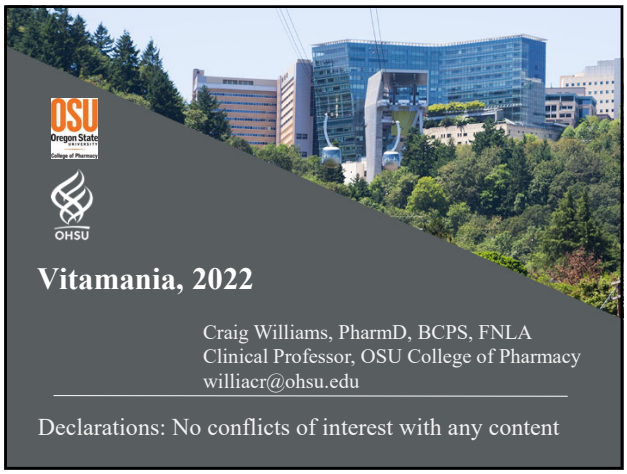
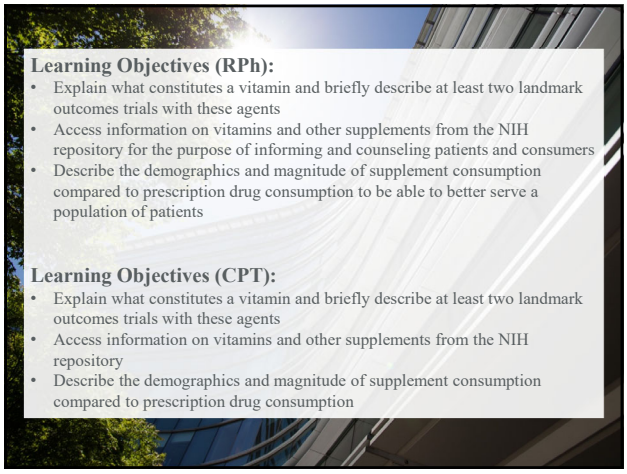


Vitamania, 2022

Craig Williams, PharmD, BCPS, FNLA
Clinical Professor, OSU College of Pharmacy
williacr@ohsu.edu

Declarations: No conflicts of interest with any content

1



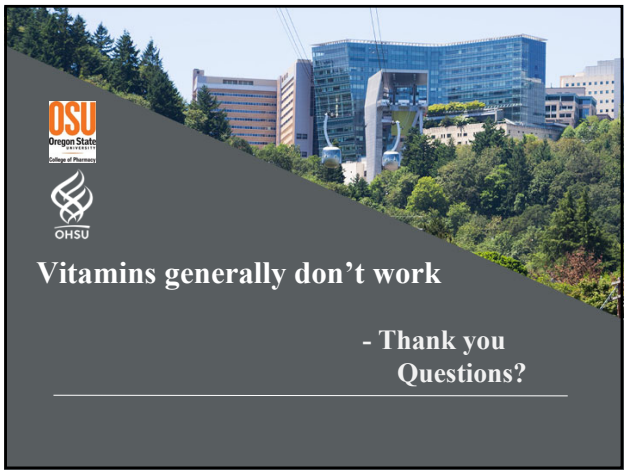
Learning Objectives (RPh):

- Explain what constitutes a vitamin and briefly describe at least two landmark outcomes trials with these agents
- Access information on vitamins and other supplements from the NIH repository for the purpose of informing and counseling patients and consumers
- Describe the demographics and magnitude of supplement consumption compared to prescription drug consumption to be able to better serve a population of patients

Learning Objectives (CPT):

- Explain what constitutes a vitamin and briefly describe at least two landmark outcomes trials with these agents
- Access information on vitamins and other supplements from the NIH repository
- Describe the demographics and magnitude of supplement consumption compared to prescription drug consumption

2



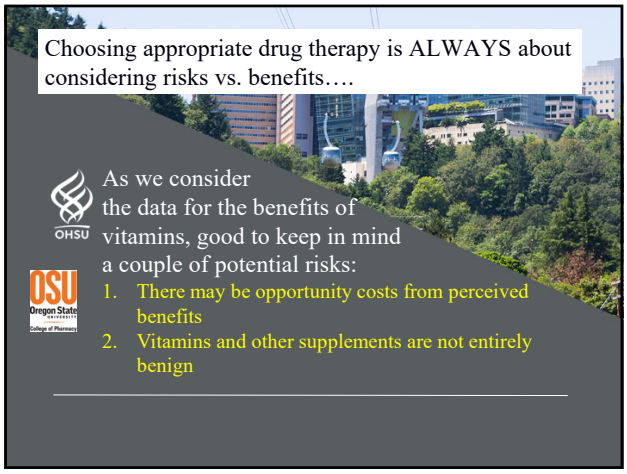
Vitamins generally don't work

- Thank you
Questions?

3


OSU
Oregon State
College of Pharmacy
OHSU
The real question: what role should vitamin supplementation play in patients who are generally healthy?

4

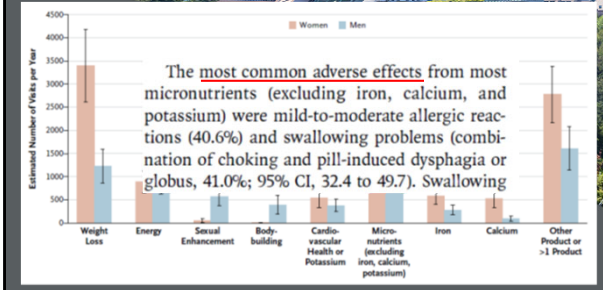

Choosing appropriate drug therapy is ALWAYS about considering risks vs. benefits….
OHSU
OSU
Oregon State
College of Pharmacy
As we consider the data for the benefits of vitamins, good to keep in mind a couple of potential risks:
1. There may be opportunity costs from perceived benefits
2. Vitamins and other supplements are not entirely benign

5


Choosing appropriate drug therapy is ALWAYS about considering risks vs. benefits….
OHSU
OSU
Oregon State
College of Pharmacy
SPECIAL ARTICLE
Emergency Department Visits for Adverse Events Related to Dietary Supplements
Andrew I. Geller, M.D., Nadine Shehab, Pharm.D., M.P.H., Nina J. Weidle, Pharm.D., Maribeth C. Lovegrove, M.P.H., Beverly J. Wolpert, Ph.D., Babgaleh B. Timbo, M.D., Dr.P.H., Robert P. Mozersky, D.O., and Daniel S. Budnitz, M.D., M.P.H.
NEJM, 2015;373:1531-40
63 ED departments surveilled for 10 years with data then extrapolated nationally. Estimate ~ 23,000 ED visits annually

6

Choosing appropriate drug therapy is ALWAYS about considering risks vs. benefits….



The most common adverse effects from most micronutrients (excluding iron, calcium, and potassium) were mild-to-moderate allergic reactions (40.6%) and swallowing problems (combination of choking and pill-induced dysphagia or globus, 41.0%; 95% CI, 32.4 to 49.7). Swallowing

"Micronutrients" included vitamins and accounted for ~ 1/3 of total ED visits

7

Synthetic vitamin manufacturing is about as far from natural foods as you can get:

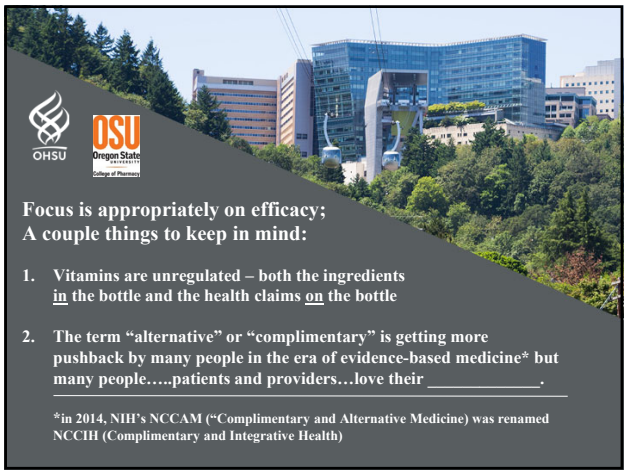
From *Pandora's Lunchbox* by Melanie Warner:

Commercial vitamin C (ascorbic acid) typically begins as sorbitol which is fermented in bacterial broths to sorbose which is fermented further in a broth of genetically modified bacteria to 2-ketogluconic acid. That is treated with hydrochloric acid to form crude ascorbic acid which is filtered and purified to Vitamin C.

