Dr Holick Receives support From NIH

Consultant and Speaker

Quest Diagnostics
Merck
Sanofi
Shire
Vital Choice
Ontometrics
Lallemand
And Support From The Sun

DrHollick.com
IOM 2010

RDA = 3X
200 IU to 600 IU/d

UL = 2X
2000 to 4000 IU/d
Objective:

The objective was to provide guidelines to clinicians for the evaluation, treatment, and prevention of vitamin D deficiency with an emphasis on the care of patients who are at risk for deficiency.
IOM Guidelines

“not intended to direct physicians on care of patients”

"it is up to professional associations to establish guidelines for care”

"used a population model, not a medical model"
Recommended Intake

0-1 YEAR: 400-1000 IU/D
1-18 YEARS: 600-1000 IU/D
18+ YEARS: 1500-2000 IU/D

Obesity: 2-3 times more
RICKETS
OSTEOMALACIA
DM, MS, RA, INFECTIONS
HBP, CHD CANCER
VITAMIN D SUNSHINE VITAMIN
Ancient DNA Reveals Neandertals
Ancient DNA Reveals Neandertals With Red Hair, Fair Complexions
Do you know why I became hypopigmented?
Normal Female Pelvis

Rachitic Pelvis
MY SKIN PIGMENT IS PERFECTLY DESIGNED !!!!!

COMPARE & CONTRAST
Solar UV Radiation

7-DHC ↔ PreD₃

ΔH

Vitamin D₃
YOU CANNOT BECOME VITAMIN D TOXIC FROM SUN EXPOSURE
DARK ALLEY in Glasgow, photographed in about 1870, is typical.

[Image of dark alley in Glasgow, photographed in the 19th century]
HESS & UNGER
1921
SUN CURED RICKETS
1931 US GOVERNMENT PROVIDED RECOMMENDATIONS FOR SUN EXPOSURE
GIVE THE BABY A COAT OF TAN

The baby should get tanned all over, but the tanning should take place gradually. Care should be taken not to burn him. Some babies tan more quickly than others; some burn more easily.

Dark-skinned babies need more sun to tan them and to protect them from rickets than fair-skinned babies.

In warm weather sun baths should be given...
THE Magic of VITAMIN D

STEEENBOCK PROCESS OF IRRADIATION with ULTRA-VIOLET LIGHT

PROTECTION

WISCONSIN ALUMNI RESEARCH FOUNDATION

MADISON, WISCONSIN
Grade A
Pasteurized Homogenized

REAL

vitamin D milk
VITAMIN D DEFICIENT RICKETS

RICKETS

3 YEARS OLD

VITAMIN D TREATED AFTER 2 MONTHS

NO CALCIFICATION

SWOLLEN WRIST

POOR CALCIFICATION

NORMAL CALCIFICATION

STEENBOCK 1920s
Do you know why vitamin D is so regulated and considered to be potentially very toxic?
Before 1950
England
1950s England
Infants
high blood calcium
Altered faces
Mental Retardation
Heart Problems
Hysteria What was the Cause?

Experts found Vitamin D Intoxication in Pregnant Rats

high blood calcium

Funny-altered faces

Heart Problems
Experts Concluded Outbreak Vitamin D Intoxication in England Due to Overfortification Milk with Vitamin D

Europe Banned All Vitamin D Fortification of Dairy and all Products adopted worldwide Except US and Canada
Vitamin D Fortification Banned in Europe

Williams Syndrome
Rare genetic disorder
Elfin faces
Vitamin D hypersensitivity - hypercalcemia
Heart Problems
Mental retardation
VITAMIN D
is
ESSENTIAL
FOR
BONE HEALTH
Case #1

- 7 month Old Female
- Muscle Weakness
- Tetanic seizures
- Serum calcium 4.2mg%
1889
BOSTON
80% INFANTS
RICKETS
BUT IS RICKETS A PROBLEM 2000 ???
Yes!!!!!!
MY DOCTOR SAID BREAST MILK PROVIDES ALL THE NUTRITION MY INFANT NEEDS.
THERE IS LITTLE VITAMIN D IN BREAST MILK, ~ 25 IU/L.
Vitamin D Deficiency in a Healthy Group of Mothers and Newborn Infants

Joyce M. Lee, MD, MPH\(^1\), Jessica R. Smith, MD\(^2\), Barbara L. Philipp, MD\(^3\), Tai C. Chen, PhD\(^4\), Jeffrey Mathieu, MS\(^4\), Michael F. Holick, MD, PhD\(^4\)

BOSTON MEDICAL CENTER

40 MOTHERS AND THEIR INFANTS AT BIRTH

MEASURED VITAMIN D STATUS

25-HYDROXYVITAMIN D
### Maternal Demographics (n=40)

<table>
<thead>
<tr>
<th>Race</th>
<th>N</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>25</td>
<td>(62.5%)</td>
</tr>
<tr>
<td>Caucasian</td>
<td>10</td>
<td>(25%)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>10</td>
<td>(25%)</td>
</tr>
<tr>
<td>Unknown</td>
<td>2</td>
<td>(5%)</td>
</tr>
</tbody>
</table>

- Drinks milk: 37 (92.5%)
- Eats fish: 44 (89.7%)
- MVI (400 IU Vit D): 28 (70%)
- Ca supplement: 4 (10%)
- Vit D supplement: 0 (0%)

<table>
<thead>
<tr>
<th>Mean Value</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>28.8 ± 6.5</td>
</tr>
<tr>
<td>Milk Consumption</td>
<td>2.3 ± 2.4</td>
</tr>
<tr>
<td>(8 oz. glasses/day)</td>
<td></td>
</tr>
<tr>
<td>Fish Consumption</td>
<td>6.2 ± 5</td>
</tr>
<tr>
<td>(servings a month)</td>
<td></td>
</tr>
</tbody>
</table>

Daily Intake Vitamin D

~600 IU

70% MTV

DRANK

2.3 GLASSES MILK/D
76% Mothers

81% Newborns

25(OH)D < 20NG/ML

Vitamin D Deficient
Strong, inverse relation between maternal 25(OH)D at <22 weeks and risk of preeclampsia

Adjusted OR (95% CI) associated with a 50-nmol/l decline in 25(OH)D: 2.4 (1.1, 5.4))

20 ng/ml

Bodnar et al 07
FIRST C-SECTIONS
Association Between Severe Vitamin D Deficiency and Primary Caesarean Section

Anne Merewood MPH, IBCLC*; Supriya D. Mehta PhD, MHS**, Tai C. Chen PhD***, Michael F. Holick PhD, MD****; Howard Bauchner MD*****
Probability C-Section

Risk C-section

0  20  40  60  80
Mother’s 25(OH)D ng/ml
I need 2000 IU Vitamin D/day to provide enough Vitamin D for me & my infant.
HOW MUCH VITAMIN D DOES MY MOM NEED TO PROVIDE ME WITH ADEQUATE VITAMIN D ??????

