KRESSER INSTITUTE
FOR FUNCTIONAL AND EVOLUTIONARY MEDICINE

Supplementing Wisely

The Science Behind Optimal Metabolic Health and Nutrition:

Adding Years to Your Life and Life to Your Years.

UCSF Osher Mini Medical School for the Public

by **Chris Kresser** M.S., L.Ac

Should we supplement?

Basic principles of supplementation?

Supplements to consider?


Well-fed, but **undernourished**

Nutrient from food alone, ranked by the occurrence of dietary inadequacy among adults	**Percentage of dietary intakes below the estimated average requirement** for a specific population		
	2-to-8-year-old children	***14-to-18-year-old girls***	***Adults 19 and older***
Vitamin D	81%	98%	95%
Vitamin E	65%	99%	94%
Magnesium	2%	90%	61%
Vitamin A	6%	57%	51%
Calcium	23%	81%	49%
Vitamin C	2%	45%	43%
Vitamin B6	0.1%	18%	15%
Folate	0.2%	19%	13%
Zinc	0.2%	24%	12%
Iron	0.7%	12%	8%
Thiamin	0.1%	10%	7%
Copper	0%	16%	5%
Vitamin B12	0%	7%	4%
Riboflavin	0%	5%	2%

Source: https://www.ewg.org/research/how-much-is-too-much/appendix-b-vitamin-and-mineral-deficiencies-us#.WoS40RPwbUI

The RDA is not enough.

Bioavailability matters.

Nutrient synergy
also matters.

Chronic disease reduces nutrient absorption.

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Antioxidants Accelerate the Growth and Invasiveness of Tumors in Mice

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November 12, 2015, by NCI Staff

Evidence from two new studies in mice shows that antioxidants —dietary supplements commonly used in the belief that they may help prevent disease—may actually promote tumor growth and metastasis.

New findings in mice suggest that antioxidant supplements may promote tumor metastasis.
Credit: iStock

The new findings, authors from both studies said, suggest that cancer patients and people with an increased risk of cancer should avoid taking antioxidant supplements.

It had long been hypothesized that antioxidants might be able to protect against cancer because they neutralize reactive oxygen species (ROS) that can damage DNA. In laboratory and animal studies, the presence of increased levels of exogenous antioxidants has been shown to prevent the types of free radical damage that have been associated with cancer development.

However, multiple large randomized, placebo-controlled prevention clinical trials failed to substantiate this idea. Some of the largest clinical trials, in fact, had to be aborted because the patients receiving antioxidants had a higher incidence of cancer than patients who did not receive them.

To investigate how antioxidants might affect cancer progression, Martin Bergö, Ph.D., of the University of Gothenburg in Sweden, led a 2014 study in mouse models of human lung cancer. The researchers found that adding the antioxidants N-acetylcysteine (NAC) or vitamin E to the diet of mice with small lung tumors substantially increased the number, size, and stage of the tumors. Additional work showed that the NAC and vitamin E reduced levels of ROS and DNA damage in cancer cells, and essentially eliminated expression of the gene *p53*—a tumor suppressor gene that is typically activated by DNA damage.

Science Translational Medicine

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Antioxidants can increase melanoma metastasis in mice

Kristell Le Gal[1,2], Mohamed X. Ibrahim[1,3], Clotilde Wiel[1,3], Volkan I. Sayin[2,4], Murali K. Akula[1,3], Christin Karlsson[1,3], Martin ...
+ See all authors and affiliations

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Article | Figures & Data | Info & Metrics | eLetters | PDF