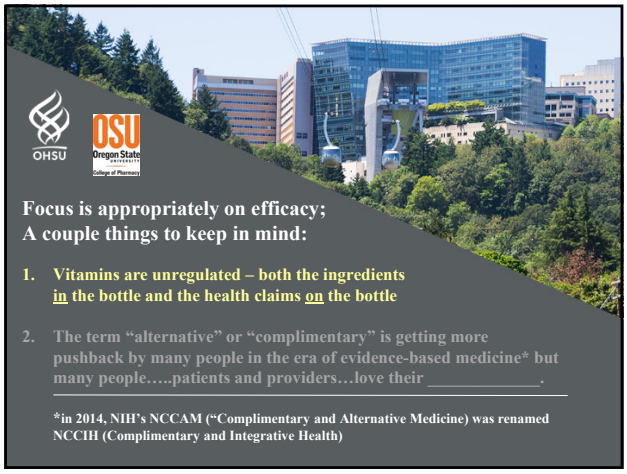
8

So, while it's fair to generally think of vitamins as low risk, no drug is truly risk free

9


OHSU
OSU
Oregon State
Focus is appropriately on efficacy;
A couple things to keep in mind:
1. Vitamins are unregulated – both the ingredients in the bottle and the health claims on the bottle
2. The term "alternative" or "complimentary" is getting more pushback by many people in the era of evidence-based medicine* but many people…..patients and providers…love their _____.
*in 2014, NIH's NCCAM ("Complimentary and Alternative Medicine) was renamed NCCIH (Complimentary and Integrative Health)

10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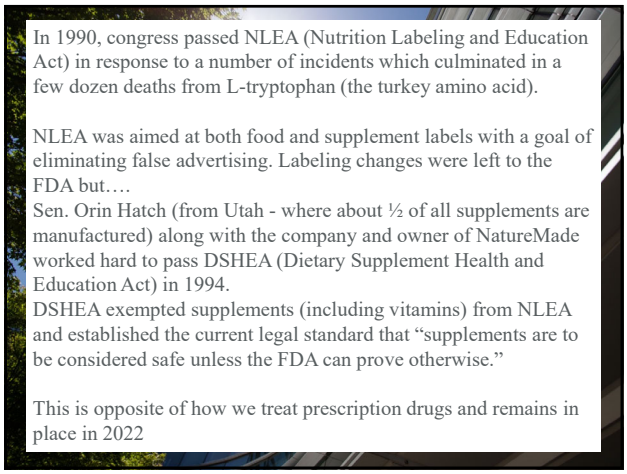
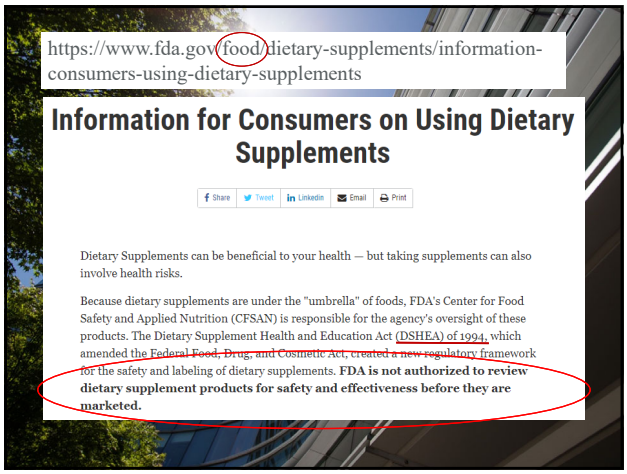
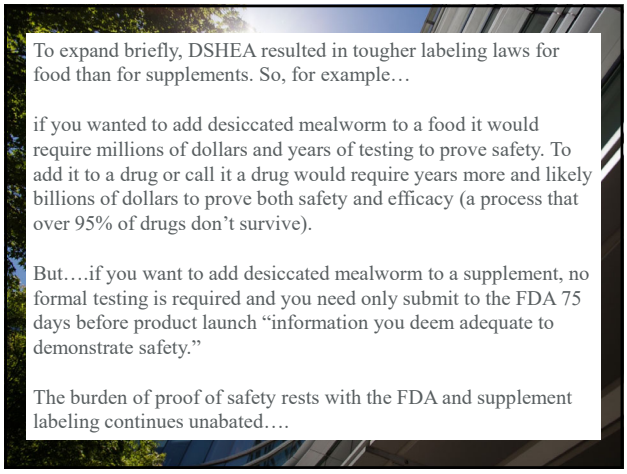
11


In 1990, congress passed NLEA (Nutrition Labeling and Education Act) in response to a number of incidents which culminated in a few dozen deaths from L-tryptophan (the turkey amino acid).
NLEA was aimed at both food and supplement labels with a goal of eliminating false advertising. Labeling changes were left to the FDA but….
Sen. Orin Hatch (from Utah - where about ½ of all supplements are manufactured) along with the company and owner of NatureMade worked hard to pass DSHEA (Dietary Supplement Health and Education Act) in 1994.
DSHEA exempted supplements (including vitamins) from NLEA and established the current legal standard that "supplements are to be considered safe unless the FDA can prove otherwise."
This is opposite of how we treat prescription drugs and remains in place in 2022

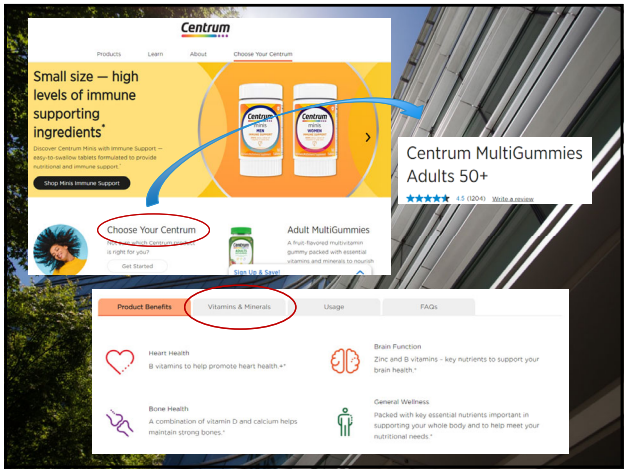
12


https://www.fda.gov/food/dietary-supplements/information-consumers-using-dietary-supplements
Information for Consumers on Using Dietary Supplements
Share
Tweet
LinkedIn
Email
Print
Dietary Supplements can be beneficial to your health — but taking supplements can also involve health risks.
Because dietary supplements are under the "umbrella" of foods, FDA's Center for Food Safety and Applied Nutrition (CFSAN) is responsible for the agency's oversight of these products. The Dietary Supplement Health and Education Act (DSHEA) of 1994, which amended the Federal Food, Drug, and Cosmetic Act, created a new regulatory framework for the safety and labeling of dietary supplements. FDA is not authorized to review dietary supplement products for safety and effectiveness before they are marketed.

13


To expand briefly, DSHEA resulted in tougher labeling laws for food than for supplements. So, for example…
if you wanted to add desiccated mealworm to a food it would require millions of dollars and years of testing to prove safety. To add it to a drug or call it a drug would require years more and likely billions of dollars to prove both safety and efficacy (a process that over 95% of drugs don't survive).
But….if you want to add desiccated mealworm to a supplement, no formal testing is required and you need only submit to the FDA 75 days before product launch "information you deem adequate to demonstrate safety."
The burden of proof of safety rests with the FDA and supplement labeling continues unabated….

14


Centrum
Products
Learn
About
Choose Your Centrum
Small size — high levels of immune supporting ingredients*
Shop Mini Immune Support
Centrum MultiGummies Adults 50+
Choose Your Centrum
Adult MultiGummies
Product Benefits
Vitamins & Minerals
Usage
FAQs
Heart Health
Brain Function
Bone Health
General Wellness

