics Research Corporation.

The purpose of this study was two fold; to increase public and physician awareness of the scope and seriousness of vitamin D deficiency and secondly to assess the effectiveness of the microemulsified vitamin D preparation. Several preparations have been recommended to patients by physicians for the treatment of vitamin D insufficiency. The

availability of vitamin D preparations ranges from high potency tablets, capsules to liquid forms. Vitamin D is a fat soluble hormone and thus requires biliary secretions to properly saponify the fats for proper intestinal absorption. To maximize the efficacy and bioavailability of fat soluble nutrients, enhanced delivery methods have been developed. One such method is an oil in water micro-emulsification, a closely-held process that enables a fat soluble (water-insoluble) vitamin to be placed into a uniformly micrometer sized, fat soluble particle that is dispersible in water and capable of intestinal transport independent of bile acid-saponification. The aim was to ascertain how efficacious 2 drops, yielding 4,000 IU of micro-emulsified vitamin D-3 would be in raising low serum levels of 25(OH) vitamin D in a group of 20 Fire Fighters residing in the Denver metro area.

Materials and Methods

20 full time Fire Fighters of the Aurora Fire Department were selected on a volunteer basis to participate in an eight week study during the Winter/Spring months of 2009. The 20 subjects were advised to stop consuming multi vitamins, cod liver oil and other supplements containing vitamin D upon initiation of the study. The subjects filled out a medical symptom questionnaire aimed to assess subjective indications of mood, energy level and digestive complaints. All subjects had blood drawn (at the Care Group, PC, office of Gerard Guillory MD in Aurora, Colorado) and serum levels of 25-hydroxyvitamin D (25(OH) vitamin D tested through Laboratory Corporation of America (Lab. Corp) via an assay developed by DiaSorin. The subjects were advised to take 4,000 IU/day (2 drops) daily of the liquid emulsified preparation produced by Biotics Research Corporation. After eight weeks of daily supplementation the study subjects' 25(OH) vitamin D levels were retested by Laboratory Corporation of America. The subjects also filled out the same medical symptom questionnaire and the data was compiled.

Results

The average baseline 25(OH) vitamin D blood level was 27.02 ng/mL. Current medical guidelines suggest that vitamin D insufficiency begins when blood levels are below 32 ng/mL and optimal disease prevention occurs when blood levels are above 60 ng/mL (REF). Only five study subjects had serum levels above the 32 ng/mL level and two subjects had blood levels less than 11 ng/mL. The majority of subjects had levels in the low to mid 20's (See Table 1). Prior to supplementation 75% of the subject were deficient in vitamin D and 10% of the subjects were severely deficient (as defined by blood levels below 10 ng/mL).

After the eight week supplemental period the average 25(OH) vitamin D blood level was 54 ng/mL, a 106% average increase. Post supplementation 15 study subjects, or 75%, had serum levels above the deficiency blood level of 32 ng/mL (pre-supplementation 75% were deficient). Only 5 study subjects, or 25%, had serum levels below the 32

ng/mL level. Seven subjects had blood levels above 50 ng/mL, the highest being 114 ng/mL (See Table 1).

Subject	**Initial blood level ng/mL**	**Final blood level ng/mL**	**% Change**
Rhonda B.	23.5	77	2.276595745
Todd B.	27.3	61.8	1.263736264
Roger B.	35	74.6	1.131428571
Cynthia A.	40.3	70.9	0.759305211
James E.	25.5	70.8	1.776470588
Eric A.	21.9	31.4	0.433789954
Klein S.	36	51	0.416666667
Donnie C.	9.6	35.8	2.729166667
Anthony C.	23.1	44.4	0.922077922
James W.	30.1	70.9	1.355481728
Vance M.	25.3	49.5	0.956521739
Ken K.	22.4	27.8	0.241071429
Scott B.	10.6	16.7	0.575471698
Diane S.	34.5	54.1	0.568115942
Roy S.	26	28.3	0.088461538
Michael A.	33.8	53	0.568047337
Dan M.	29	114	2.931034483
Justin B.	34.4	45	0.308139535
Stephan V.	25	49.2	0.968
Average Levels	27.01578947	54.01052632	106% Change

Table. 1 Listed by study subject first name and last initial. The pre and post eight week supplementation blood levels are listed.