4000 IU/D

Hollis and Wagner AJCN 2004
BUT INFANTS ARE MORE SUSCEPTIBLE TO VITAMIN D INTOXICATION !!!!!!
American Academy Pediatrics
Beginning at Birth
All
INFANTS need
400 IU Vitamin D/d
- Total vitamin D intake from all sources during the first year should be 200 IU/day in the premature infant (recommendation grade A) and 400 IU/day in the full-term infant, with an increase to 800 IU/day from all sources between October and April north of the 50th parallel. This nutritional vitamin D intake should be added to the vitamin D from sunlight exposure (approximately 2000 IU/day) to meet the requirement of 2000 IU/day. Infants should be exposed to sunlight regularly for 10-30 minutes before and after a meal, especially after age 6 months. Babies should be protected from the sun to avoid skin damage.

- Because infants triple their weight in the first year, and given the evidence for weight-related vitamin D needs, more research is needed to establish whether higher intakes of vitamin D in infancy are desirable. Further research into weight-related vitamin D sufficiency should be carried out (recommendation grade A).
Case #2

- 1 Year Old Female
- Muscle Weakness
- Boney Deformities
- Failure to Thrive
Case #3

• 25 Year Old Female
• Poor Dentition
• Dental Caries
• Delayed tooth eruption
Dental Caries is on the Rise

The Centers for Disease Control and Prevention report that dental caries is the most common childhood disease in America today, five times more common than asthma. Even more alarming is the fact that the decay rate is on the rise. Today, 8% of our nation’s infants and toddlers have “Early Childhood Caries”, formerly called Baby Bottle Tooth Decay. Approximately 18% of three year old children have more than one cavity. That number increases to 40% in five year olds with over 95% of eighteen-year-olds having had at least one cavity. Of concern is the association between early
Inverse relationship with maternal 25(OH)D vs amount of decay in infants
Association between serum concentrations of 25-hydroxyvitamin D₃ and periodontal disease in the US population

Thomas Dietrich, Kaumudi J Joshipura, Bess Dawson-Hughes, and Heike A Bischoff-Ferrari

ABSTRACT

Background: Periodontal disease (PD) is a common chronic inflammatory disease and an important risk factor for tooth loss. Vitamin D might affect periodontal disease risk via an effect on bone mineral density (BMD) or via immunomodulatory effects.

Objective: The objective was to evaluate whether serum 25-hydroxyvitamin D₃ [25(OH)D₃] concentrations are associated with PD in the third National Health and Nutrition Examination Survey.

Design: We analyzed data on periodontal attachment loss (AL) and serum 25(OH)D₃ concentrations from 11,202 subjects aged ≥20 y. Mean AL was modeled in a multiple linear regression with quintile of serum 25(OH)D₃ concentration as an independent variable. The model was stratified by age and sex and was adjusted for age within age groups, race or ethnicity, smoking, diabetes, poverty income ratio, body mass index, estrogen use, and gingival bleeding.

Results: 25(OH)D₃ concentrations were significantly and inversely associated with AL in men and women aged ≥50 y. Compared with men in the highest 25(OH)D₃ quintile, those in the lowest quintile had a mean AL that was 0.39 mm (95% CI: 0.17, 0.60 mm) higher; in women, the difference in AL between the lowest and highest quintiles was 0.26 mm (0.09, 0.43 mm). In men and women younger than 50 y, there was no significant association between 25(OH)D₃ and AL. The BMD of the total femoral region was not associated with AL and did not mediate the association between 25(OH)D₃ and AL.

Conclusion: Low serum 25(OH)D₃ concentrations may be associated with PD independently of BMD. Given the high prevalence of PD and vitamin D deficiency, these findings may have important public health implications.

Case #4

- Fertile couple from Indonesia
- Relocated to Washington DC for diplomatic reasons
- Had nonviable offspring
Vitamin D is Rare in Foods
% US POPULATION USUAL VITAMIN D INTAKE FROM DIET ALONE OR DIET + SUPPLEMENTS

200,400,600 IU 0.0%
Did you Know Mushrooms Make Vitamin D ?????
Shrooms’ plant sterol - **ergosterol** - converts to vitamin D when exposed to light.

Growers can expose mushrooms to UV light to increase vitamin D levels.
GROWING?

VITAMIN D

Helps GROWTH - TEETH - BONES

Take Cod liver oil or other source of Vitamin D all year round
100-250 IU/3.5 oz

10-25% VIT D in FARMEDE VS WILD CAUGHT SALMON
The ozone layer: shielding the rest of the solar system from the Earth’s harmful effects.
The ozone layer: shielding the rest of the solar system from the Earth’s harmful effects.
Seasonal Effect on Cutaneous Vitamin D Synthesis in Boston

Vitamin D Synthesis %

Nov-Feb 0%
Cannot Make Vitamin D In Winter Above 32 N
Great for Romance
Not for Vitamin D

10am-3pm
NO KIDDING?

THE PRICE OF A TAN
Skin Cancer in the U.S.

1. Primary cause – sun in 90% of cases
2. New cases — 1,370 each day
3. 63 life-threatening cases each day
4. 1 in 7 will contact in a lifetime
5. Risk of life-threatening skin cancer in lifetime — 1 in 150 persons

Source: The Skin Cancer Foundation
Holick, 1987

Without Sunscreen

SPF30 ↓ ~98%

With Sunscreen

Serum Concentration of Vitamin D (ng/ml)
HOW MUCH SUN EXPOSURE
NEVER
BURN
Total Body

1X

ORAL VITAMIN D
1 minimal erythemal dose
Exposure to 1 Minimum Erythemal Dose

\[ \sim 20,000 \text{ IU Vitamin D}_3 \] (RDA 600-800 IU)
Therefore -

To get the RDA of 1500-2000 IU of vitamin D$_3$

Need to expose 15-20% of Body Surface
Am I washing off The Vitamin D I just Made from the Sun ??????
Not True
Vitamin D
Is made in the Living cells in The skin !!!!
Does Sunlight Really Provide us with Vitamin D?
Brot et al, Brit J Nutr (2001), 86, Suppl. 1, S97-S103

SUMMER 35 ng/ml

WINTER 20 ng/ml
DOES AGING AFFECT VITAMIN D SYNTHESIS ???
YES
75% REDUCTION
Holick et al Lancet 1989
CAN I MAKE A SUFFICIENT AMOUNT ???????????
BUT

THE SKIN HAS
A LARGE CAPACITY
TO MAKE VITAMIN D
Changes in Serum 25(OH)D with Sunlight Exposure

Δ25(OH)D (ng/ml) vs Time (weeks)

30 min/d

15 min/d

Reld 1988
We need Sensable Sun Exposure !!!!
Recommendation in Boston

5 to 15 Minutes Sunlight 2-3X/wk

ARMS

LEGS
5-15 MINUTES THEN SUNPROTECTION
Did You Know
Obesity Causes
Vitamin D Deficiency?
BMI vs. serum 25(OH)D (N= 10)