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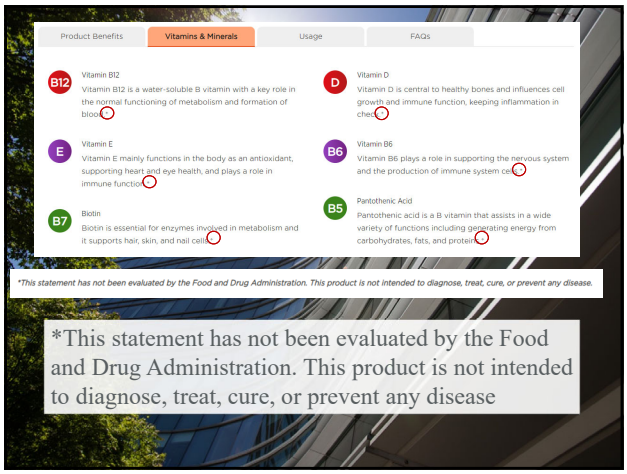
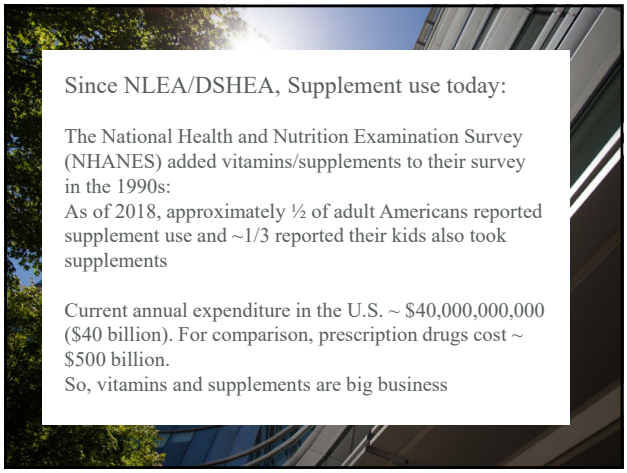
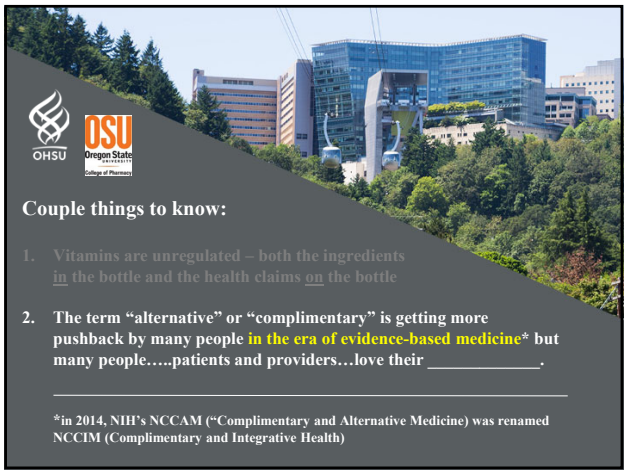

Product Benefits
Vitamins & Minerals
Usage
FAQs
B12
Vitamin B12
Vitamin B12 is a water-soluble B vitamin with a key role in the normal functioning of metabolism and formation of blood
D
Vitamin D
Vitamin D is central to healthy bones and influences cell growth and immune function, keeping inflammation in check
E
Vitamin E
Vitamin E mainly functions in the body as an antioxidant, supporting heart and eye health, and plays a role in immune function
B6
Vitamin B6
Vitamin B6 plays a role in supporting the nervous system and the production of immune system cells
B7
Biotin
Biotin is essential for enzymes involved in metabolism and it supports hair, skin, and nail cells
B5
Pantothenic Acid
Pantothenic acid is a B vitamin that assists in a wide variety of functions including generating energy from carbohydrates, fats, and proteins
*This statement has not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.
*This statement has not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease

16


Since NLEA/DSHEA, Supplement use today:
The National Health and Nutrition Examination Survey (NHANES) added vitamins/supplements to their survey in the 1990s:
As of 2018, approximately ½ of adult Americans reported supplement use and ~1/3 reported their kids also took supplements
Current annual expenditure in the U.S. ~ $40,000,000,000 ($40 billion). For comparison, prescription drugs cost ~ $500 billion.
So, vitamins and supplements are big business

17


OHSU
OSU
Oregon State University
College of Pharmacy
Couple things to know:
1. Vitamins are unregulated – both the ingredients in the bottle and the health claims on the bottle
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*in 2014, NIH's NCCAM ("Complimentary and Alternative Medicine) was renamed NCCIM (Complimentary and Integrative Health)

18

A little bit of background on vitamins (vital amines):

There are 13 human vitamins (ADEK are fat soluable and C and the B vitamins [8 in all] are water soluble) and all are classified as essential micronutrients to distinguish from….

Macronutrients (fat, carbohydrate and protein) provide caloric nutrition whereas vitamins are essential enzymes which help to catalyze intracellular reactions

What do vitamins do, how much do we need and what is the evidence for 'supplementing' a sufficient diet?

19

Patient in mid-50's with alcohol use disorder admitted to OHSU March, 2022….

This is the early stages of scurvy

IRB 00024339

VITAMIN C, PLASMA

Status: Final result Visible to patient: No (not released)

0 Result Notes

Component	Ref Range & Units	8 d ago
VITAMIN C (LAB)	23 - 114 umol/L	<5

Comment: INTERPRETIVE DATA: Vitamin C (Ascorbic Acid), Plasma

20

Vitamins in micro doses are truly vital…Vitamin C is a great example given the well known maritime history of scurvy

Scurvy is a disease of insufficient collagen production. Collagen is literally the glue that holds us together (skin, muscle, blood vessels, bones, cartilage). Collagen is made from procollagen and that reaction is catalyzed by Vitamin C.

But it will be an extremely rare patient who is truly at risk for scurvy (my second case in 25 years)…..or from Ricketts from Vit. D deficiency.

So how much do we need and what is the evidence for 'supplementing' sufficient diets with vitamins?

21

The RDA…..

Recommended Daily Allowance is poorly understood…It is the amount of a specific vitamin that is needed by the upper 97th percentile of the population (2 standard deviations from that mean).

The RDA is NOT the amount that the average person needs (97% could get by with less) and is also NOT a daily goal. Vitamins last a long time in our system and what is important is average consumption over time. Needed amounts for good health are tiny.

Example: Vitamin D. Popular vitamin past decade. Recommended intake of 600 IU is 15 microgram (0.000015 gm) which is about 1/10 of a grain of table salt. The RDA for Vit. B12 is 1/7 that or 2.4 mcg!

22

So we don't need much at all of any of the vitamins and what we get lasts a long time

But this is America – if a little is good, more must be better……right?
If micro doses of vitamins cure things like scurvy and Ricketts, imagine what larger doses could do?

23

NEJM, May 2, 1996

The New England
Journal of Medicine

Volume 334 MAY 2, 1996 Number 18

LACK OF EFFECT OF LONG-TERM SUPPLEMENTATION WITH BETA CAROTENE ON THE INCIDENCE OF MALIGNANT NEOPLASMS AND CARDIOVASCULAR DISEASE

Randomized, double-blind trial of 22,071 patients followed for an average of 12 years

Conclusions. In this trial among healthy men, 12 years of supplementation with beta carotene produced neither benefit nor harm in terms of the incidence of malignant neoplasms, cardiovascular disease, or death from all causes. (N Engl J Med 1996;334:1145-9.)

24

ATBC trial, NEJM, April 14, 1994

The New England
Journal of Medicine

Volume 330 APRIL 14, 1994 Number 15

THE EFFECT OF VITAMIN E AND BETA CAROTENE ON THE INCIDENCE OF LUNG CANCER AND OTHER CANCERS IN MALE SMOKERS

THE ALPHA-TOCOPHEROL, BETA CAROTENE CANCER PREVENTION STUDY GROUP*

Randomized, double-blind trial of 29,133 patients followed for 5-8 years

Conclusions. We found no reduction in the incidence of lung cancer among male smokers after five to eight years of dietary supplementation with alpha-tocopherol or beta carotene. In fact, this trial raises the possibility that these supplements may actually have harmful as well as beneficial effects. (N Engl J Med 1994;330:1029-35.)

25

ATBC trial, NEJM, April 14, 1994

The New England
Journal of Medicine

Volume 330 APRIL 14, 1994 Number 15

THE EFFECT OF VITAMIN E AND BETA CAROTENE ON THE INCIDENCE OF LUNG CANCER AND OTHER CANCERS IN MALE SMOKERS

THE ALPHA-TOCOPHEROL, BETA CAROTENE CANCER PREVENTION STUDY GROUP*

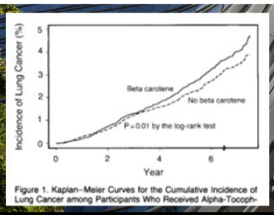


Figure 1. Kaplan–Meier Curves for the Cumulative Incidence of Lung Cancer among Participants Who Received Alpha-Tocoph-

Increased incidence of lung cancer in beta-carotene (Vit. A) group (p=0.01) and strong trend for increased lung cancer mortality (p=0.08)

