

Vitamin D

“The Sunshine Vitamin”

Douglas Mann, DPE, ATC

Outline of Presentation

- History of Vitamin D
- How do we get it
- What does it do
- What are recommended levels
- What does deficiency look like
- What do we know and what do we not know about Vitamin D
- Review research investigation done at Rowan University

Financial Disclosures

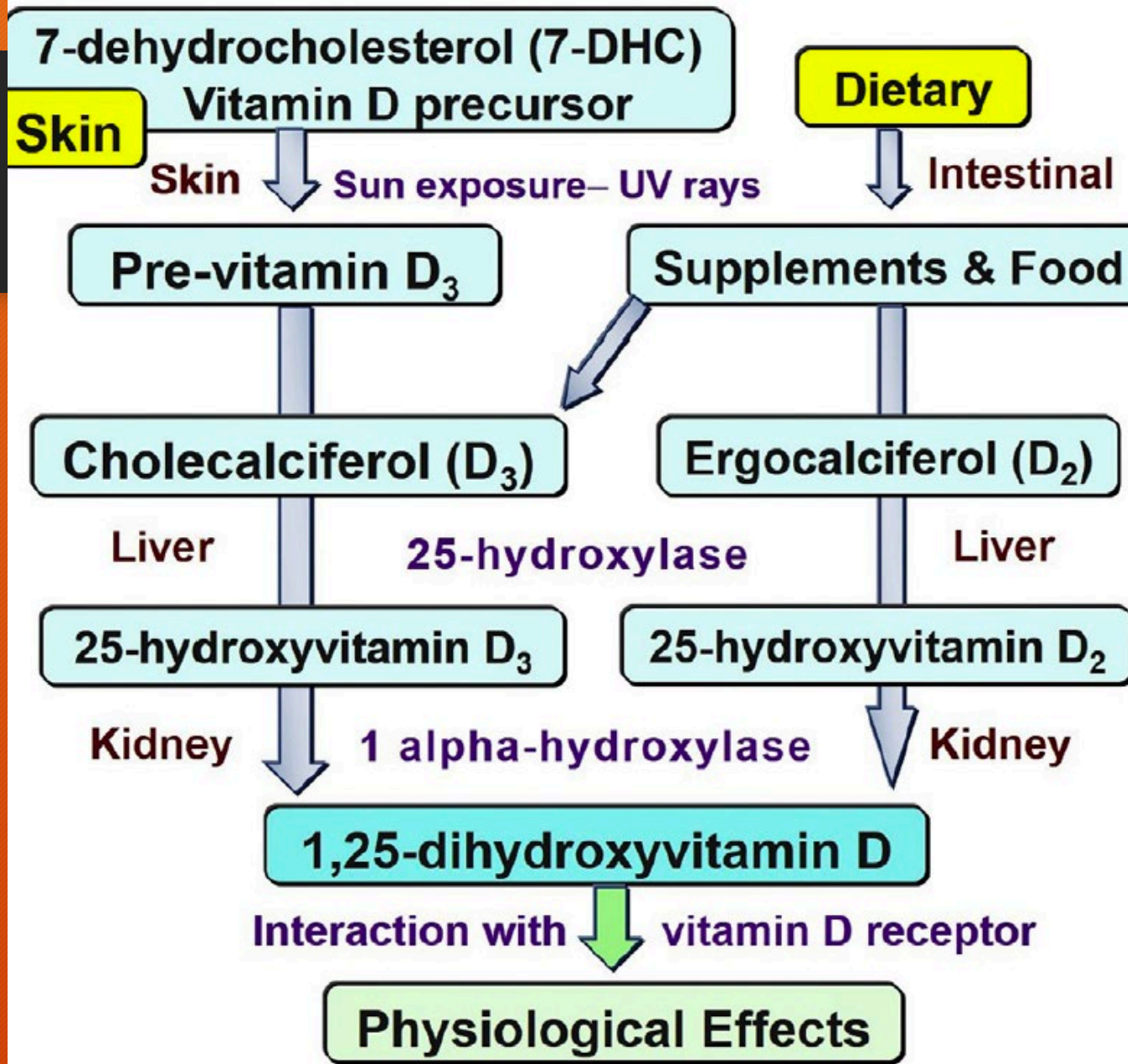
- Research project made possible by a grant from Athletic Trainers' Society of New Jersey
- I DO NOT have a financial interest, arrangement or affiliation with any products that could be perceived a real or apparent conflict of interest in the context of the subject of this presentation

History of Vitamin D

- Early 1900's, Development of Vitamin A paved way for discovery of Vitamin D
- With increased pollution, Rickets became a health concern, particularly in lower sunlight countries. Rickets became known as the “English Disease”. Anecdotal reports of giving cod liver oil to help cure or prevent the disease.
- At the same time rickets was being treated and prevented by exposure to sunlight.