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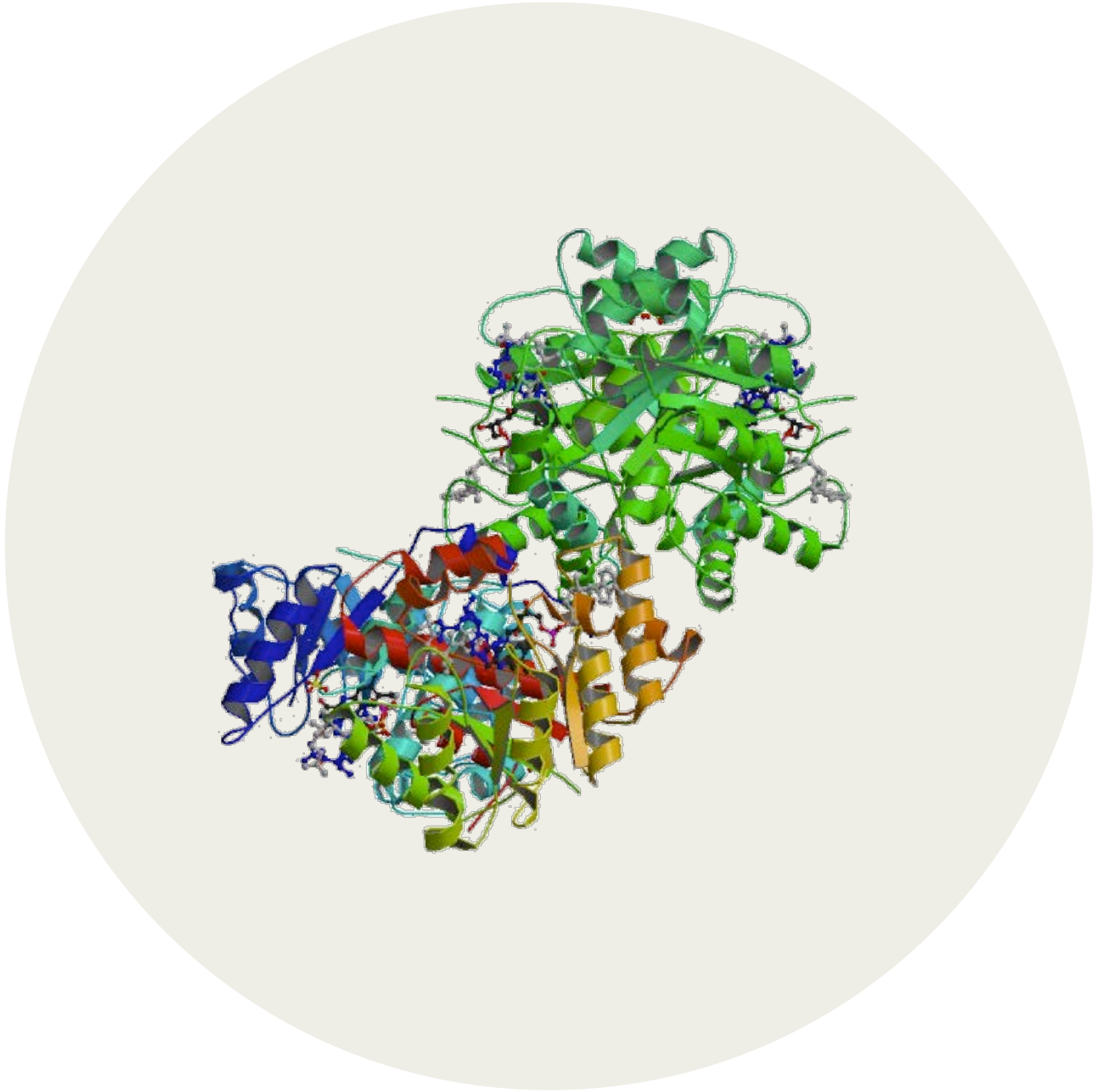
Another strike against antioxidants

Antioxidants are found in a variety of foods and dietary supplements and are frequently used with the goal of preventing cancer, but mounting evidence suggests that they may not be as beneficial as once thought. Clinical studies have shown mixed or no benefits, and other works demonstrated that antioxidants may accelerate the progression of lung cancer. Now, Le Gal *et al*. discovered that some common antioxidants increase the rate of melanoma cell migration and invasion and increase metastasis in a mouse model. These are early findings, and additional work will be required to confirm the generalizability of this observation. Nevertheless, the results suggest a need for caution in the use of antioxidants, especially for patients with existing cancer.