26

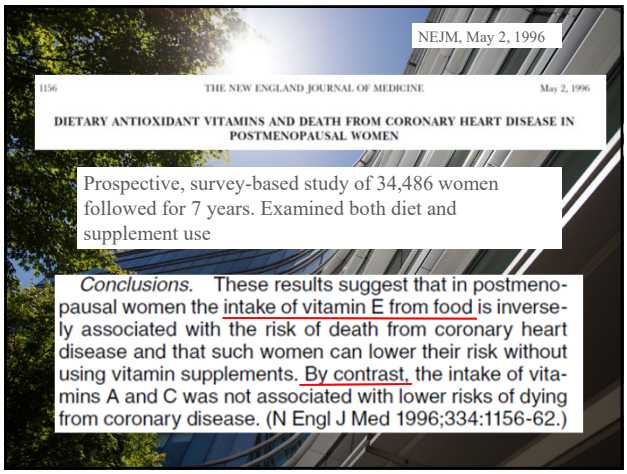
NEJM, May 2, 1996

EFFECTS OF A COMBINATION OF BETA CAROTENE AND VITAMIN A ON LUNG CANCER AND CARDIOVASCULAR DISEASE

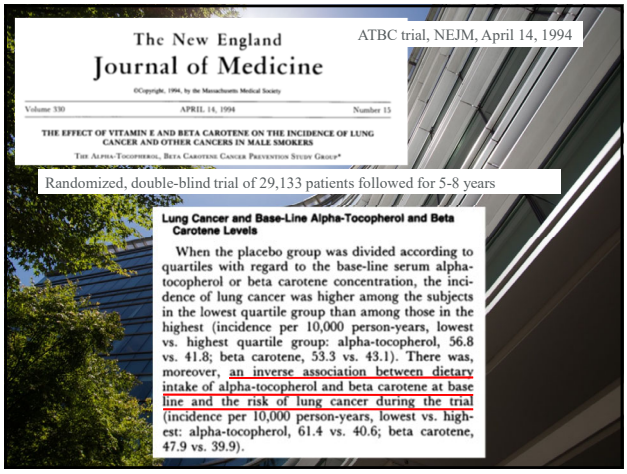
Randomized, double-blind trial of 18,314 patients followed for an average of 4 years

Conclusions. After an average of four years of supplementation, the combination of beta carotene and vitamin A had no benefit and may have had an adverse effect on the incidence of lung cancer and on the risk of death from lung cancer, cardiovascular disease, and any cause in smokers and workers exposed to asbestos. (N Engl J Med 1996;334:1150-5.)

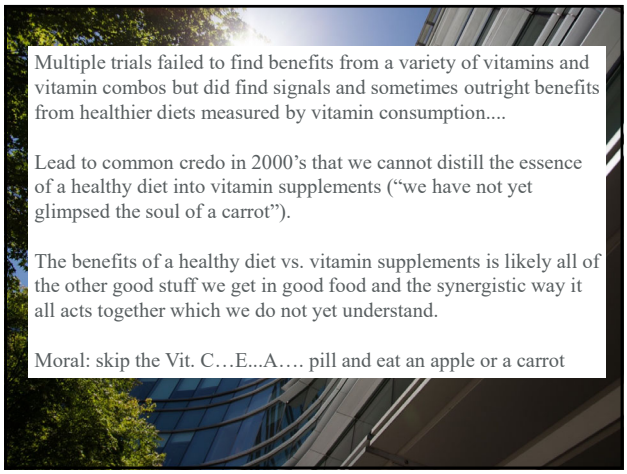
27


NEJM, May 2, 1996
1156 THE NEW ENGLAND JOURNAL OF MEDICINE May 2, 1996
DIETARY ANTIOXIDANT VITAMINS AND DEATH FROM CORONARY HEART DISEASE IN POSTMENOPAUSAL WOMEN
Prospective, survey-based study of 34,486 women followed for 7 years. Examined both diet and supplement use
Conclusions. These results suggest that in postmenopausal women the intake of vitamin E from food is inversely associated with the risk of death from coronary heart disease and that such women can lower their risk without using vitamin supplements. By contrast, the intake of vitamins A and C was not associated with lower risks of dying from coronary disease. (N Engl J Med 1996;334:1156-62.)

28


The New England Journal of Medicine
ATBC trial, NEJM, April 14, 1994
Volume 330 APRIL 14, 1994 Number 15
THE EFFECT OF VITAMIN E AND BETA CAROTENE ON THE INCIDENCE OF LUNG CANCER AND OTHER CANCERS IN MALE SMOKERS
Randomized, double-blind trial of 29,133 patients followed for 5-8 years
Lung Cancer and Base-Line Alpha-Tocopherol and Beta Carotene Levels
When the placebo group was divided according to quartiles with regard to the base-line serum alpha-tocopherol or beta carotene concentration, the incidence of lung cancer was higher among the subjects in the lowest quartile group than among those in the highest (incidence per 10,000 person-years, lowest vs. highest quartile group: alpha-tocopherol, 56.8 vs. 41.8; beta carotene, 53.3 vs. 43.1). There was, moreover, an inverse association between dietary intake of alpha-tocopherol and beta carotene at base line and the risk of lung cancer during the trial (incidence per 10,000 person-years, lowest vs. highest: alpha-tocopherol, 61.4 vs. 40.6; beta carotene, 47.9 vs. 39.9).

29


Multiple trials failed to find benefits from a variety of vitamins and vitamin combos but did find signals and sometimes outright benefits from healthier diets measured by vitamin consumption....
Lead to common credo in 2000's that we cannot distill the essence of a healthy diet into vitamin supplements ("we have not yet glimpsed the soul of a carrot").
The benefits of a healthy diet vs. vitamin supplements is likely all of the other good stuff we get in good food and the synergistic way it all acts together which we do not yet understand.
Moral: skip the Vit. C…E...A…. pill and eat an apple or a carrot

30

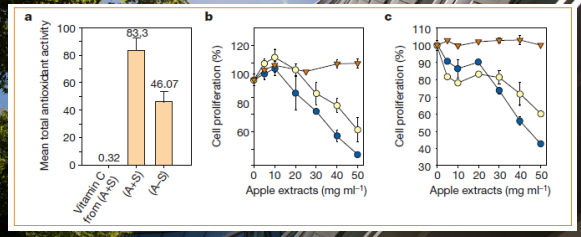
Nature 2000;405:903-4

Nutrition

Antioxidant activity of fresh apples

Vitamin C is used as a dietary supplement because of its antioxidant activity, although a high dose (500 mg) may

100 gm of apple has 5.7 mg of Vitamin C but the antioxidant potency of 1,500 mg of Vit. C



Apple w skin ● Apple w/out skin ● Control ▼

31

While randomized, long-term trial data for different diets is not robust, there is data out there……

The NEW ENGLAND JOURNAL of MEDICINE

APRIL 4, 2013

Primary Prevention of Cardiovascular Disease with a Mediterranean Diet

The "PREDIMED" trial of the Mediterranean diet was retracted and republished in 2018 but still showed ~ 25% reduction in major CVD events

ORIGINAL ARTICLE

Primary Prevention of Cardiovascular Disease with a Mediterranean Diet Supplemented with Extra-Virgin Olive Oil or Nuts

…..but regardless of the quality/quantity of outcomes data for certain diets, there is no question that a healthy meal is the best "multivitamin"

32

The failure throughout the '80's and '90's of large antioxidant trials of Vit. A, C, E and the B vitamins continued for a time into 2000's….

The New Engla

ORIGINAL ARTICLE

HOPE-TOO results: vitamin E supplements do not protect against cancer or cardiovascular disease

MRC/BHF Heart Protection Study of antioxidant vitamin supplementation in 20 536 high-risk individuals: a randomised placebo-controlled trial

POSTMENOPAUSAL WOMEN

1150 THE NEW ENGLAND JOURNAL OF MEDICINE May 2, 1996

EFFECTS OF A COMBINATION OF BETA CAROTENE AND VITAMIN A ON LUNG CANCER AND CARDIOVASCULAR DISEASE

33

The repeated failure of trials in '80's, 90's and 2000's of Vitamins A, C, E and the B's led to some soul searching and much editorializing….

EDITORIAL | Annals of Internal Medicine

Enough Is Enough: Stop Wasting Money on Vitamin and Mineral Supplements

Ann Intern Med. 2013;159:850-851.

Three articles in this issue address the role of vitamin and mineral supplements for preventing the occurrence or progression of chronic diseases. First, Fortmann and

U.S. adults from 30% between 1988 to 1994 to 39% between 2003 to 2006, while overall use of dietary supplements increased from 42% to 53% (9). Longitudinal and

REVIEW | Annals of Internal Medicine

Vitamin and Mineral Supplements in the Primary Prevention of Cardiovascular Disease and Cancer: An Updated Systematic Evidence Review for the U.S. Preventive Services Task Force

Stephen P. Fortmann, MD; Brittany U. Burda, MPH; Caitlyn A. Senger, MPH; Jennifer S. Lin, MD, MCR; and Evelyn P. Whitlock, MD, MPH

34

As the 2010's dawned and the data for Vit. A, B's, C, and E were looking pretty bad, everyone seemed to turn all at once to Vit. D…..