- P = 0.077
- BMI vs. serum 25(OH)D (N= 10)
- r² = 0.51
- P = 0.643
Serum Vitamin D Levels After Exposure Of Non-obese And Obese Adults To The Same Amount Of Ultraviolet Radiation

55%
Is Vitamin D Stored In Fat ?????
Rx Obese pts need 2-3 X vitamin D 50,000 IU vitamin D/wk
4-320ng/g Vitamin D Both D2&D3
Skin Pigment affects Vitamin D Synthesis. Need 4 to 10X more exposure than my friend.
How Do You Know What Your Vitamin D Status Is ?????
How do you define Vitamin D deficiency??
25(OH)D Assay
Used To Determine
Vitamin D Status
Not
1,25(OH)_{2}D
Serum 25(OH)D is the barometer for vitamin D status
25(OH)D

- Excess
- Normal
- Deficient

100 ng/ml
20 ng/ml
25(OH)D in Lifeguards

- 100 ng/mL
- 120 ng/mL
- 140 ng/mL
- 100 ng/mL
Vitamin D Intoxication

25(OH)D > 150 ng/ml
25(OH)D

20 ng/mL

Normal
Deficient

L
Vitamin D Inadequacy (<30 ng/ml) Prevalence by Latitude

N=198/362 (54.7%)
N=342/642 (53.3%)
N=259/532 (48.7%)

Sites also in Alaska and Hawaii
P=NS for test of trend

Prevalence of Vitamin D Inadequacy among Postmenopausal North American Women Receiving Osteoporosis Therapy

Michael F. Holick, Ethel S. Siris, Neil Binkley, Mary K. Beard, Aliya Khan, Jennifer T. Katzer, Richard A. Petruschke, Erluo Chen, and Anne E. de Papp

30 ng/ml>
Prevalence of 2nd Hyperparathyroidism

~3X Risk 2 HPTH

21 ng/ml

>30 ng/ml
What is the Role of Sunlight On 25(OH)D and on PTH ????
Temporal Relationship between Vitamin D Status and Parathyroid Hormone in the United States

Martin H. Kroll, M.D., Caixia Bi, Ph.D., Carl C. Garber, Ph.D., Harvey W. Kaufman, M.D., Dungang Liu, Ph.D., Anne Balderrama, Ph.D., Ke Zhang, Ph.D., Nigel Clarke, Ph.D., Minge Xie, Ph.D., Richard E. Reitz, M.D., Stephen C. Suffin, M.D., and Michael F. Holick, Ph.D.

Design: We retrospectively evaluated the relationship between 25-hydroxyvitamin D [25(OH)D$_2$ and 25(OH)D$_3$]
Effect of season and gender on serum 25(OH)D levels

27 ng/ml

19 ng/ml

3.3 million samples

Effect of season and latitude on serum 25(OH)D levels

North

South

Temporal Relationship between Kroll et al PLOS1 in review
Seasonal variation in PTH and 25-hydroxyvitamin D levels

- PTH peaks in winter
- 25(OH)D peaks in summer

Kroll et al. PLOS1 in review
Is it healthy to have PTH levels fluctuate seasonally?
IOM Relied on this to Define Vitamin D Sufficiency Bone Health.
675 German MVA Victims Bone Bx & 25(OH)D
Normal High Bone Mass
Low Bone Mass Thin poor Connectivity
~Normal Accumulated Osteoid
Priemel et al.

100% > 30 ng/ml
Healthy German Adults

26.5% Osteomalacia All Ages

36.1% Osteoidosis All Ages
Priemel et al.

100% > 30 ng/ml

No Evidence

Osteomalacia
25(OH)D 21-29 ng/ml
24% had Osteomalacia

= ~24% Osteomalacia

0% > 30 ng/ml
Endocrine Society's
Recommendation 25(OH)D

- Excess: >100 ng/ml
- Preferred: 40-60 ng/ml
- Deficient: <20 ng/ml
Is Vitamin D Deficiency A Health Issue ?????
Figure 1. Serum 25OHD status of persons aged 1 year and over: United States, 2001–2006

- Sufficient (50–125 nmol/L): 67%
- At risk of inadequacy (30–49 nmol/L): 24%
- At risk of deficiency (<30 nmol/L): 8%
- Possibly harmful (>125 nmol/L): 1%

32% 25(OH)D<20 ng/ml
Serum 25-Hydroxyvitamin D Levels Among US Children Aged 1 to 11 Years: Do Children Need More Vitamin D?
Jonathan M. Mansbach, Adit A. Ginde and Carlos A. Camargo, Jr
*Pediatrics* 2009;124;1404-1410;

- 1-5 yrs: 50% < 30 ng/ml
- 6-11 yrs: 70% < 30 ng/ml
FIGURE 5. Reported incidence of vitamin D deficiency defined as a 25-hydroxyvitamin D (25(OH)D) level below 20 ng/mL around the globe in pregnant women and the general population. To convert 25(OH)D values to nmol/L, multiply by 2.496. Copyright Holick 2013, reproduced with permission.
Vitamin D Deficiency

- Osteomalacia
- 2º HPTH
- Osteoporosis
Subclinical Vitamin D Deficiency PRECIPITATES & EXACERBATES OSTEOPOROSIS
OSTEOPOROSIS IS OFTEN A SILENT DISEASE
OSTEOMALACIA/RICKETS IS NOT A SILENT DISEASE
Curiously

Your aches and pains
In your bones and muscles
Always occur during
The winter

I wonder why

???????
Symptoms

- Generalized bone pain
- Isolated bone pain
- Muscle aches
40-60% OSTEOMALACIA

FIBROMYALGIA
Prevalence of Severe Hypovitaminosis D in Patients With Persistent, Nonspecific Musculoskeletal Pain

GREGORY A. PLOTNIKOFF, MD, MTS, AND JOANNA M. QUIGLEY, BA
Serum 25-Hydroxyvitamin D Levels (ng/ml) in Non-immigrant and Immigrant Subjects

150 aged 10-65 yrs

Bone & Muscle Pains

93% Vitamin D Deficient
# Subjects With Undetectable 25-Hydroxyvitamin D

<table>
<thead>
<tr>
<th>Age/Sex</th>
<th>Race</th>
<th>Symptoms</th>
<th>Diagnoses</th>
<th>Medications</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>Cauc</td>
<td>Non-radic. LBP, weakness, fatigue</td>
<td>Dysthymia, non-DJD low back pain</td>
<td>OTC and Rx NSAIDs</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Asian</td>
<td>Diffuse MSK pain, Fatigue, insomnia</td>
<td>Dysthymia, stress reaction</td>
<td>OTC and Rx NSAIDs, TCA</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>AA</td>
<td>Severe non-radic. LBP, fatigue</td>
<td>Pregnancy 3rd T. Gestational DM</td>
<td>OTC NSAID, Pre-natal vitamins</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>African</td>
<td>Fatigue, insomnia, headache, weakness</td>
<td>MDD/PTSD</td>
<td>Rx NSAID, SSRI, Neuroleptic agent</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>58</td>
<td>AA</td>
<td>Severe non-radic. low back pain, intermitt.</td>
<td>Dysthymia/MDD, DJD refractory to surgery,</td>
<td>Rx NSAID, intermittent narcotic agents, SSRI, TCA,</td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td>chest pain, depressed mood, insomnia, weakness</td>
<td>angina refractory to PTCA</td>
<td>TCA, Cardiovascular</td>
</tr>
</tbody>
</table>

**VITAMIN D DEFICIENT**
We present a case of 78 Y/O M with muscle weakness, atrophy, denervation, and neurological symptoms. Results of the neurological examination were remarkable, showing diffuse limb weakness and atrophy, rare fasciculations, normal sensory examination, no bulbar weakness, and no upper motor neuron signs. Electromyography revealed mild chronic changes, denervation and re-innervation, without fibrillations or positive waves.
Progressive painless muscle weakness with muscle atrophy, which manifests like lower motor neuron disease and improves after vitamin D supplementation.