Nutrient	Total	% of RDA
Vitamin A *(RE)*	6,386	798
Vitamin B1 *(mg)*	3.4	309
Vitamin B2 *(mg)*	4.2	355
Vitamin B3 *(mg)*	60	428
Vitamin B6 *(mg)*	6.7	515
Folate *(µg)*	891	223
Vitamin B12 *(µg)*	17.6	733
Vitamin C *(mg)*	748	1247
Vitamin E *(IU)*	19.5	244
Calcium *(mg)*	691	69
Magnesium *(mg)*	643	207
Iron *(mg)*	24.3	162

Source: Cordain, L. "The Paleo Diet: Lose Weight and Get Healthy by Eating the Foods You Were Designed to Eat." John Wiley & Sons, New York, New York. 2010.



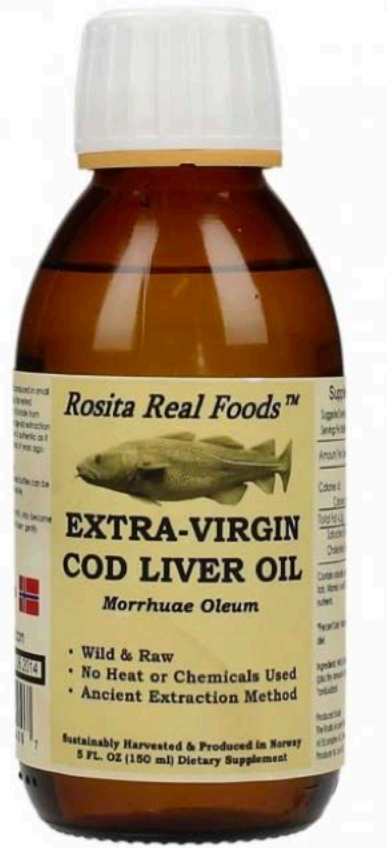
Therapeutic

Correct specific imbalance

Maintenance

Augment nutrients from diet


Supplement Fa
Amount Per Serving
% Daily Value
Vitamin A 3500 IU 70%
(20% as beta-carotene)
Vitamin C 120 mg 200%
Vitamin D 1000 IU 250%
(as Vitamin D3)
Vitamin E 30 IU 100%
Amount Per Serving
Niacin
Vitamin B6
Folic Acid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COD LIVER OIL
Morrhuae Oleum
• Wild & Raw
• No Heat or Chemicals Used
• Ancient Extraction Method
Sustainably Harvested & Produced in Norway
5 FL. OZ (150 ml) Dietary Supplement

Optimal 25D level

Coronary artery disease
Review

PDF

Subclinical magnesium deficiency: a principal driver of cardiovascular disease and a public health crisis

James J DiNicolantonio[1], James H O'Keefe[1] and William Wilson[2]

Author affiliations +

Abstract

Because serum magnesium does not reflect intracellular magnesium, the latter making up more than 99% of total body magnesium, most cases of magnesium deficiency are undiagnosed. Furthermore, because of chronic diseases, medications, decreases in food crop magnesium contents, and the availability of refined and processed foods, the vast majority of people in modern societies are at risk for magnesium deficiency. Certain individuals will need to supplement with magnesium in order to prevent suboptimal magnesium deficiency, especially if trying to obtain an optimal magnesium status to prevent chronic disease. Subclinical magnesium deficiency increases the risk of numerous types of cardiovascular disease, costs nations around the world an incalculable amount of healthcare costs and suffering, and should be considered a public health crisis. That an easy, cost-effective strategy exists to prevent and treat subclinical magnesium deficiency should provide an urgent call to action.

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http://dx.doi.org/10.1136/openhrt-2017-000668