The "sunshine" molecule

The USPSTF also recently turned their attention to Vitamin D….

35

Search the USPSTF Website

Vitamin D

Recommendations search results

Hits: 129

Status	Type	Year	Topic Name	Age Group	Category
Published	Screening	2021	Vitamin D Deficiency in Adults: Screening	Adult, Senior	Metabolic, nutritional, and Endocrine Conditions
Published	Preventive medication	2018	Vitamin D, Calcium, or Combined Supplementation for the Primary Prevention of Fractures in Community-Dwelling Adults: Preventive Medication	Adult, Senior	Metabolic, nutritional, and Endocrine Conditions
Published	Preventive medication	2014	Vitamin Supplementation to Prevent Cancer and CVD: Preventive Medication	Adult, Senior	Cancer, Cardiovascular Disorders (Heart and Vascular Diseases)

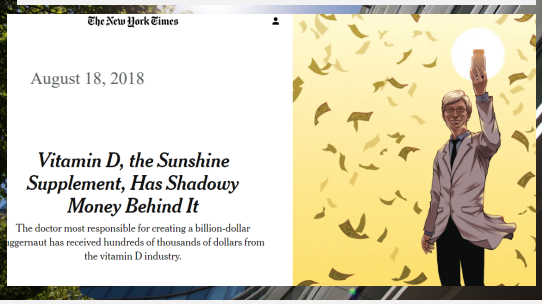
Read the full Recommendation Statement | Download (PDF)

Recommendation Summary

Population	Recommendation	Grade
Asymptomatic, community-dwelling, nonpregnant adults	The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of screening for vitamin D deficiency in asymptomatic adults. See the Practice Considerations section for additional information regarding the I statement.	I

36

But, how did we get to where everyone thinks they're Vit. D deficient or insufficient?


The New York Times

August 18, 2018

Vitamin D, the Sunshine Supplement, Has Shadowy Money Behind It

The doctor most responsible for creating a billion-dollar juggernaut has received hundreds of thousands of dollars from the vitamin D industry.

"Dr. Holick's role in drafting national Vitamin D guidelines have helped push supplement sales to $936 million in 2017, a ninefold increase over the previous decade."

37

So how did we get to where everyone thinks they're Vit. D deficient or insufficient?


The New York Times

August 18, 2018

Vitamin D, the Sunshine Supplement, Has Shadowy Money Behind It

The doctor most responsible for creating a billion-dollar juggernaut has received hundreds of thousands of dollars from the vitamin D industry.

"…..lab tests for vitamin D have spiked, too: Doctors ordered more than 10 million for Medicare patients in 2016, up 547% since 2007, at a cost of $365 million."

38

So how did we get to where everyone thinks they're Vit. D deficient or insufficient?


The New York Times

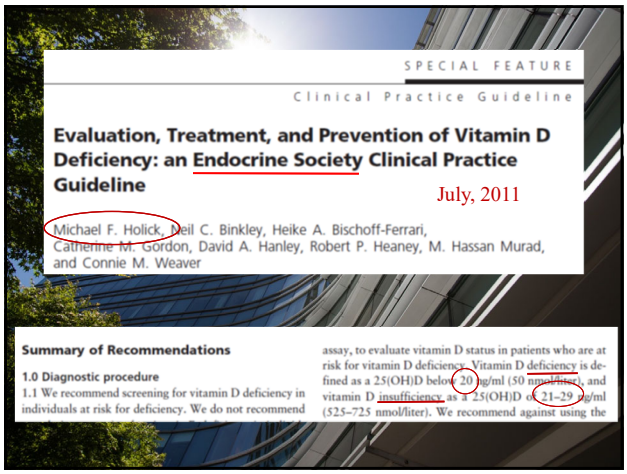
August 18, 2018

Vitamin D, the Sunshine Supplement, Has Shadowy Money Behind It

The doctor most responsible for creating a billion-dollar juggernaut has received hundreds of thousands of dollars from the vitamin D industry.

"But few of the Americans swept up in the Vitamin D craze are likely aware that the industry has sent a lot of money Dr. Holick's way…."

39


SPECIAL FEATURE
Clinical Practice Guideline
Evaluation, Treatment, and Prevention of Vitamin D Deficiency: an Endocrine Society Clinical Practice Guideline
July, 2011
Michael F. Holick, Neil C. Binkley, Heike A. Bischoff-Ferrari, Catherine M. Gordon, David A. Hanley, Robert P. Heaney, M. Hassan Murad, and Connie M. Weaver
Summary of Recommendations
1.0 Diagnostic procedure
1.1 We recommend screening for vitamin D deficiency in individuals at risk for deficiency. We do not recommend
assay, to evaluate vitamin D status in patients who are at risk for vitamin D deficiency. Vitamin D deficiency is defined as a 25(OH)D below 20 ng/ml (50 nmol/liter), and vitamin D insufficiency as a 25(OH)D of 21–29 ng/ml (525–725 nmol/liter). We recommend against using the

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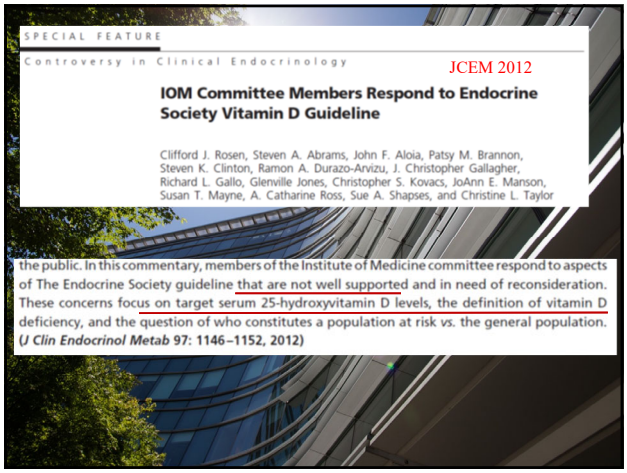
SPECIAL FEATURE
Controversy in Clinical Endocrinology
JCEM 2012
IOM Committee Members Respond to Endocrine Society Vitamin D Guideline
Clifford J. Rosen, Steven A. Abrams, John F. Aloia, Patsy M. Brannon, Steven K. Clinton, Ramon A. Durazo-Arvizu, J. Christopher Gallagher, Richard L. Gallo, Glenville Jones, Christopher S. Kovacs, JoAnn E. Manson, Susan T. Mayne, A. Catharine Ross, Sue A. Shapses, and Christine L. Taylor
the public. In this commentary, members of the Institute of Medicine committee respond to aspects of The Endocrine Society guideline that are not well supported and in need of reconsideration. These concerns focus on target serum 25-hydroxyvitamin D levels, the definition of vitamin D deficiency, and the question of who constitutes a population at risk vs. the general population.
(J Clin Endocrinol Metab 97: 1146–1152, 2012)

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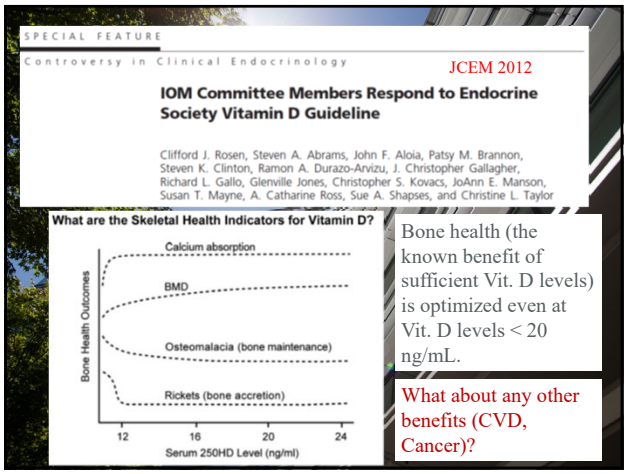
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What are the Skeletal Health Indicators for Vitamin D?
Calcium absorption
BMD
Osteomalacia (bone maintenance)
Rickets (bone accretion)
Bone Health Outcomes
12
16
20
24
Serum 250HD Level (ng/ml)
Bone health (the known benefit of sufficient Vit. D levels) is optimized even at Vit. D levels < 20 ng/mL.
What about any other benefits (CVD, Cancer)?