What is Vitamin D

- Vitamin D is a hormone rather than a vitamin since it can be made in the body when exposed to sunlight. Body only makes Vitamin D3 or cholecalciferol
- About 10% of the Vitamin D the body needs comes from food, the rest is made from a chemical reaction involving the sun and cholecalciferol to calcidiol to calcitriol
- Vitamin D2 come from plant sources
- Vitamin D3 come from animal sources and is what is produced from the sun



Food Sources Insufficient

- Most foods do not contain a meaningful amount of Vitamin D
- Dietary sources are inadequate and not sufficient to meet the daily vitamin d requirement
- Many dietary sources are not adequately fortified and salmon and mackerel vitamin d levels can vary between species
- Bottom line: Diet alone cannot be relied upon to get adequate amount of vitamin d
- If going to supplement, supplement with Vitamin D3

Sports Med (2018) 48 (Suppl 1):S3–S16
<https://doi.org/10.1007/s40279-017-0841-9>



REVIEW ARTICLE

Vitamin D and the Athlete: Current Perspectives and New Challenges

Daniel J. Owens¹ · Richard Allison^{1,2,3} · Graeme L. Close¹

What Does Vitamin D DO?

Increase blood calcium
stops proliferation of parathyroid cells
Immune system

**1,25-Dihydroxyvitamin D₃ Restrains
CD4⁺ T Cell Priming Ability of
CD11c⁺ Dendritic Cells by
Upregulating Expression of CD31**

Vitamin D and the Immune System

Cynthia Aranow, MD[Investigator]
Feinstein Institute for Medical Research, Manhasset, N.Y.

Immune System

He CS, Aw Yong XH, Walsh NP, et al. Is there an optimal vitamin D status for immunity in athletes and military personnel?

Exerc Immunol Rev. 2016;22:42-64.

- He CS, Handzlik M, Fraser WD, et al. Influence of vitamin D status on respiratory infection incidence and immune function during 4 months of winter training in endurance sport athletes. Exerc Immunol Rev. 2013;19:86-101.
- 65. He CS, Fraser WD, Tang J, et al. The effect of 14 weeks of vitamin D3 supplementation on antimicrobial peptides and proteins in athletes. J Sports Sci. 2016;34:67-74.

Immune System

Vitamin D₃ Supplementation Reduces the Symptoms of Upper Respiratory Tract Infection during Winter Training in Vitamin D-Insufficient Taekwondo Athletes: A Randomized Controlled Trial

[Hyun Chul Jung](#),¹ [Myong-Won Seo](#),² [Sukho Lee](#),³ [Sung Woo Kim](#),² and [Jong Kook Song](#)^{2,*}

Research

Vitamin D supplementation to prevent acute respiratory tract infections: systematic review and meta-analysis of individual participant data

BMJ 2017 ; 356 doi: <https://doi.org/10.1136/bmj.i6583> (Published 15 February 2017)

Cite this as: *BMJ* 2017;356:i6583

Recommended levels

IOM recommendations

	Conventional units	SI units
Deficient	<20 ng/ml	<50 nmol/L
Normal	≥20 ng/ml	≥50 nmol/L
Excessive	>50 ng ml	>125 nmol/L

Frequently used vitamin D cut-points by many laboratories

	Conventional units	SI units
Deficient	< 20 ng/ml	<50 nmol/L
Insufficient	20 to 29.9 ng/ml	50–74.9 nmol/L
Sufficient	>30 ng/ml	>75 nmol/L

Pediatric
(The IOM and the Pediatric Endocrine Society have agreed on these cut-points.)