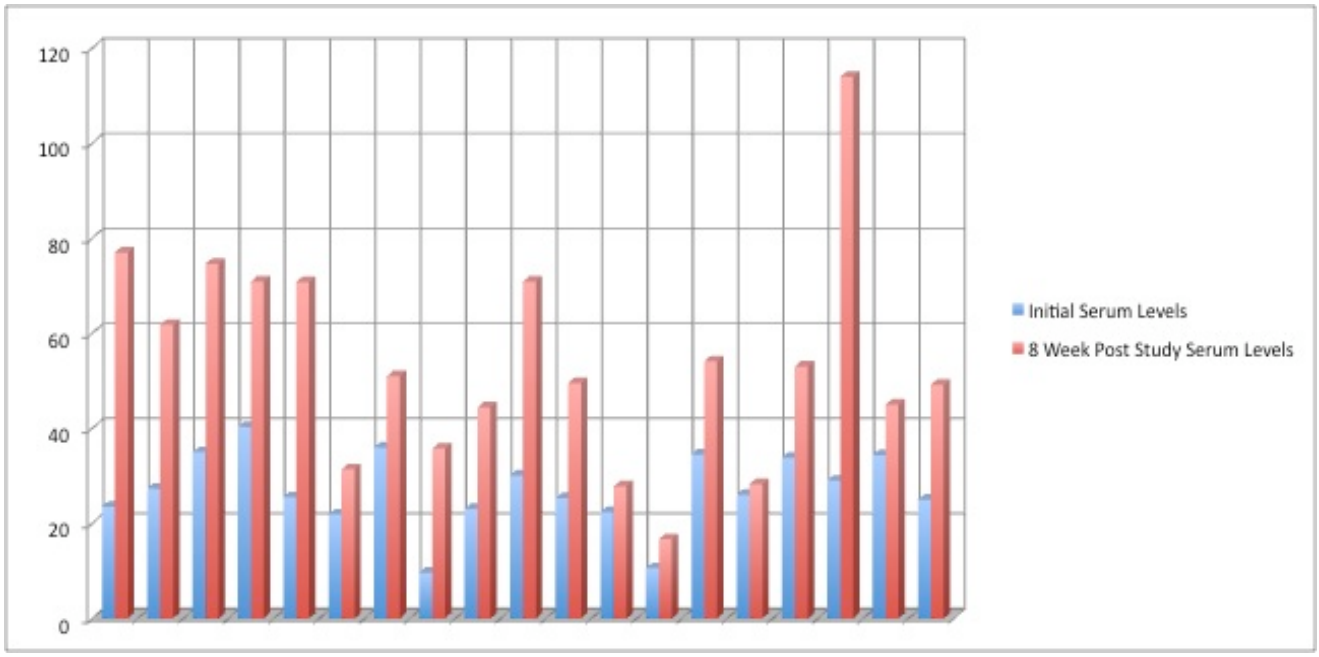

Figure 1. Legend: the Y axis represents serum levels of 25(OH) vitamin D in ng/dL, the X axis represents study subject 1-20. Deficiency is defined as blood levels below 32 ng/mL.