Statistics from Altmetric.com

See more details

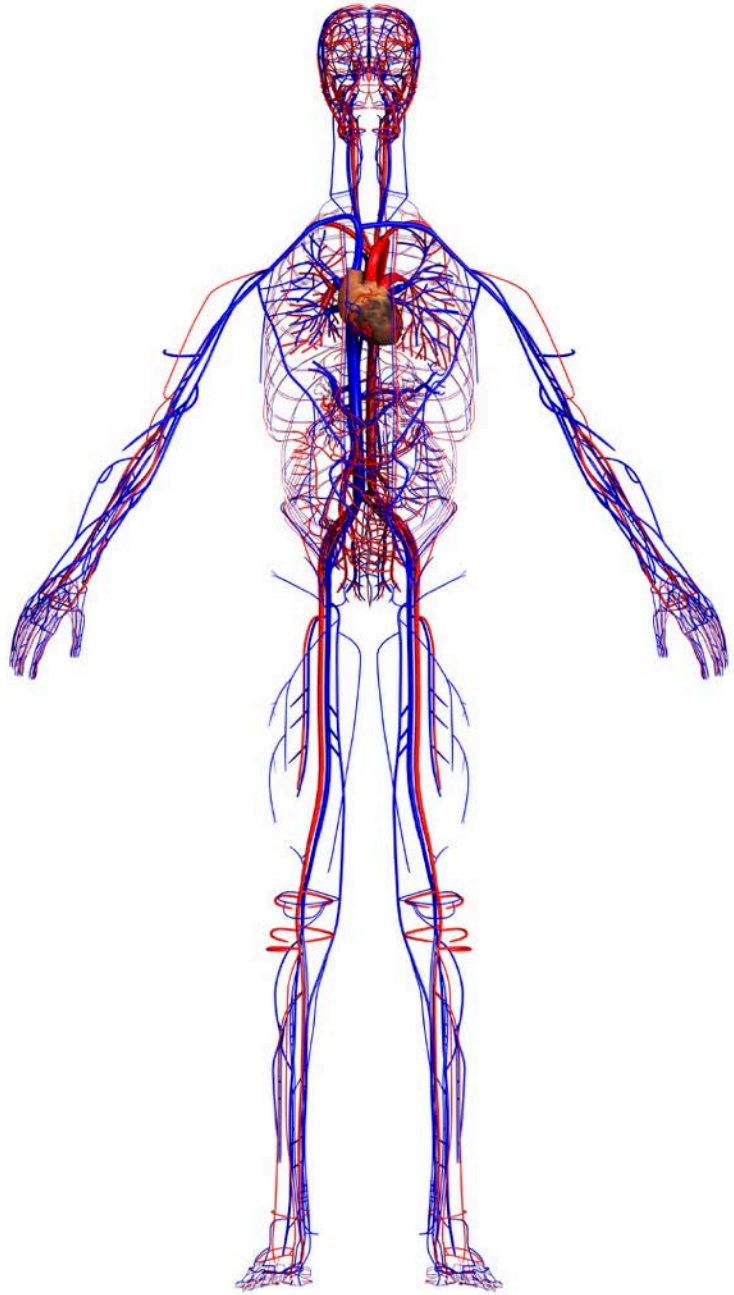
Magnesium in human biology

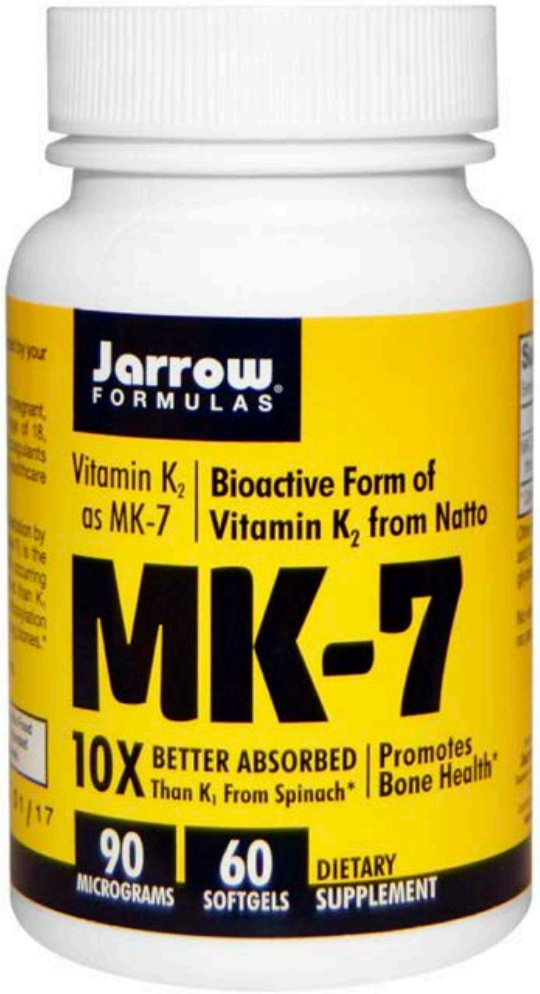
'Magnesium is the seventh most abundant element in the Earth's crust by mass or molarity…In vertebrates, magnesium is extremely abundant and it is the second most common intracellular cation (potassium being the first). Extracellular magnesium accounts for only ~1% of total body magnesium, which is found primarily in serum and red blood cells'.[1]