	Conventional units	SI units
Deficient	<20 ng/ml	<50 nmol/L
Normal	≥20 ng/ml	≥50 nmol/L

Recommended Levels of Vitamin D

- In 2010 lower than 20 ng/ml was considered Vitamin D deficient
- In 2011 Endocrine Society urged 30 ng/ml
- In NEJM article, suggested 12.5 ng/ml and below was deficient
- Generally accepted that concern should be taken at 20 ng/ml, particularly with those higher risks (anorexia nervosa, gastric bypass surgeries, celiac, darker skin, cover up, osteopenia, post-menopausal women, pregnant and lactating women)
- For purposes of our investigation we used 20ng/ml as Vitamin D deficient

What Does Insufficiency Look Like

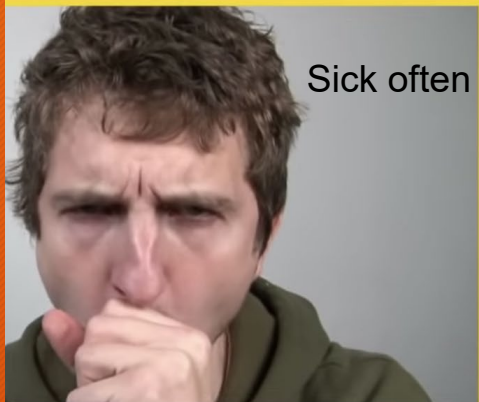
Joint/low back pain



Muscle cramps



Sick often



fatigue



Symptoms Insufficiency

- Mood changes
- Bone loss
- Muscle cramps
- Bone and joint pain
- Fatigue
- Sick often
- Impaired wound healing
- Hair loss

Previous Research

What We Know:

Vitamin D deficiency higher in African Americans

Vitamin D deficiency higher in winter and early spring sports and indoor sports

Vitamin D helps to maintain calcium and phosphorus levels in the blood

Vitamin D is important for a healthy immune system

Previous research: What we don't know

Effect of Vitamin D Supplementation on 25(OH)D Status in Elite Athletes With Spinal Cord Injury

How important is it in the musculoskeletal system/ Injury and Performance

The Association of Vitamin D Status in Lower Extremity Muscle Strains and Core Muscle Injuries at the National Football League Combine



Brian J. Rebolledo, M.D., Johnathan A. Bernard, M.D., Brian C. Werner, M.D., Andrea K. Finlay, Ph.D., Benedict U. Nwachukwu, M.D., M.B.A., David M. Dare, M.D., Russell F. Warren, M.D., and Scott A. Rodeo, M.D.

Original research

The influence of winter vitamin D supplementation on muscle function and injury occurrence in elite ballet dancers: A controlled study

Matthew A. Wyon^{a,b,c,*}, Yiannis Koutedakis^{a,d,e}, Roger Wolman^{c,f}, Alan M. Nevill^a, Nick Allen^{a,b,c}

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Deficiency

Does vitamin D deficiency trigger carpal tunnel syndrome?

Vitamin D supplementation to prevent vitamin D deficiency for children with epilepsy

The relationship between vitamin D status and depression in a tactical athlete population

Kelly A. Schaad^{1,2*}, Asma S. Bukhari^{1,2}, Daniel I. Brooks³, Justin D. Kocher^{1,4} and Nicholas D. Barringer^{1,5}

Abstract

Background: Stressors inherent to the military, such as combat exposure, separation from family, and strenuous training collectively contribute to compromised psychological resilience and greatly impact military performance.

Methods: This retrospective review of records was conducted to determine whether vitamin D status was associated with diagnoses of depression and if diagnoses differed by geographic location.

Results: Depression (defined using diagnostic codes) was more prevalent in individuals who were diagnosed with vitamin D deficiency (20.4%) than in individuals who were not (4.2%). After adjustment, vitamin D deficient diagnoses remained significantly associated with depression diagnoses (OR = 1.22; 95% CI, 1.11–1.33, $p < 0.001$). Furthermore, vitamin D deficient diagnoses were strongly associated with geographic latitude ($r^2 = 0.92$, $p = 0.002$).

Conclusion: These results suggest that service members stationed at installations located at northerly latitudes may be at increased risk for vitamin D deficiency. Furthermore, vitamin D deficient service members may be at higher risk for diagnosis of depression. As a number of military service members avoid reporting symptoms or seeking treatment, vitamin D status may be a useful screening tool to identify service members at risk for depression.