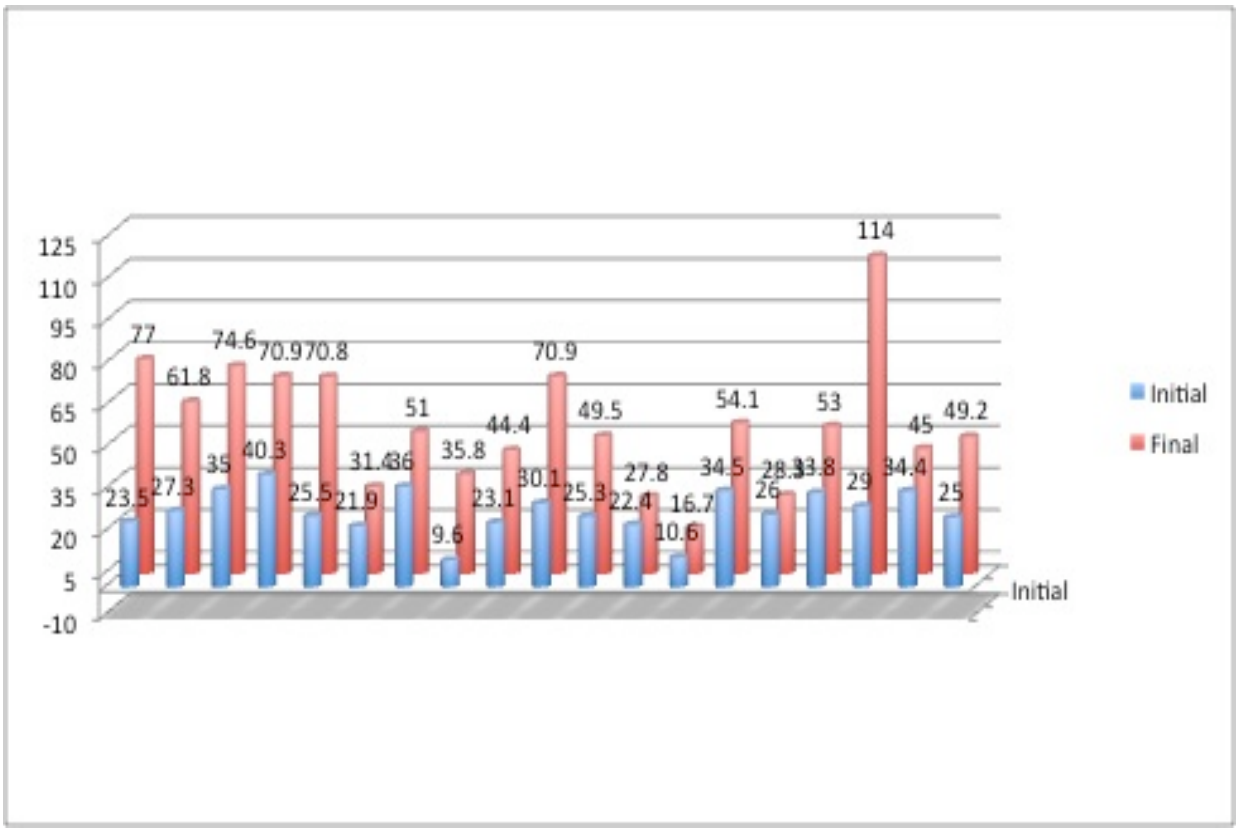

Figure 2. Legend: the Y axis represents serum levels of 25(OH) vitamin D in ng/mL, the X axis represents study subject 1-20. The numbers overlaying the graph represent serum level per patient.

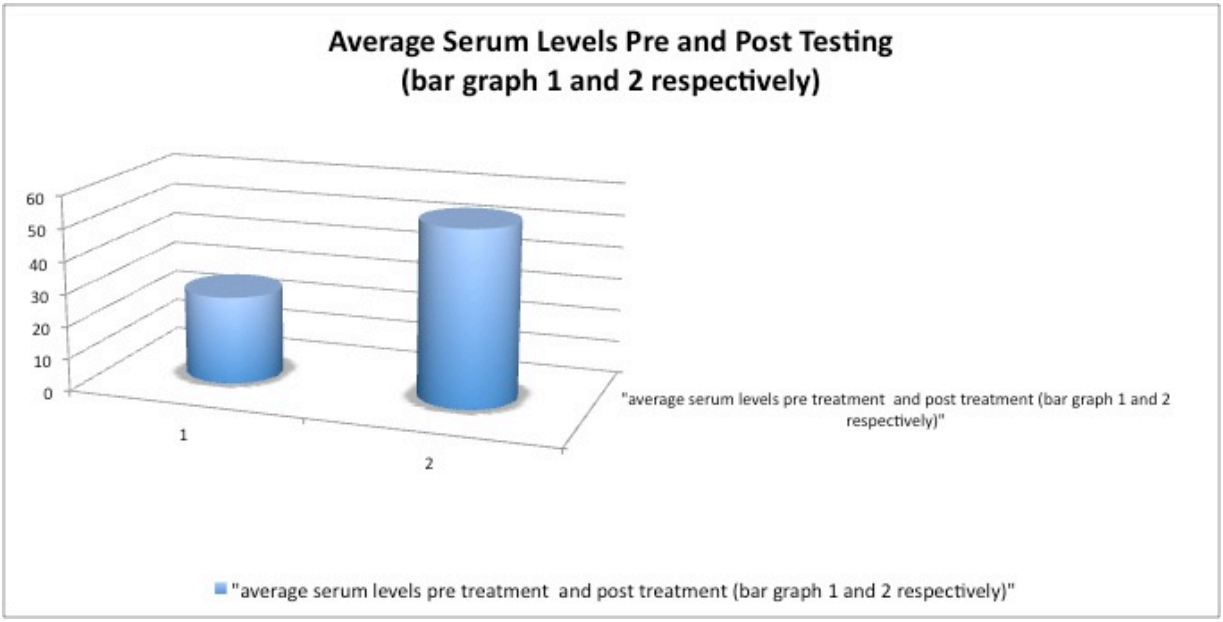

Figure 3. Legend: the Y axis represents serum levels of 25(OH) vitamin D in ng/mL, the X axis represents average serum levels of 25(OH) vitamin D in the 20 test subjects pre and post treatment.

Discussion

The prevalence of vitamin D insufficiency in a group of 20 firefighters not taking any vitamin D supplements is 75%. Studies show that individuals with vitamin D levels below 32 ng/mL have an increased risk for developing heart disease, cancers, and autoimmune diseases. Due to high prevalence of vitamin D insufficiency in firefighters residing in a sunny part of the country, physicians should increase their 25(OH) vitamin D blood testing on a more routine basis among firefighters and lay people alike. Increased screening would likely have a huge health and financial impact, leading to increased work productivity and decreased medical costs through disease prevention.

The form of vitamin D supplementation in deficient individuals should be inexpensive, highly bio-available and easy to use for optimal compliance. In this study the micro-emulsified Bio D Mulsion Forte from Biotics Research Corporation was used and can be attributable to an average increase of 106% in blood levels of the study subjects. It's likely that the micro-emulsification process in a liquid delivery form facilitates maximal absorption and bio-availability of the vitamin D supplement. This is evidenced by the consistent increases in blood levels after eight weeks of 4,000 IU/daily use, bringing 75% of the study subjects out of the deficiency reference range.