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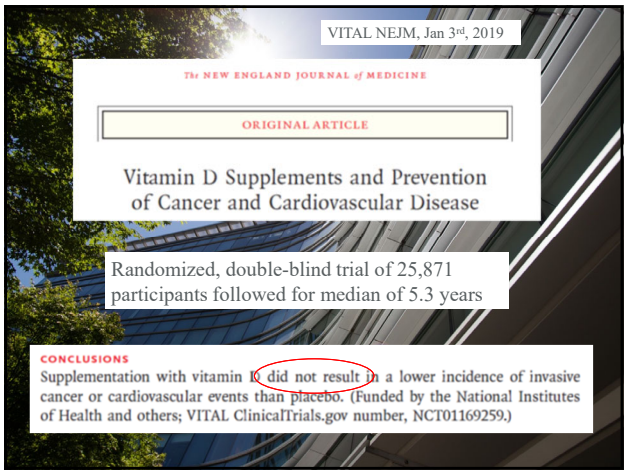
VITAL NEJM, Jan 3rd, 2019
The NEW ENGLAND JOURNAL of MEDICINE
ORIGINAL ARTICLE
Vitamin D Supplements and Prevention of Cancer and Cardiovascular Disease
Randomized, double-blind trial of 25,871 participants followed for median of 5.3 years
CONCLUSIONS
Supplementation with vitamin D did not result in a lower incidence of invasive cancer or cardiovascular events than placebo. (Funded by the National Institutes of Health and others; VITAL ClinicalTrials.gov number, NCT01169259.)

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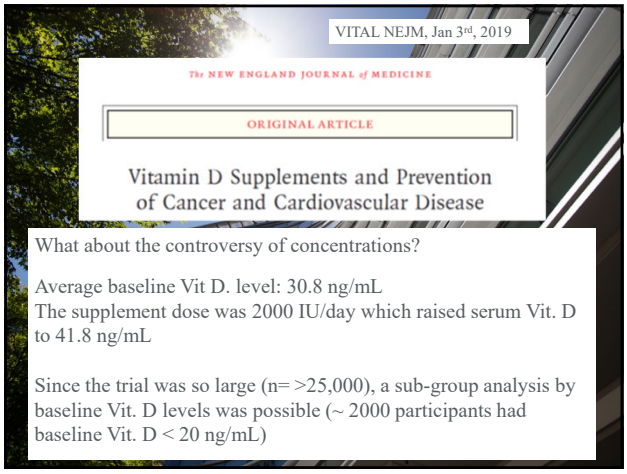
VITAL NEJM, Jan 3rd, 2019
The NEW ENGLAND JOURNAL of MEDICINE
ORIGINAL ARTICLE
Vitamin D Supplements and Prevention of Cancer and Cardiovascular Disease
What about the controversy of concentrations?
Average baseline Vit D. level: 30.8 ng/mL
The supplement dose was 2000 IU/day which raised serum Vit. D to 41.8 ng/mL
Since the trial was so large (n= >25,000), a sub-group analysis by baseline Vit. D levels was possible (~ 2000 participants had baseline Vit. D < 20 ng/mL)

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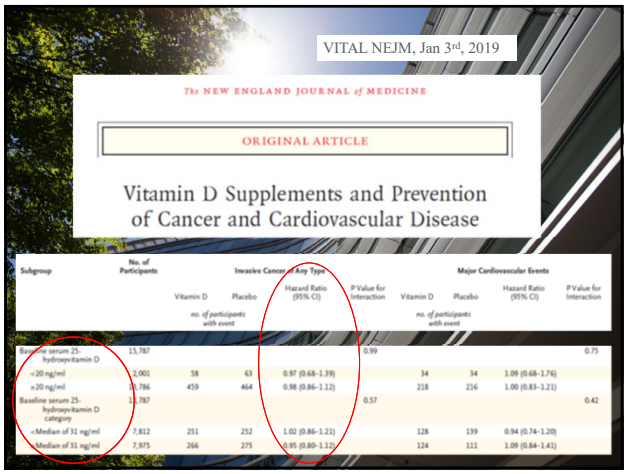
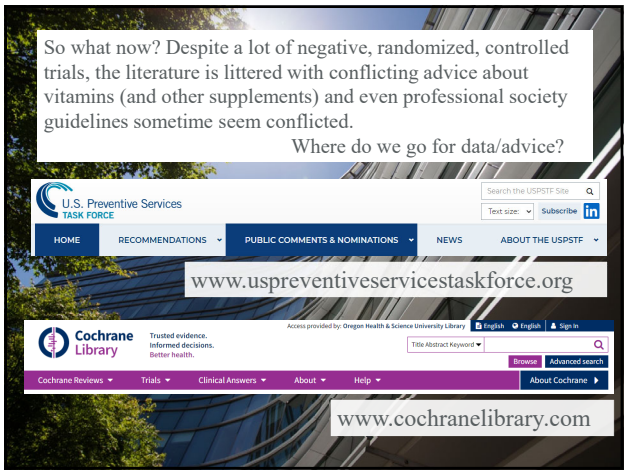

VITAL NEJM, Jan 3rd, 2019
The NEW ENGLAND JOURNAL of MEDICINE
ORIGINAL ARTICLE
Vitamin D Supplements and Prevention of Cancer and Cardiovascular Disease
Subgroup
No. of Participants
Invasive Cancer of Any Type
Major Cardiovascular Events
Vitamin D
Placebo
Hazard Ratio (95% CI)
P Value for Interaction
no. of participants with event
Baseline serum 25-hydroxyvitamin D
15,787
0.99
0.75
<20 ng/ml
2,001
58
63
0.97 (0.68–1.39)
34
34
1.09 (0.68–1.76)
≥20 ng/ml
11,786
459
464
0.98 (0.86–1.12)
218
216
1.00 (0.83–1.21)
Baseline serum 25-hydroxyvitamin D category
11,787
0.57
0.42
<Median of 31 ng/ml
7,812
251
252
1.02 (0.86–1.21)
128
139
0.94 (0.74–1.20)
≥Median of 31 ng/ml
7,975
266
275
0.95 (0.80–1.12)
124
111
1.09 (0.84–1.41)

45


So what now? Despite a lot of negative, randomized, controlled trials, the literature is littered with conflicting advice about vitamins (and other supplements) and even professional society guidelines sometime seem conflicted.
Where do we go for data/advice?
U.S. Preventive Services TASK FORCE
HOME
RECOMMENDATIONS
PUBLIC COMMENTS & NOMINATIONS
NEWS
ABOUT THE USPSTF
www.uspreventiveservicestaskforce.org
Cochrane Library
Trusted evidence.
Informed decisions.
Better health.
Cochrane Reviews
Trials
Clinical Answers
About
Help
About Cochrane
www.cochranelibrary.com

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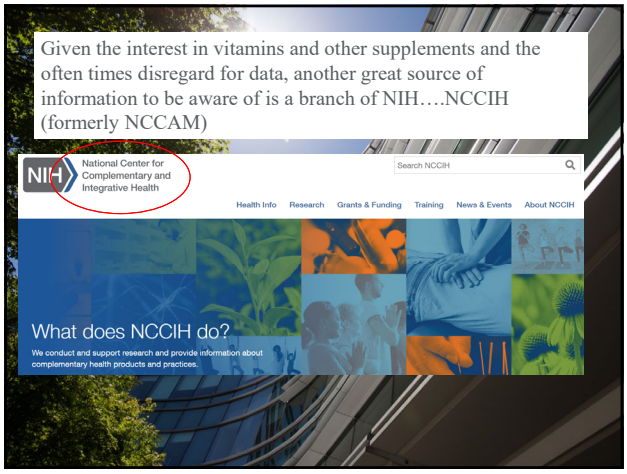
Given the interest in vitamins and other supplements and the often times disregard for data, another great source of information to be aware of is a branch of NIH….NCCIH (formerly NCCAM)
NIH
National Center for Complementary and Integrative Health
Search NCCIH
Health Info
Research
Grants & Funding
Training
News & Events
About NCCIH
What does NCCIH do?
We conduct and support research and provide information about complementary health products and practices.

