

Top Vitamin and Mineral Deficiencies – Are You at Risk?

Analysis by [Dr. Joseph Mercola](#)

October 05, 2024

STORY AT-A-GLANCE

- › Topping the list of the most common nutrient deficiencies are vitamins D, E, A, C, magnesium and calcium. Certain nutrient deficiencies are common even among those taking supplements
- › Looking at the foods that supply the most often lacking nutrients, it becomes apparent that a majority of problems stem from a lack of real, whole foods in the diet
- › Vitamin K2 and potassium are additional nutrients that many are deficient in, which both play important roles in heart health

Editor's Note: This article is a reprint. It was originally published November 16, 2016.

Eating a balanced whole-food diet is a foundational requirement for optimal nutrition. It's quite difficult to get sufficient amounts of vitamins and minerals from your diet if you do not eat real food. Unfortunately, even if you do eat well, how and where your food was grown can also influence your nutritional intake.

Soil quality, for example, significantly influences the levels of certain nutrients in your food, even if you eat organic. Your age and certain health conditions (digestive issues and others) also impact your body's ability to absorb and metabolize nutrients, raising your risk for deficiencies, as can diets that restrict certain foods, such as strict vegan diets.

Below, I will review some of the most common vitamin and mineral deficiencies,¹ and how to address them. Eating real food is your best bet, but sometimes supplementation

is advisable, especially if you're already experiencing signs of deficiency.

Six Most Common Vitamin and Mineral Deficiencies

Studies from both the U.S.^{2,3,4,5} and the U.K.⁶ suggest a majority of people fail to get certain key vitamins and minerals from food alone. Topping this list are vitamins D, E, A and C, as well as magnesium and calcium.

However, in my experience, the following nutrient deficiencies tend to have the most important impact on your health. For even more in-depth information about the benefits of each of these vitamins and minerals, and how to optimize your levels, please see the corresponding hyperlinks provided.

Vitamin/Mineral	Food sources
Vitamin D	Mushrooms
Magnesium	Raw cacao, seaweed and dark leafy greens like spinach and Swiss chard
Vitamin C	Most fruits and vegetables, particularly citrus fruit, strawberries and kiwi
Animal-based omega-3	Sardines and anchovies (make sure to eat in moderation, as omega-3s are a type of polyunsaturated fat)
Vitamin K2	Fermented foods such as natto and fermented vegetables like sauerkraut; certain cheeses; raw butter and kefir made from raw milk
Potassium	Deep greens such as spinach and broccoli; sweet potatoes; fruits such as

Vitamin/Mineral

Food sources

cantaloupe, oranges, red grapefruit,
plums and bananas

Looking at this chart, it's easy to see where the majority of problems stem from – a lack of fermented foods as well as fresh vegetables and fruits in the diet.

This chart also hints at important interactions between different nutrients. Vitamins, A, D, K2, magnesium and calcium, for example, work in tandem with each other. If one is lacking, it will affect one or more of the others.

Marine-Based Omega-3 Fats Are Important, but Keep This Caveat in Mind

Deficiency in animal-based omega-3 fats EPA and DHA⁷ is associated with an increased risk of death from all causes, and has been revealed as the sixth biggest killer of Americans. It also sets the stage for health problems such as cardiovascular disease, cancer, depression, Alzheimer's, rheumatoid arthritis and Type 2 diabetes, just to name a few.

Along with probiotics, B vitamins, magnesium, vitamin D and zinc, omega-3 fats are among the most common nutrient deficiencies associated with attention deficit disorder (ADD) and attention-deficit/hyperactivity disorder (ADHD).⁸ Telltale signs of omega-3 deficiency include dry, flaky skin, "chicken skin" on the back of your arms, dandruff or dry hair, soft brittle nails, fatigue, menstrual cramps and poor attention span.

Sardines and anchovies are one of the most concentrated sources of omega-3 fats.⁹ They also contain other nutrients that many are deficient in, such as vitamin B12, calcium and choline. It's best to purchase them in water, not in olive oil, as nutritionally inferior versions of olive oil are used in canned fish.

Keep in mind, though, that omega-3s are a type of PUFA, which you do not want to consume in excessive quantities, as they break down into dangerous metabolites known

as ALEs (advanced lipoxidation end products), which in turn cause metabolic damage. So, make sure to consume omega-3-rich foods in moderation.

If you decide to take omega-3s in supplement form, I believe krill oil is superior to fish oil. The omega-3 in krill is attached to phospholipids that increase its absorption, which means you need less of it.

Nutrient Deficiencies Are Common Even Among Those Taking Supplements

Even WITH supplementation, intakes for certain nutrients fall short of the estimated requirements, and excessive intake of any given nutrient is extremely rare. As noted by the authors of a 2014 study:¹⁰

"Only 0%, 8% and 33% of the population had total usual intakes of potassium, choline and vitamin K above the adequate intake when food and MVMM (multivitamin/mineral supplements) use was considered.

The percentage of the population with total intakes greater than the tolerable upper intake level (UL) was very low for all nutrients; excess intakes of zinc were the highest (3.5%) across the population of all of the nutrients assessed ..."

Also, as noted by Medtech Boston:¹¹

"On January 6, 2016, the U.S. Departments of Health and Human Services and of Agriculture released the 2015 [to] 2020 Dietary Guidelines for Americans ...