Whitaker CH, Malchoff CD, Felice KJ.
Vitamin D Status Predicts Physical Performance and Its Decline in Older Persons

Ilse S. Wicherts, Natasja M. van Schoor, A. Joan P. Boeke, Marjolein Visser, Dorly J. H. Deeg, Jan Smit, Dirk L. Knol, and Paul Lips
No Benefit

72% Less Falls

800 IU/d 5 months

200, 400, or 600 IU/d

A Higher Dose of Vitamin D Reduces the Risk of Falls in Nursing Home Residents: A Randomized Multiple-Dose Study
Monthly High-Dose Vitamin D Treatment for the Prevention of Functional Decline: A Randomized Clinical Trial

CONCLUSIONS AND RELEVANCE Although higher monthly doses of vitamin D were effective in reaching a threshold of at least 30 ng/mL of 25-hydroxyvitamin D, they had no benefit on lower extremity function and were associated with increased risk of falls compared with 24,000 IU.

Methods

Participants and Study Design
By newspaper advertisement, we recruited home-dwelling men and women 70 years and older with a low-trauma fall in the previous 12 months.
25(OH)D > 30 ng/ml

- **Muscle strength,**  
  **balance,**  
  **lower extremity function**

- **BMD**

- **Fall risk**

- **Fx**s
HOW DO YOU TREAT VITAMIN D DEFICIENCY ????
HOW MANY???

1, 2, 4, 10, 20??????????

400 IU

TOO MUCH VITAMIN A
TREAT VITAMIN D DEFICIENCY

50,000 IU VITAMIN D$_2$

~6500 IU/d ONCE/WEEK

8 WEEKS
MAINTAIN VITAMIN D SUFFICIENCY

50,000 IU VITAMIN D ONCE/2 WEEKS

~3000 IU/d
MEAN 25(OH)D LEVELS IN PATIENTS RECEIVING 50,000 IU VITAMIN D2 EVERY 2 WEEKS FOR 6 YRS

Mean 25(OH)D (ng/dL) vs. Time (Months)

- **DEFICIENT** ≤ 20 ng/ml
- **INSUFFICIENT** 20 ng/ml < ~40 ng/ml
- **SUFFICIENT** ~40 ng/ml < 60 ng/ml

Pietras Arch Int Med 2009

Time (Months)
Human serum 25-hydroxycholecalciferol response to extended oral dosing with cholecalciferol

Robert P Heaney, K Michael Davies, Tai C Chen, Michael F Holick, and M Janet Barger-Lux

10,000 IU/d is Safe
The dose response relationship between oral vitamin D supplementation and serum 25(OH)D levels based on 22,214 observations of healthy volunteers.

What about Infants and Children ???????
Infants & Toddlers

2000 IU/d; 50,000 IU/wk
Safe
Vitamin D Supplementation During Pregnancy: Double-Blind, Randomized Clinical Trial of Safety and Effectiveness

Hollis et al. JBMR 2012
A Serum Calcium (nmol/L) During Pregnancy by Treatment Group

Mean Serum Calcium (nmol/L) ± S.D.

Weeks of Gestation

Serum Ca
Urinary Ca
1 MILLION IU VITAMIN D/DAY

1000 IU/TSP
Ca = 15.2 mg/dl

25(OH)D = 520 ng/ml
Results: Of 20,308 total 25(OH)D measurements, 1714 (8.4%), 123 (0.6%), and 37 (0.2%) unique persons had 25(OH)D values above 50, 80 and above, and 100 ng/mL and above, respectively. The age- and sex-adjusted incidence of 25(OH)D values above 50 ng/mL increased from 9 to 233 cases per 100,000 person-years from 2002 to 2011 (P<.001), respectively, and was greatest in persons aged 65 years and older (P<.001) and in women (P<.001). Serum 25(OH)D values were not significantly related to serum calcium values (P=.20) or with the risk of hypercalcemia (P=.24). A medical record review identified 4 cases (0.2%) in whom 25(OH)D values above 50 ng/mL were temporally associated with hypercalcemia, but only 1 case had clinical toxicity associated with the highest observed 25(OH)D value of 364 ng/mL.

Conclusion: The incidence of 25(OH)D values above 50 ng/mL increased significantly between 2002 and 2011 without a corresponding increase in acute clinical toxicity.
FIGURE 2. Age- and sex-adjusted incidence trend (per 100,000 person-years) of elevated vitamin D levels from 2002 to 2011 in Olmsted County, Minnesota, for patients with 25-hydroxyvitamin D (25(OH)D) values ≥80 and ≥100 ng/mL. P values represent the significance of the trend.
25(OH)D 380 ng/mL
Calcium 17.6 mg/dL

FIGURE 3. Bivariate plots of serum calcium, 25-hydroxyvitamin D (25(OH)D), and parathyroid hormone (PTH) data of patients with 25(OH)D values >50 ng/mL. A, Relation of total calcium to 25(OH)D concentrations (n=1035). B, Relation of PTH to total calcium (n=95).
Skin → Vitamin D → Liver → 25-OHase → 25(OH)D₃ → Kidney → 1α-OHase → 1,25(OH)₂D₃
ESSENTIALLY EVERY TISSUE AND CELL HAS A VDR
WHAT ARE THE FUNCTIONS? 
????????
WHY???????
VITAMIN D & CANCER
1915

8X more likely to Die
Worked Indoors

Association Study
...CAN CUT YOUR RISK OF CANCER

SUNBATHING — OFTEN the culprit in other forms of the disease actually reduces the risk of breast and colon cancer!

In fact, it could prove the principal factor in dramatically cutting the two cancers.

Two-Thirds of the American population are exposed to the natural production of vitamin D.

"There was a three-fold increase in the incidence of breast cancer in the northern latitudes with little sunlight, individuals are often deprived of vitamin D. And that leaves them exposed to increased cancer risk."

But, says the doctor, you don't have to seek the sun all the time to cut your risk of developing breast or colon cancer.

A simple change in your diet can also do the trick. 