Magnesium is the fourth most common cation in our body, the second most common intracellular cation and the most common intracellular divalent cation.[2] The human body contains around 25 g of magnesium.[3] Magnesium is necessary for the functioning of over 300 enzymes in human,[4] with 90% of total body magnesium being contained in the muscles and bones (~27% and ~63%, respectively), 90% of which is bound and with only 10% being free.[5] In the serum, 32% of magnesium is bound to albumin, whereas 55% is free.[5]

Some of the main functions of magnesium in human biology include the maintenance of ionic gradients (keeping intracellular sodium and calcium low and potassium high), cellular and tissue integrity, mitochondrial oxidative phosphorylation (ATP production and activation), and DNA, RNA and protein synthesis and integrity.[3 6]

Source: http://www.douglaslabs.com/magnesium-glycinate.html





Source: http://www.images-iherb.com/l/JRW-30001-13.jpg, https://livesuperfoods.com/green-pasture-x-factor-high-vitamin-butter-oil-capsules.html

Food	Iodine (mcg/ serving)	Iodine (% DV)
Kelp, 1gr	1,542	1,028%
Kombu, 1gr	1,350	900%
Hijiki, 1gr	629	419%
Arame, 1gr	586	391%
Cod, baked, 3oz	99	66%
Yogurt, low-fat, 1 cup	75	50%
Iodized salt, 1/4 tbsp	71	47%
Milk, low-fat, 1 cup	56	37%
Shrimp, 3oz	35	23%
Egg, 1 large	24	16%
Tuna, canned in oil, 3oz	17	11%
Nori, 1gr	16	11%
Prunes, dried, 5 units	13	9%
Banana, 1 medium	3	2%

Source: http://www.iherb.com/Citracal-Calcium-Supplement-D3-Gummies-Natural-Blueberry-Strawberry-and-Watermelon-70-Gummies/62137

139%

Higher risk of heart attack for **those who took Calcium supplements** instead of calcium-rich food

31%

Higher risk of **heart attack, 20% of stroke** and **9% for death** from all causes for those taking calcium supplements