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www.nih.gov and search "Dietary Supplements"….will lead you to NCCIH and a list of fact sheets for both patient and health care provider (hint – they're not very different)
Health Information
Home > Health Information > Dietary Supplement Fact Sheets
Dietary Supplement Fact Sheets
This collection of fact sheets and other resources from the NIH Office of Dietary Supplements and other federal government sources presents information about dietary supplements and their ingredients. These include vitamins, minerals, herbs and botanicals, probiotics, and more. Many of these resources are available in versions written for consumers (in both English and Spanish) and also for health professionals.
General Supplement Information
Dietary Supplements: Background Information
Botanical Dietary Supplements: Background Information
Vitamin and Mineral Fact Sheets
A
Acai
Activated charcoal
African mango (see Weight Loss)
Alfalfa
Aloe vera
Anabolic steroids
Andrographis (see COVID-19)
Antioxidants (see Exercise and Athletic Performance)
Apple cider vinegar
Arginine (see Exercise and Athletic Performance)
Ashwagandha
Astragalus
Athletic and exercise performance (see Exercise and Athletic Performance)
Vitamin A

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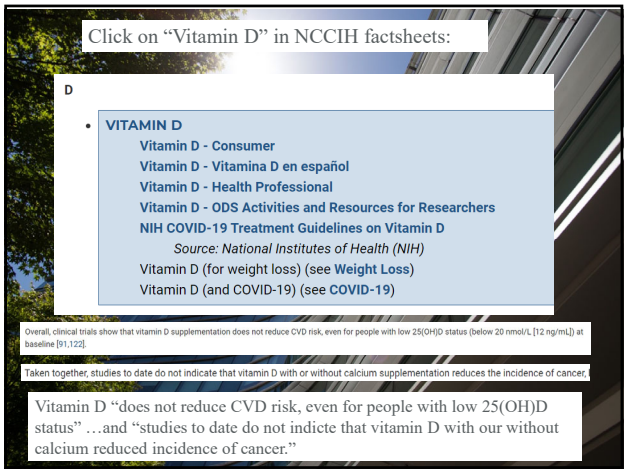
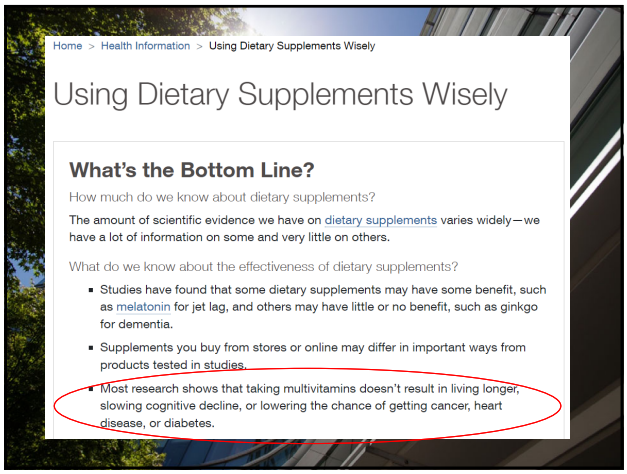
www.nih.gov and search "Vitamins"….will lead you to NCCIH brand of NIH which is National Center for Complementary and Integrative Health
U.S. Department of Health and Human Services
National Institutes of Health
Información en Español
NIH
National Center for Complementary and Integrative Health
Search NCCIH
Health Info
Research
Grants & Funding
Training
News & Events
About NCCIH
Home > Health Information > Vitamins and Minerals
Vitamins and Minerals
Share
Vitamins and Minerals
Vitamins and minerals are essential substances that our bodies need to develop and function normally. The known vitamins include A, C, D, E, and K, and the B vitamins: thiamin (B_1), riboflavin (B_2), niacin (B_3), pantothenic acid (B_5), pyridoxal (B_6), cobalamin (B_{12}), biotin, and folate/folic acid. A number of minerals are essential for health: calcium, phosphorus, potassium, sodium, chloride, magnesium, iron, zinc, iodine, sulfur, cobalt, copper, fluoride, manganese, and selenium. The Dietary Guidelines for Americans 2015–2020 recommends that people should aim to meet their nutrient requirements through a healthy eating pattern that includes nutrient-dense forms of foods.
5 A B C D E F G H I K L M N O P Q R S T V W Y Z
A
Antioxidants (see Exercise and Athletic Performance)
Vitamin A

49


Click on "Vitamin D" in NCCIH factsheets:
D
VITAMIN D
Vitamin D - Consumer
Vitamin D - Vitamina D en español
Vitamin D - Health Professional
Vitamin D - ODS Activities and Resources for Researchers
NIH COVID-19 Treatment Guidelines on Vitamin D
Source: National Institutes of Health (NIH)
Vitamin D (for weight loss) (see Weight Loss)
Vitamin D (and COVID-19) (see COVID-19)
Overall, clinical trials show that vitamin D supplementation does not reduce CVD risk, even for people with low 25(OH)D status (below 20 nmol/L [12 ng/mL]) at baseline [91,122].
Taken together, studies to date do not indicate that vitamin D with or without calcium supplementation reduces the incidence of cancer,
Vitamin D "does not reduce CVD risk, even for people with low 25(OH)D status" …and "studies to date do not indicte that vitamin D with our without calcium reduced incidence of cancer."

50


Home > Health Information > Using Dietary Supplements Wisely
Using Dietary Supplements Wisely
What's the Bottom Line?
How much do we know about dietary supplements?
The amount of scientific evidence we have on dietary supplements varies widely—we have a lot of information on some and very little on others.
What do we know about the effectiveness of dietary supplements?
Studies have found that some dietary supplements may have some benefit, such as melatonin for jet lag, and others may have little or no benefit, such as ginkgo for dementia.
Supplements you buy from stores or online may differ in important ways from products tested in studies.
Most research shows that taking multivitamins doesn't result in living longer, slowing cognitive decline, or lowering the chance of getting cancer, heart disease, or diabetes.

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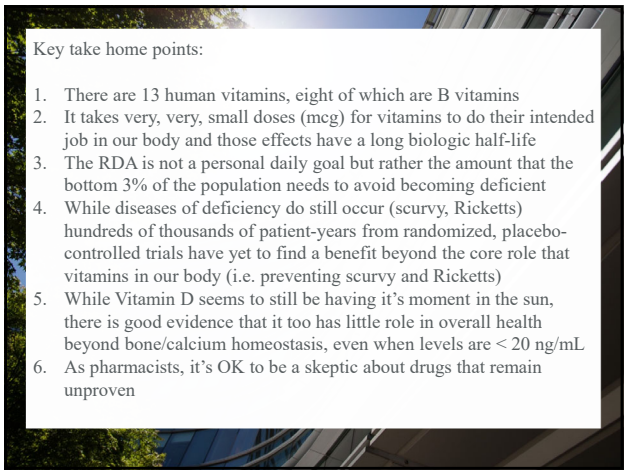
Key take home points:
1. There are 13 human vitamins, eight of which are B vitamins
2. It takes very, very, small doses (mcg) for vitamins to do their intended job in our body and those effects have a long biologic half-life
3. The RDA is not a personal daily goal but rather the amount that the bottom 3% of the population needs to avoid becoming deficient
4. While diseases of deficiency do still occur (scurvy, Ricketts) hundreds of thousands of patient-years from randomized, placebo-controlled trials have yet to find a benefit beyond the core role that vitamins in our body (i.e. preventing scurvy and Ricketts)
5. While Vitamin D seems to still be having it's moment in the sun, there is good evidence that it too has little role in overall health beyond bone/calcium homeostasis, even when levels are < 20 ng/mL
6. As pharmacists, it's OK to be a skeptic about drugs that remain unproven

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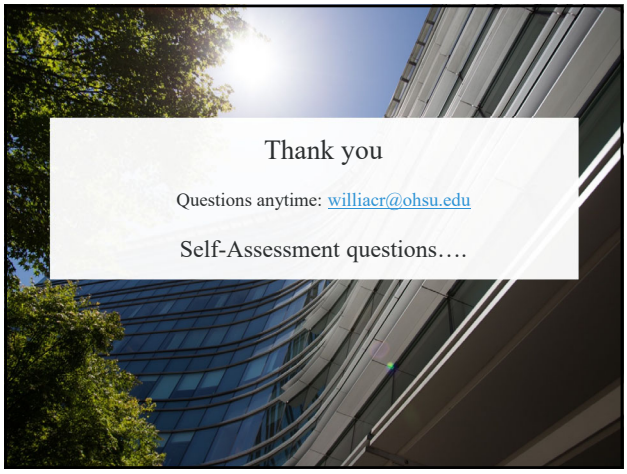
Thank you
Questions anytime: williacr@ohsu.edu
Self-Assessment questions….