We care about your health

Man bungles suicide — 10 times!

Lonely and depressed factory worker tried to commit suicide 10 TIMES — and failed!

Peter Dietz, 28, first decided to do it all by throwing himself in front of a speeding car. But the young man only succeeded in knocking himself unconscious.

Undaunted, Dietz dunked a linesman into his bath water and hitched it on — but it blew a fuse. So he slashed his wrists. Unfortunately, he didn't cut deep enough. Then he turned on the gas and aimed to be overcome by the fumes. Hours later, all he was overcome by was boredom. He remained very much alive.

Being more aggressive, Dietz took a pistol to his head and pulled the trigger. The gun jammed.

Next, the human disaster drove his car off an embankment at 70 mph, but emerged from the wreckage with minor cuts and bruises.

He swallowed rat poison. And threw up.

He drank a pint of brake fluid. And threw up.

He gulped down 60 sleeping pills and woke up — safe and sound in the hospital.

Losing his patience, Peter drove crazily, smashing into a whopping 14 cars before he was hauled off to court in Hallefeld, Germany.

Explained his attorney: "Peter's parents left him when he was four. He still suffers from emotional shock."

The link was due to differences in diet between the north and south." added Dr. Garland. "But when we looked at data from the US Department of Agriculture we found none that fitted the map we had studied for cancer.

Uncontrolled

"When vitamin D is absent, the binding losses — leaving the old rogue, cancer-prone cell to grow uncontrolled. The result is often cancer."

Breast cancer will strike more than 150,000 new victims this year — colon cancer 110,000.
Fig. — Showing the relation of total cancer mortality rates to Smith's Solar Radiation Index in the American states, (white population only).
50% PROJECTED REDUCTION COLON CANCER WITH 1000 IU/D

Garland et al 2005
Vitamin D and prevention of breast cancer: Pooled analysis


50% LOWER RISK

25(OH)D = 48 ng/ml
Lappe et al AJCN 2007

- 1179 PM WOMEN
- 1200MG Ca +- D3
- ALL CANCERS

YEARS 0-4

1100 IU D3

60% LESS CANCERS
WHAT IS THE POSSIBLE CONNECTION BETWEEN VITAMIN D & CANCER
ACTIVATED VITAMIN D INHIBITS CANCER CELL GROWTH
BUT

VITAMIN D

INTAKE OR SUNLIGHT

DOES NOT INCREASE

\[ 1,25(\text{OH})_2\text{D}_3 \]
IS IT POSSIBLE PROSTATE CELLS MAKE \( 1,25(OH)_{2}D_{3} \) TO REGULATE CELL GROWTH?
Autocrine Regulation of Cell Growth

25(OH)D

1-OHase

1,25(OH)₂D

Control of cell growth
25(OH)D > 30 ng/ml

Colon Cell

Mitochondria

1-OHase

~ 2000 Genes Affected By 1,25(OH)\(_2\)D

Bcl-2, Bcl-X\(_L\), Mcl-1, BAG1, XIAP, cIAP1, cIAP2

Differentiation

MATURATION

CDK2, p21, p27, p53, Ki67, E-Cadherin

Nucleus

Cell-cycle Arrest

Arrest

25(OH)D > 30 ng/ml

MITURATION

1-OHase
ACTIVATED MACROPHAGES

Metabolize 25(OH)D₃ to 1,25(OH)₂D₃

Adams et al. JCEM 1987
1849

Codliver oil - Rx Tuberculosis

Brompton Hospital Records, 38 1849
Vitamin D Protects Against Tuberculosis
02.23.06, 12:00 AM ET
Published Online February 23, 2006
Science DOI: 10.1126/science.1123933

REPORTS
Submitted on December 16, 2005
Accepted on February 8, 2006

Toll-Like Receptor Triggering of a Vitamin D-Mediated Human Antimicrobial Response

Philip T. Liu ¹, Steffen Stenger ², Huiying Li ³, Linda Wenzel ², Belinda H. Tan ¹, Stephan Krutzik ⁴, Maria Teresa Ochoa ⁴, Jürgen Schaub ⁵, Kent Wu ⁶, Christoph Meinken ², Diane L. Kamen ⁷, Manfred Wagner ⁸, Robert Bals ⁹, Andreas Steinmeyer ¹⁰, Ulrich Zügel ¹¹, Richard L. Gallo ⁵, David Eisenberg ³, Martin Hewison ¹², Bruce W. Hollis ¹³, John S. Adams ¹², Barry R. Bloom ¹⁴, Robert L. Modlin ¹*
25(OH)D → TLR2/1 → MACROPHAGE

1-OHase mRNA

1-OHase

1,25(OH)₂D → Cathelicidin mRNA

Death → TB

TLR2/1

19KDa

Liu et al. Science 2006
„Der Zauberberg“ (Thomas Mann 1924)
Why is flu Season always In the WINTER ????????
1981 Edgar Hope-Simpson Suggested a "SEASONAL STIMULUS"
Fig. 2. Weekly consultation rates for illnesses diagnosed clinically as influenza or influenza-like, calculated from re-
25(OH)D levels in winter:

- Jan-Mar: 32 ng/ml
- Aug: 12 ng/ml
Serum 25-Hydroxyvitamin D and the Incidence of Acute Viral Respiratory Tract Infections in Healthy Adults

James R. Sabetta\textsuperscript{1,2*}, Paolo DePetrillo\textsuperscript{3}, Ralph J. Cipriani\textsuperscript{2}, Joanne Smardin\textsuperscript{2}, Lillian A. Burns\textsuperscript{2}, Marie L. Landry\textsuperscript{4}

\textit{Methodology/Findings:} In this prospective cohort study serial monthly concentrations of 25-hydroxyvitamin D were measured over the fall and winter 2009–2010 in 198 healthy adults, blinded to the nature of the substance being measured. The participants were evaluated for the development of any acute respiratory tract infections by investigators blinded to the 25-hydroxyvitamin D concentrations. The incidence of infection in participants with different concentrations of vitamin D was determined. One hundred ninety-five (98.5\%) of the enrolled participants completed the study. Light skin pigmentation, lean body mass, and supplementation with vitamin D were found to correlate with higher concentrations of 25-hydroxyvitamin D. Concentrations of 38 ng/ml or more were associated with a significant (p < 0.0001) two-fold reduction in the risk of developing acute respiratory tract infections and with a marked reduction in the percentages of days ill.