Review

**Vitamin D and Neurological Diseases:
An Endocrine View**

Previous Research: What we don't know

Non Musculoskeletal Effects

Autoimmune disease

Mental Health

Diabetes

Blood pressure

Infection

Non-musculoskeletal benefits of vitamin D

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ARTICLE INFO

ABSTRACT



Table 1

Diseases and conditions that are associated with or aggravated by vitamin D deficiency.

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- | | |
|--|-------------------------------|
| • Osteomalacia/osteoporosis | • Parathyroid diseases |
| • Muscle function and falls | • Polymyalgia rheumatic |
| • Autoimmune disorders | • Autism |
| • Tuberculosis/infections | • Peripheral vascular disease |
| • Cancer (breast, colon, skin, pancreas, prostate) | • Chronic pain |
| | • Fibromyalgia |
| • Celiac disease | • Chronic fatigue syndrome |
| • Cystic fibrosis | • Cardiovascular mortality |
| • Multiple sclerosis | • Demyelinating diseases |
| • Hypertension | • Infections |
| • Type 2 diabetes | • Athletic performance |
| • Inflammatory bowel disease | • Seasonal affective disorder |
| • Rheumatoid arthritis | • Depression |
| • Migraine headaches | • Obesity |
| • Incontinence | • Rheumatoid arthritis |
| • Macular degeneration (AMD) | • Parkinson's disease |
| • Cognitive impairment | • Psoriasis |
| • Cardiovascular events | • Overall mortality |
-

Research Investigation

- The purpose of this research investigation was to compare Vitamin D levels between gender, race, indoor vs outdoor athletes. In addition we looked at injury rates between those that were considered vitamin d deficient and those that were not.
- Hypothesis: Females would have lower vitamin d levels than males, African Americans would have lower levels of vitamin d than Caucasians and injury rates would be higher for those that were vitamin d deficient.

Subjects

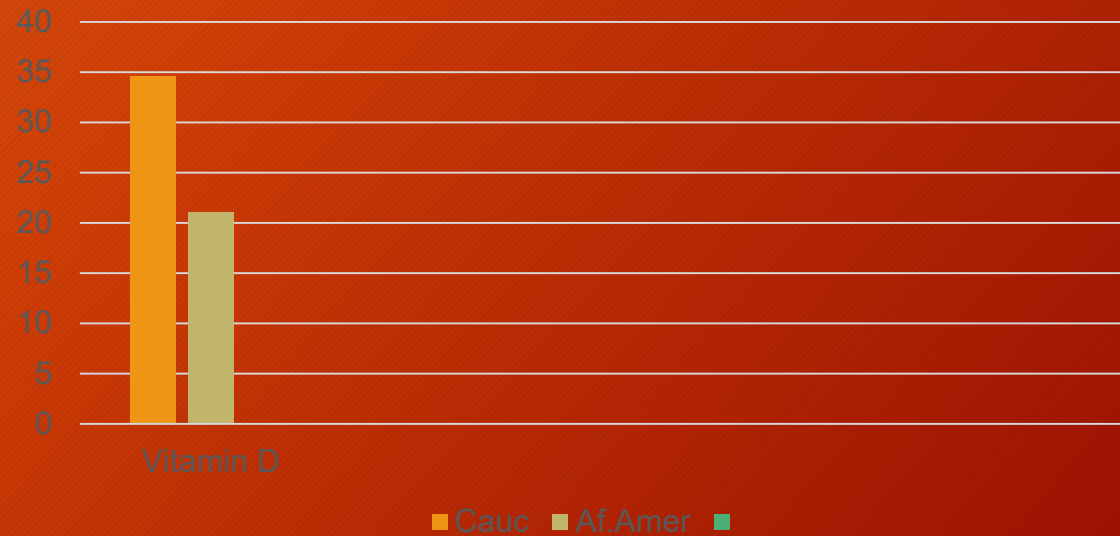
- 24 Division III College Athletes
- 12 Males, 12 Females
- 13 Outdoor athletes, 11 Indoor athletes
- 13 Caucasian, 11 African American