20%

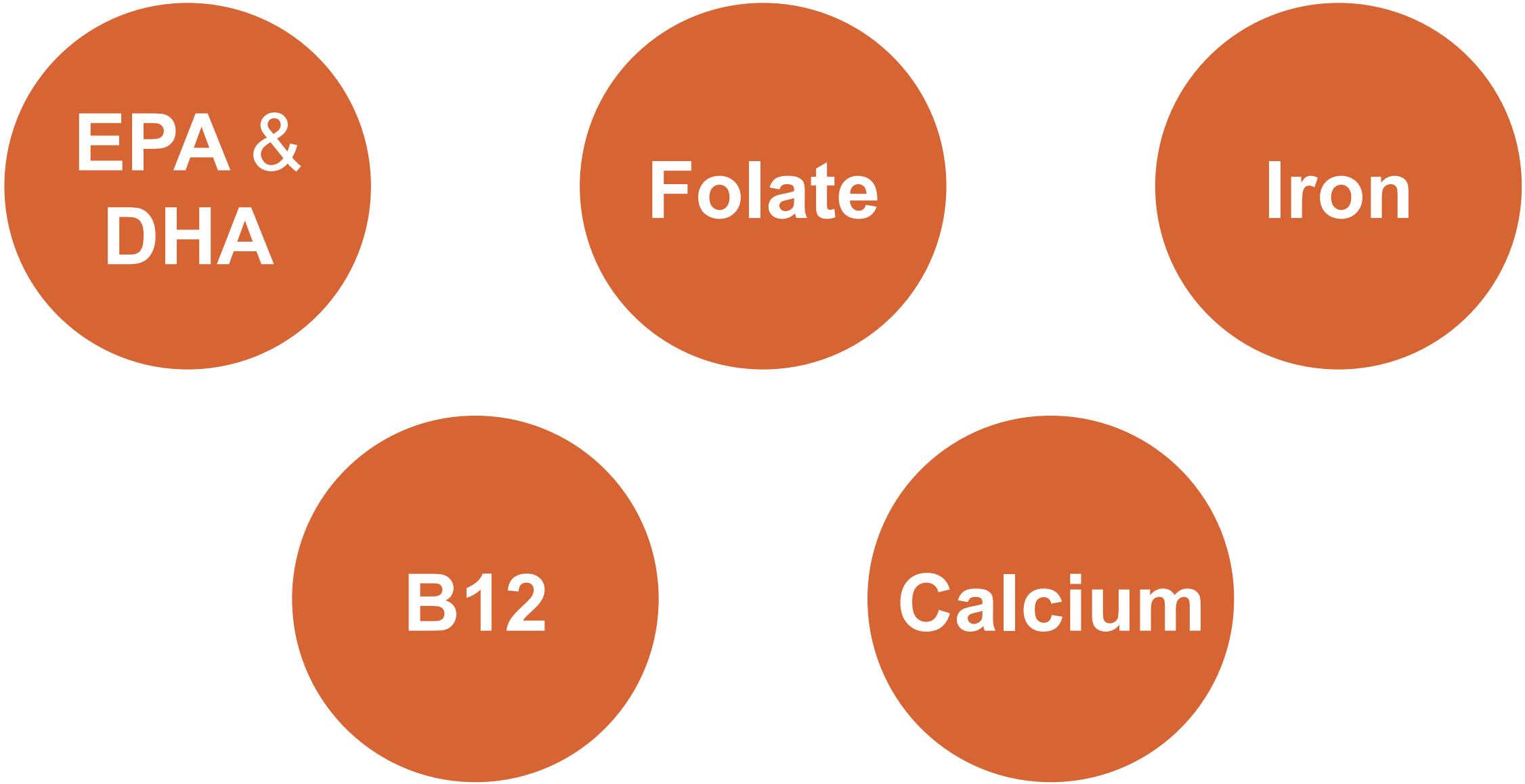
Higher risk of **death from CVD** with an intake **higher than 1,000mg** of supplemental calcium

Food	Serving	Calcium (mg)
Sesame Seeds	0.25 cup	351
Sardines (with bones)	3.75 oz can	351
Yogurt	1 cup	296
Collard Greens	1 cup	268
Spinach	1 cup	245
Cheese	1 oz	204
Turnip Greens	1cup	197
Canned Sockeye Salmon (with bones)	3 oz	188
Molasses (blackstrap)	1tbsp	180
Mustard Greens	1 cup	165
Beet Greens	1 cup	164
Bok Choy	1 cup	158
Almonds (dry roasted)	2 oz	150
Cow's Milk	4 oz	138
Swiss Chard	1 cup	102
Kale	1 cup	94
Cabbage	1 cup	63
Broccoli	1 cup	62

Food	Serving	Calcium (mg)
Brussels Sprouts	1 cup	56
Green Beans	1 cup	55
Oranges	1 medium	52
Cinnamon	2 tbsp	52
Summer Squash	1 cup	49
Fennel	1 cup	43
Parsley	1/2 cup	42
Asparagus	1 cup	41
Celery	1 cup	40
Cumin	2 tbsp	39
Basil	1/2 cup	38
Garlic	6 cloves	33
Oregano	2 tbsp	32
Leeks	1 cup	31
Romaine Lettuce	2 cups	31
Cloves	2 tbsp	27
Black Pepper	2 tbsp	26

Source: http://www.healthpost.co.nz/radiance-vitamin-e-400iu-rde.html

Source: http://www.healthpost.co.nz/radiance-vitamin-e-400iu-rde.html


EPA & DHA
Folate
Iron
B12
Calcium