\textbf{25(OH)D=38 ng/ml

Randomized trial of vitamin D supplementation to prevent seasonal influenza A in schoolchildren\textsuperscript{1-3}

Mitsuyoshi Urashima, Takaaki Segawa, Minoru Okazaki, Mana Kurihara, Yasuyuki Wada, and Hiroyuki Ida
Vitamin D deficiency in early life accelerates Type 1 diabetes in non-obese diabetic mice

A. Giulietti · C. Gysemans · K. Stoffels · E. van Etten · B. Decallonne · L. Overbergh · R. Bouillon · C. Mathieu

Laboratory for Experimental Medicine and Endocrinology (LEGENDO), Catholic University of Leuven, UZ Gasthuisberg, Onderwijs en Navorsing, Leuven, Belgium
Type 1 Diabetes/100,000 Boys<14 yrs

Garland et al 2008
10,366 Children in Finland
WHO RECEIVED 2000 IU/D Vitamin D
Risk Type 1 Diabetes After 31 Years
↓ 88%
Hypponen et al. Lancet 2001
Annual age-adjusted incidence rates of type 1 diabetes, children ≤ 14 years old, per 100,000 population, Finland, 1965-2005

- 1964: Recommended Vitamin D intake reduced from 4500 to 2000 IU/d
- 1975: Recommended Vitamin D intake reduced from 2000 to 1000 IU/d
- 1992: Recommended Vitamin D intake reduced from 1000 to 400 IU/d
WHAT IS THE EVIDENCE & MECHANISM ????????
Beta-ISLET CELL

1,25(OH)D₃ → VDR + → VDR + → Insulin

Metabolic Syndrome & Type 2 Diabetes
REVIEW: The Role of Vitamin D and Calcium in Type 2 Diabetes. A Systematic Review and Meta-Analysis

Anastassios G. Pittas, Joseph Lau, Frank B. Hu, and Bess Dawson-Hughes

Fig. 1. Adjusted relative risk of incident type 2 DM in the Nurses Health Study by calcium and vitamin D intake (52).

Pittas et al JCEM 07
North-South Gradient in Mortality from MS

Fig. 3.4 Average annual age adjusted death rates for multiple sclerosis per 100,000 population by state of residence at death: United States, 1959–61. From Kurtzke et al. (1971).
Vitamin D Intake Is Inversely Associated With Rheumatoid Arthritis

Results From the Iowa Women’s Health Study

Linda A. Merlino,¹ Jeffrey Curtis,² Ted R. Mikuls,³ James R. Cerhan,⁴ Lindsey A. Criswell,⁵ and Kenneth G. Saag²

Vitamin D Intake (>400IU/D) Inversely Related To RA In Women

44%
Vitamin could prevent arthritis

Scientists hope adding vitamin D to the diet could help prevent one of the most common and painful forms of arthritis.

Osteoarthritis affects more than a million people in the UK, many of them elderly.

There is currently no cure and all doctors can do is control pain and keep patients active and mobile.

But scientists at the Royal National Orthopaedic Hospital (RNOH), in Stanmore, Middlesex and University College, London, are to study 600 patients to see if they can help prevent osteoporosis of the knee.

They will study the patients over a three-year period to see whether a simple tablet or supplement can help prevent cartilage destruction and reduce pain.

They will measure the effects on the cartilage with X-rays.
Serum 25-Hydroxyvitamin D Levels and the Prevalence of Peripheral Arterial Disease. Results from NHANES 2001 to 2004

Michal L. Melamed, Paul Muntner, Erin D. Michos, Jaime Uribarri, Collin Weber, Jyotirmay Sharma and Paolo Raggi

PVD vs 25(OH)D

80% ↓

>29 ng/ml
Vitamin D deficiency in humans is associated with heart failure.

Low Vitamin D Status: A Contributing Factor in the Pathogenesis of Congestive Heart Failure?

Armin Zittermann, PhD,* Stefanie Schulze Schleithoff,* Gero Tenderich, MD,†
Heiner K. Berthold, MD, PhD,‡ Reiner Körfer, MD,† Peter Stehle, PhD* 

Bisn, Bad Oeynhausen, and Rotenburg a.d. Fulda, Germany
Suppression of Renin Transcription by VDR Activation

> 200 Genes in Heart & Vessels

Atherosclerosis, Inflammation, oxidative stress

Blood Pressure

LVH

Suppression of Renin

Activation

RXR

DNA binding

RNA Pol II

CoReg

VDR

RNA Pol II

B

VDR

RXR

Renin

TGACCT

TGACCT

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First MI >50% Increase Associated With Vitamin D Deficiency
I heard that taking Calcium supplements increases CV Calcifications !!!!
Is this True ???
Calcium supplements do not raise cardiovascular risk

74,245 Women in Nurses HS 29% Reduction in CVD Who took Calcium

Researchers at Brigham and Women’s Hospital in Boston, MA, USA conducted a study and found evidence suggesting that taking calcium supplements does not increase risk of cardiovascular disease in women.

Some studies have early suggested that calcium supplementation may boost risk of cardiovascular disease. Calcium supplements are commonly used to prevent osteoporosis in older women.

The current study was based on data from 74,245 women in the Nurses’ Health Study who were free of cancer and cardiovascular disease at baseline. During the follow-up, calcium supplement intake was estimated every four years.

During the 24-year follow up, researchers did not find any independent associations between supplemental calcium intake and an increased risk of coronary heart disease and stroke.

At baseline, women who took calcium supplements were more physically active, smoked less and had lower intake of trans fat, compared with those who did not take calcium supplements.

After adjustment for age, body mass index, dietary calcium intake, vitamin D intake, and other cardiovascular disease risk factors, the risk of cardiovascular disease for women taking 1 gram of calcium or more per day were 18% reduced, compared with those who did not take the supplement.
Calcium intake and the risk of stroke: an up-dated meta-analysis of prospective studies.

Tian DY¹, Tian J², Shi CH¹, Song B¹, Wu J¹, Ji Y¹, Wang RH³, Mao CY¹, Sun SL¹, Xu YM⁴.

**Author information**

**Abstract** in English, Chinese

**BACKGROUND AND PURPOSE:** Calcium intake has been associated with stroke risk in a prior meta-analysis, however, newly published results are inconsistent. Dairy food benefits on stroke incidence may involve a calciumrelated mechanism. We have therefore updated this meta-analysis with particular references to any possibility of a calcium-mediated dairy food risk reduction of stroke risk.
**RESULTS:** Ten studies with 371,495 participants and 10,408 stroke events were analyzed. The pooled analysis showed no statistically significant association of the risk of total stroke (RR=0.96; 95% CI: 0.89-1.04) and stroke subtypes with the highest and lowest calcium intake quantiles. Nevertheless, high dairy calcium intake was significantly associated with an approximately 24% reduction of stroke risk. (RR=0.76; 95% CI: 0.66-0.86). Furthermore, a long-term follow-up (≥14 years) was helpful to reduce the risk of stroke (RR=0.67; 95% CI: 0.51-0.88). Additionally, a non-linear dose-response relationship was predicted between calcium intake and stroke risk.