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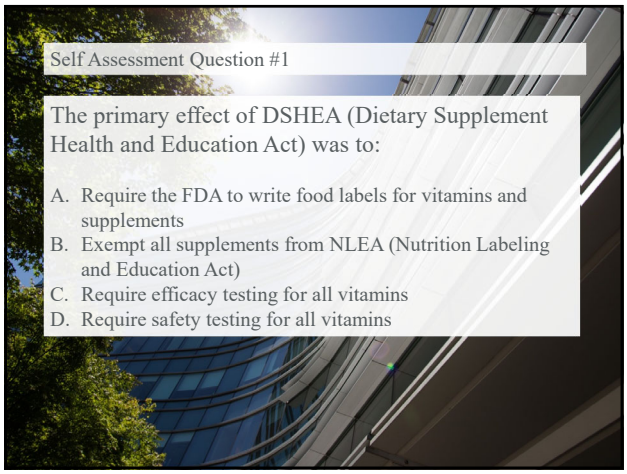
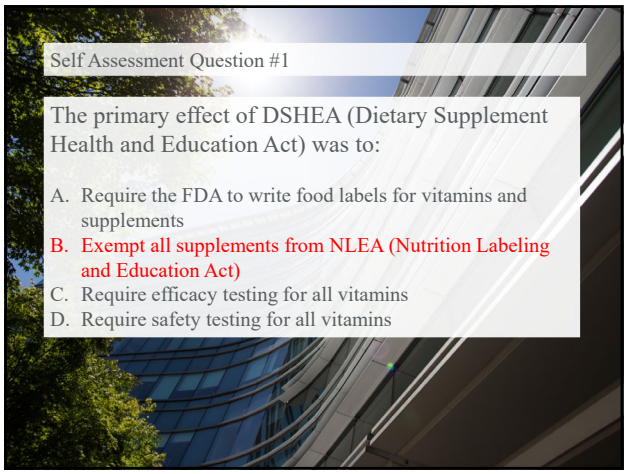

Self Assessment Question #1
The primary effect of DSHEA (Dietary Supplement Health and Education Act) was to:
A. Require the FDA to write food labels for vitamins and supplements
B. Exempt all supplements from NLEA (Nutrition Labeling and Education Act)
C. Require efficacy testing for all vitamins
D. Require safety testing for all vitamins

54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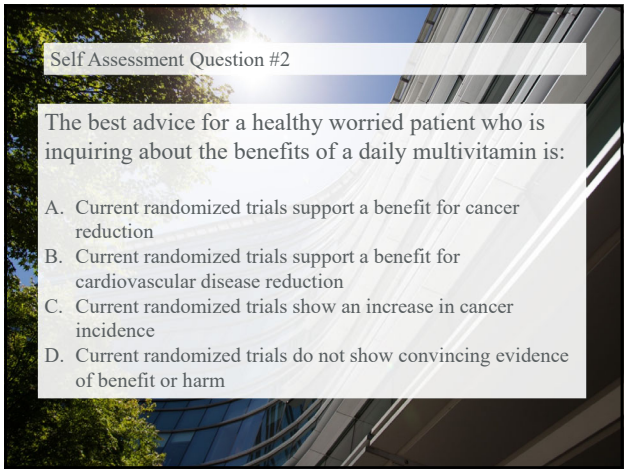
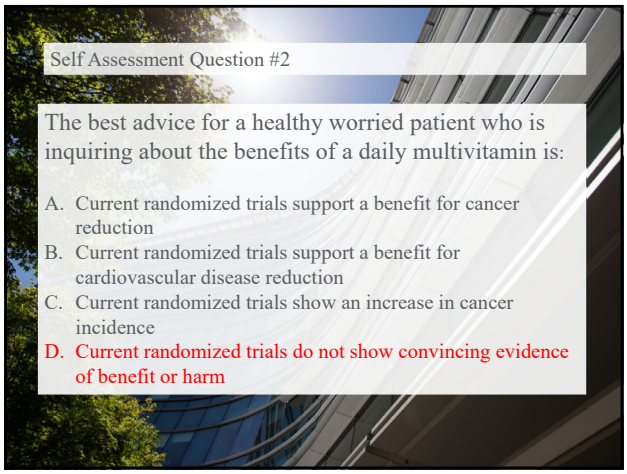

Self Assessment Question #2
The best advice for a healthy worried patient who is inquiring about the benefits of a daily multivitamin is:
A. Current randomized trials support a benefit for cancer reduction
B. Current randomized trials support a benefit for cardiovascular disease reduction
C. Current randomized trials show an increase in cancer incidence
D. Current randomized trials do not show convincing evidence of benefit or harm

56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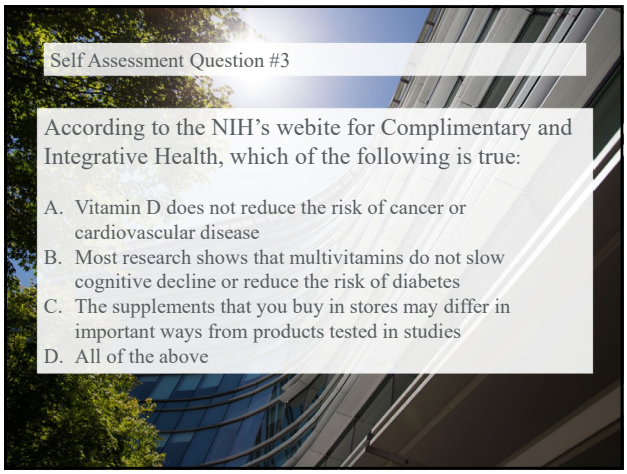
Self Assessment Question #3
According to the NIH's webite for Complimentary and Integrative Health, which of the following is true:
A. Vitamin D does not reduce the risk of cancer or cardiovascular disease
B. Most research shows that multivitamins do not slow cognitive decline or reduce the risk of diabetes
C. The supplements that you buy in stores may differ in important ways from products tested in studies
D. All of the above

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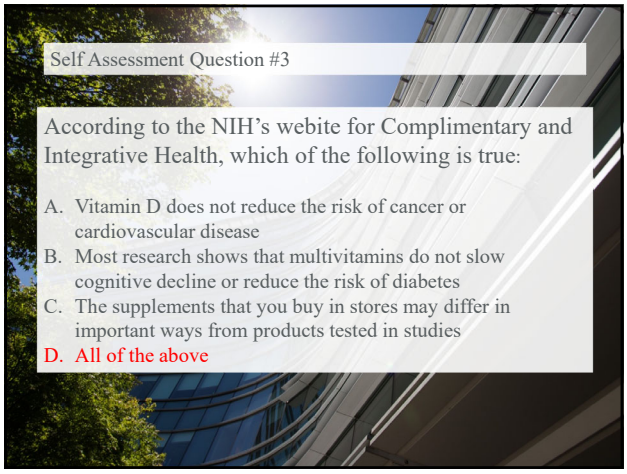
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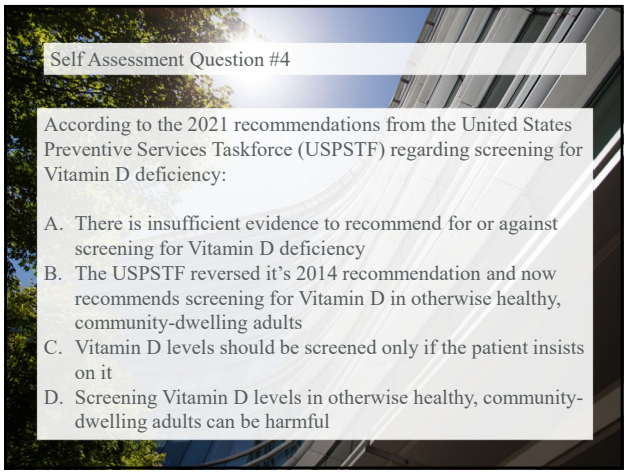
Self Assessment Question #4
According to the 2021 recommendations from the United States Preventive Services Taskforce (USPSTF) regarding screening for Vitamin D deficiency:
A. There is insufficient evidence to recommend for or against screening for Vitamin D deficiency
B. The USPSTF reversed it's 2014 recommendation and now recommends screening for Vitamin D in otherwise healthy, community-dwelling adults
C. Vitamin D levels should be screened only if the patient insists on it
D. Screening Vitamin D levels in otherwise healthy, community-dwelling adults can be harmful

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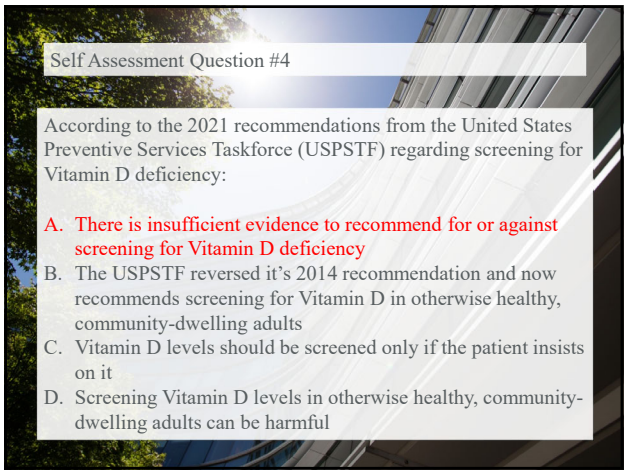
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