Results

Subject	Gender	Indoor or Outdoor	Race	Vitamin D level (ng/ml)	# of Injuries in last 12 months	Bone injuries
1	male	Outdoor	African American	27.0	1	1
2	female	Outdoor	Caucasian	27.2	2	0
3	female	Outdoor	African American	19.1	2	0
4	female	Outdoor	Caucasian	42.2	4	0
5	female	Outdoor	Caucasian	63.5	3	0
6	male	Outdoor	Caucasian	36.6	4	0
7	male	Outdoor	African American	19.0	3	1
8	male	Outdoor	African American	16.0	4	2
9	female	Outdoor	Caucasian	27.1	1	0
10	male	Outdoor	Caucasian	26.5	1	0
11	male	Outdoor	African American	15.5	0	0
12	male	Outdoor	African American	17.9	6	3
13	male	Outdoor	African American	25.4	2	0
14	female	Indoor	Caucasian	19.7	1	0
15	male	Indoor	Caucasian	34.6	0	0
16	female	Indoor	Caucasian	26.6	1	0
17	male	Indoor	Caucasian	36.9	3	1
18	female	Indoor	Caucasian	26.3	2	0
19	female	Indoor	African American	33.6	2	0
20	female	Indoor	African American	25.5	4	1
21	female	Indoor	African American	20.1	2	0
22	female	Indoor	Caucasian	52.9	3	0
23	male	Indoor	African American	12.1	2	1
24	male	Indoor	Caucasian	29.0	2	0

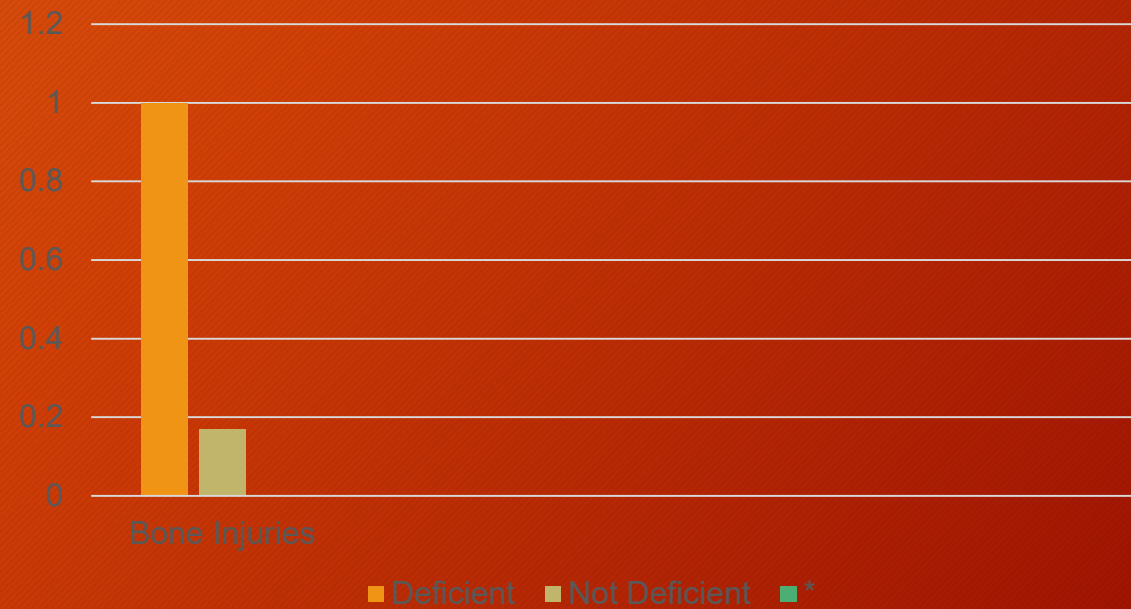
Results

- Significant difference in Vitamin D levels between Caucasian and African American Athletes



Results

- Significant difference in bone Injuries



Clinical Take Home/Objectives

Who is at risk

Bone injuries

Immune System

What does deficiency look like

When recommend testing and talking to a physician about supplementation

Objectives

- What disease brought attention to Vitamin D?
- What is best source of Vitamin D. Which Vitamin D is better to supplement D2 or D3?
- What do we know it does?

Articles

- <https://drive.google.com/drive/folders/1I3QJygpi7PRYS8NzskyS5j9fLrgyH0tk?usp=sharing>

WSJ

Can Vitamin D Deficiency Result in Athlete's Injuries?



Watch later



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