**CONCLUSIONS:** Dairy calcium intake is inversely associated with stroke incidence. There is a non-linear dose-response relationship between calcium intake and stroke risk. However, when the follow-up time is long enough, the inverse relationship is independent of dose. Additional large cohort studies are required to illustrate this relationship in detail.
Effect of Vitamin D Supplementation on Blood Pressure
A Systematic Review and Meta-analysis Incorporating Individual Patient Data

Louise A. Beveridge, MB, ChB1; Allan D. Struthers, MD1; Faisal Khan, PhD1; Rolf Jorde, PhD2; Robert Scragg, MBBS, PhD3; Helen M. Macdonald, PhD4; Jessica A. Alvarez, PhD, RD5; Rebecca S. Boxer, MD, MS6; Andrea Dalbeni, MD7; Adam D. Gepner, MD8; Nicole M. Isbel, MBBS, PhD9; Thomas Larsen, MD, PhD10; Jitender Nagpal, MBBS, MD11; William G. Petchey, BM, PhD12; Hans Stricker, MD13; Franziska Strobel, MD14; Vin Tangpricha, MD, PhD5; Laura Toxqui, PhD15; M. Pilar Vaquero, PhD15; Louise Wamberg, MD, PhD16; Armin Zittermann, PhD17; Miles

Results We included 46 trials (4541 participants) in the trial-level meta-analysis. Individual patient data were obtained for 27 trials (3092 participants). At the trial level, no effect of vitamin D supplementation was seen on SBP (effect size, 0.0 [95% CI, −0.8 to 0.8] mm Hg; \( P = .97 \); \( I^2 = 21\% \)) or DBP (effect size, −0.1 [95% CI, −0.6 to 0.5] mm Hg; \( P = .84 \); \( I^2 = 20\% \)). Similar results were found analyzing individual patient data for SBP (effect size, −0.5 [95% CI, −1.3 to 0.4] mm Hg; \( P = .27 \); \( I^2 = 0\% \)) and DBP (effect size, 0.2 [95% CI, −0.3 to 0.7] mm Hg; \( P = .38 \); \( I^2 = 0\% \)). Subgroup analysis did not reveal any baseline factor predictive of a better response to therapy.

Conclusions and Relevance Vitamin D supplementation is ineffective as an agent for lowering BP and thus should not be used as an antihypertensive agent.
50 Million Teens Deficient/Insufficient

2.4 X HBP
2.5 X Elevated BS
4 X Metabolic Syndrome

adolescents with the lowest levels of vitamin D were:
• 2.36 times more likely to have high blood pressure;
• 2.54 times more likely to have high blood sugar; and
• 3.99 times more likely to have metabolic syndrome.
A 16-Week Randomized Clinical Trial of 2000 International Units Daily Vitamin D₃ Supplementation in Black Youth: 25-Hydroxyvitamin D, Adiposity, and Arterial Wall Stiffness

Yanbin Deng, MD, MPH, PhD
Daniel Klein, MD, PhD
Gary L. Phillips, PhD

Significant Decrease in Arterial Wall Stiffness

22.0, and 85.9, respectively. Partial correlations showed that carotid-femoral pulse wave velocity (PWV) was inversely associated with 25-hydroxyvitamin D (25(OH)D) (r = -0.075 m/sec), as shown in Figure 2B. Furthermore, carotid-femoral PWV in the control group (P = 0.016), whereas in the experimental group carotid-femoral PWV decreased from baseline (5.41 ± 0.73 m/sec) to posttest (5.33 ± 0.79 m/sec) (P = 0.031).
All Cause Mortality Decreased 7% On 528 IU Vitamin D
Vitamin D Levels Predict All-Cause and Cardiovascular Disease Mortality in Subjects With the Metabolic Syndrome: The Ludwigshafen Risk and Cardiovascular Health (LURIC) Study

Optimal 25(OH)D > 30 ng/ml

All cause Mortality 25%
CV Mortality 33%
CHF Mortality 24%

CONCLUSIONS—Optimal 25(OH)D levels substantially lowered all-cause and cardiovascular disease mortality in subjects with the metabolic syndrome. These observations call for interventional studies that test whether vitamin D supplementation provides a useful adjunct in reducing mortality in these subjects.

Diabetes Care Publish Ahead of Print, published online March 7, 2012
Age Adjusted hazard ratio in 32 studies of 25(OH)D with All cause mortality 1966-2013

Garland et al AJPH, 2014

40-50 ng/ml
IOM
Increase mortality
25(OH)D > 30 ng/ml

FIGURE 6-2 Risk of death in elderly people according to baseline serum 25OHD level in the Longitudinal Aging Study (subjects with serum 25OHD levels of 50.0–74.9 nmol/L are the referent)
Decreased Mortality
25(OH)D
30-49 ng/ml
Who has a 25(OH)D >50 ng/ml
And
Why
??????

Being Rx for vitamin D Deficiency
Taking mega doses of supplements
57% with total 25(OH)D > 50 ng/mL had detectable 25(OH)D2.
Those with $25(\text{OH})D>50$ ng/ml

Most 57% had Detectable Levels $25(\text{OH})D_2$

Thus were being Treated for Vitamin D Deficiency
Is there any evidence that vitamin D can improve immune health?
Gene Expression With Vitamin D
Influence of vitamin D status and vitamin D₃ supplementation on genome wide expression of healthy adult white blood cells

8 Adults 12 weeks Received 400 or 2000 IU/d X12 wks
Buffy Coat time 0 and 12 wks

Chip Analysis 22,500 genes
Before Vitamin D
291 Genes

After Vitamin D

Expression of 82 genes decreased
Expression of 209 genes increased

Low Expression

High Expression

Higher Expression

Lower Expression
>80 Pathways Influenced by Vitamin D Supplementation

DNA Repair
Apoptosis
Oxidative Stress
Metabolic Processes
Anti-inflammatory
FEED YOUR GENES RIGHT
Eat to Turn Off Disease-Causing Genes and Slow Down Aging
With Vitamin D
Lose weight and feel better
VITAMIN D DEFICIENCY IS A DISEASE OF NEGLECT
THERE IS NOW A MOUNTAIN OF EVIDENCE LINKING VITAMIN D DEFICIENCY WITH CANCER RISK & MORTALITY. AUTOIMMUNE DISEASES, TYPE 1 DIABETES, HYPERTENSION, TYPE 2 DIABETES.
WHAT IS A NORMAL VERSUS HEALTHY 25(OH)D LEVEL
OUR 25(OH)D
40-50 ng/mL

GOOD MUSCLE STRENGTH
LOW CANCER RISK
LOW RISK AUTOIMMUNE
HBP & CVD DISEASE

GOAL
25(OH)D > 30 ng/ml
GOAL
25(OH)D
40-100 ng/mL
Disease Burdon & Vitamin D Deficiency

Low Birth Weight
Stunted Growth

Type 2 Diabetes

HBP
Fracture
Cancer

Infectious Diseases
Autoimmune Diseases
100 IU VITAMIN D3 RAISES 25(OH)D BY ONLY 1NG/ML
CHILDREN & ADULTS HAVE 25(OH)D ~18 -25 ng/ml
No one was sufficient
Adults 2000 IU
&
Children 1000 IU
Conquer Vitamin D Deficiency
What is the Best Source of Vitamin D?
Capturing the sunshine vitamin (VITAMIN-D) in 88 new Bond Bread Recipes
To help retain the peak of sunny summer energy— to help maintain rugged resilience all through Fall and Winter— drink Schlitz, with Sunshine Vitamin D.

As the summer sun heads south, as days grow shorter and stormier—we get less and less of sunshine’s benefits. Likewise, our ordinary foods are lacking in Sunshine Vitamin D, so essential to robust vitality.

Schlitz, with Sunshine Vitamin D®, gives you the sunny source of energy you need the whole year around. Beer is good for you—but Schlitz, with Sunshine Vitamin D, is extra good for you. It has all the old-time Schlitz flavor and bouquet brewed to mellow ripe perfection under precise enzyme control, with new health benefits... and at no increase in price.

SUNSHINE VITAMIND
THE BEER THAT MADE MILWAUKEE FAMOUS
"Look, Johnnie, over there is a little spot of sunshine, go over and play in and get your vitimin D."

Published September 17, 1953
HOLICK
HOW DO YOU GET THE MESSAGE OUT ???????
THE UV ADVANTAGE

MICHAEL HOLICK, PH.D., MD.
Professor of Medicine, Surgery, and Biology, Boston University Medical Center
AND MARK JENKINS

"PEOPLE SHOULD HAVE THE OPPORTUNITY TO BENEFIT FROM DR. HOLICK'S INSIGHTS WITHOUT FURTHER DELAY."
—JANE E. BRODY, THE NEW YORK TIMES

MAY 04
I DO NOT ADVOCATE TANNING !!!!!!!!!!!!!!
The Influence of Painful Sunburns and Lifetime Sun Exposure on the Risk of Actinic Keratoses, Seborrheic Warts, Melanocytic Nevi, Atypical Nevi, and Skin Cancer

Cornelis Kennedy, Chris D. Bajdik,* Rein Willemze, Frank R. de Gruijl, and Jan N. Bouwes Bavinck, for the members of the Leiden Skin Cancer Study
Departments of Dermatology, Leiden University Medical Center, Leiden, The Netherlands; *British Columbia Cancer Agency, Vancouver, British Columbia, Canada

Lifetime sun exposure was predominantly associated with an increased risk of squamous cell carcinoma (p-value for trend = 0.03) and actinic keratoses (p-value for trend <0.0001) and to a lesser degree with the two types of basal cell carcinoma. By contrast, lifetime sun exposure
I should Avoid ALL Sunlight to Prevent Melanoma !!!!!!
Did you Know
Most Melanomas
Occur on the
Least Sun Exposed Areas
????????
Occupational sun exposure decreases risk of melanoma
The Influence of Painful Sunburns and Lifetime Sun Exposure on the Risk of Actinic Keratoses, Seborrheic Warts, Melanocytic Nevi, Atypical Nevi, and Skin Cancer

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By contrast, lifetime sun exposure appeared to be associated with a lower risk of malignant melanoma, despite the fact that lifetime sun exposure did not diminish the number of melanocytic nevi or atypical nevi. Neither painful sunburns nor lifetime sun exposure were associated with an increased risk of seborrheic warts. Key words: actinic keratoses/atypical nevi/melanocytic nevi/seborrheic warts/skin cancer/ultraviolet light. J Invest Dermatol 120:1087–1093, 2003
ANCESTORS APPRECIATION OF THE SUN FOR ITS LIFE GIVING BENEFITS
UNENLIGHTENED DERMATOLOGISTS VIEW OF THE SUN’S EFFECT ON HEALTH
CHARLES M. SCHULZ
1922 - 2000
Thank You For Giving The World Sushi Happiness.
Good grief!

Another note!

"Are you sitting in the sun? I hope so for a little sun is good as long as we don't overdo it... Perhaps ten minutes a day this time of year is about right"
Slip, Slap, Slop

~ 40% Australians D-Ficient
Vitamin D Deficiency Associated with:

Schizophrenia
Depression
Dementia
AZD
Consequences of Vitamin D Deficiency

Cognitive dysfunction
Alzheimer’s disease
Schizophrenia
Depression
Multiple sclerosis
Parkinson’s disease
Autism
Stroke
Epilepsy

Brain development
Synaptic plasticity
Calcium signaling
Regulating neurotrophic factors
neurotransmission
Neuroprotection
Anti-inflammatory
The Brain Has a VDR
And responds To vitamin D
By increasing Serotonin
Vitamin D and Risk of Cognitive Decline in Elderly Persons

the MMSE in participants who were severely serum 25(OH)D deficient (levels <25 nmol/L) in comparison with those with sufficient levels of 25(OH)D (≥75 nmol/L) were examined. Participants who were severely 25(OH)D deficient declined by an additional 0.12 MMSE points per year more than those with sufficient levels of 25(OH)D. The relative risk for substantial decline on Trail-Making Test B was 1.31 (95% CI, 1.03-1.65) among those who were severely 25(OH)D deficient compared with those with sufficient levels. This association was observed in both men and women.

Conclusions: Serum vitamin D deficiency was associated with substantial cognitive decline in a community-based population studied over a 6-year period, which raises important new possibilities for treatment and prevention.

Arch Intern Med. 2010;170(13):1135-1141
Australian dermatologist

87% < 20 ng/ml

87% Vitamin D Deficient end of Summer
YOU CAN GET IT FROM DIET !!!
YOU CANNOT GET IT FROM DIET
What is the Best Source of Vitamin D?
WHEN CAN YOU MAKE VITAMIN D ????

How about an App???

http://dmindder.info
+ 2000 IU Vitamin D3
+ MTV=1000 IU
+ 3 glasses milk = 300 IU
My Total Vitamin D ~ 4000 IU/d

My 25(OH)D = 56 ng/ml
VITAMIN D DEFICIENCY

CAUSES

MEDICATIONS
Antiseizure
Glucocorticoids
Rifampin
HAART
St John’s Wart

MALABSORPTION
Crohn’s
Whipple’s
Cystic Fibrosis
Celiac
Liver disease

SUNSCREEN
MELANIN LATITUDE WINTER

SUN

CONSEQUENCES

Schizophrenia
Depression

INFECTIONS
URI
TB

HBP
CHD

FEV1
Wheezing illnesses

Autoimmune
Type 1 Diabetes
MS
Crohn’s
RA

CANCER
Colon
Breast
Prostate etc.

HBP
CHD

CANCER
Colon
Breast
Prostate etc.

FEV1
Wheeze
AODM
Syndrome X

Muscle weakness
Muscle aches

Obesity

Bone weakness
Osteoporosis
Osteomalacia
Rickets

Muscle weakness
Osteoporosis
Osteomalacia
Rickets

Holick NEJM July 07
We Need Sensible Sun & Vitamin D Supplementation Recommendations !!!!!!!!

You Do Not Need To Be A Genius To Know

This is NOT HYPOTHESIS
Do we need to screen everyone for their 25(OH)D levels?
No !!!!!!!

But Yes
BMI > 30
Malabsorption
Meds/AEs., Glc
Sarcoidosis
Vitamin D Can help Improve Your Health