Consistent with the above findings, the Guidelines identified potassium, dietary fiber, choline, magnesium, calcium and vitamins A, D, E and C as nutrients 'consumed by many individuals in amounts below the Estimated Average Requirement or Adequate Intake levels.'

And while the Guidelines state as a goal that people should 'meet nutritional needs primarily through foods,' they also recognize that dietary supplements are

'useful in providing one or more nutrients that otherwise may be consumed in less than recommended amounts ...'

Optimizing Your Vitamin D Goes a Long Way Toward Improving Health

Vitamin D was one of the nutrients most people failed to get sufficient amounts of, even when taking vitamin supplements. One reason for this is that vitamin D is best obtained from sensible sun exposure, not pills or fortified foods.

This is how your body was designed to produce it, and oral supplementation appears to have certain drawbacks. That said, vitamin D-rich foods and D3 supplements are necessary if you cannot get adequate sun exposure year-round.

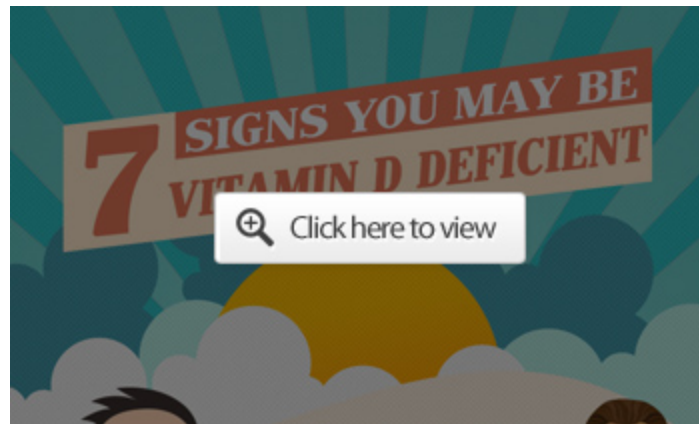
Avoiding processed foods is another important consideration, as they tend to be loaded with the herbicide glyphosate (used on most conventional and genetically engineered food crops), and **glyphosate** has been shown to interfere with enzymes responsible for activating vitamin D in your liver and kidneys.

Eliminating processed foods from your diet also lowers your consumption of seed oils (rich in linoleic acid or LA), which is one of the most important steps to take before increasing your sun exposure. These oils migrate to your skin and oxidize when exposed to sunlight, causing inflammation and DNA damage, which makes you more prone to sunburn.

If you've been on a high-LA diet, I recommend avoiding intense sun exposure until you've reduced your seed oil intake for four to six months. As you reduce your LA intake, you can slowly increase your time in the sun and safely enjoy an hour or more during peak sunlight hours.

A growing body of evidence shows that vitamin D plays a role in maintaining optimal health. There are about 30,000 genes in your body and vitamin D affects nearly 3,000 of them, as well as vitamin D receptors located throughout your body.

Signs indicating you have a vitamin D deficiency include having darker skin, obesity, achy bones, feeling blue, head sweating and poor immune function. Being over the age of 50 also puts you at a higher risk of deficiency.



Your best bet is to [get your vitamin D level tested](#) twice a year. Based on the evaluation of healthy populations that get plenty of natural sun exposure, the optimal range for general health appears to be somewhere between 60 and 80 nanograms per milliliter (ng/ml). In Europe, the measurements you're looking for are 150 to 200 nmol/L, respectively.

The Importance of Magnesium

Magnesium is the fourth most abundant mineral in your body, and researchers have detected more than 3,750 magnesium-binding sites on human proteins,¹² reflecting how important this mineral is for optimal biological functioning. The fact that magnesium is the third most common deficiency hints at the potential that magnesium deficiency might be involved in any health problem you're experiencing.

Without sufficient amounts of magnesium, your body simply cannot function at its best. Insufficient cellular magnesium levels set the stage for deterioration of proper metabolic function, which leads to more significant health problems. For example, magnesium plays an important role in:

- Your body's detoxification processes
- Preventing headaches

- Managing cardiovascular health
- Reducing insulin resistance^{13,14,15} and metabolic syndrome¹⁶ if you're at high risk. The mechanism by which magnesium controls glucose and insulin homeostasis appears to involve two genes responsible for magnesium homeostasis.¹⁷ Magnesium is also required to activate tyrosine kinase, an enzyme that functions as an "on" or "off" switch in many cellular functions and is required for the proper function of your insulin receptors

Are You Getting Enough Magnesium?

Experts estimate up to 80% of us are deficient in magnesium. Since there's no easily available commercial lab test that will give you an accurate reading of your magnesium status, the best way to evaluate your status is by tracking your signs and symptoms. In her book, "The Magnesium Miracle," Dr. Carolyn Dean lists 100 factors that will help you decide whether or not you might be deficient.

Magnesium deficiency symptoms include headaches, muscle spasms and fatigue.¹⁸ Besides eating magnesium-rich foods (see chart above), you can also improve your magnesium status by taking regular Epsom salt baths or foot baths, which allow the magnesium to be absorbed into your body through your skin. Magnesium oil (from magnesium chloride) is also used for topical application and absorption.

If you plan to take a magnesium supplement, start with magnesium citrate to find your ideal dose. Gradually increase the dose until you experience loose stools, then reduce it slightly – this indicates your ideal dose. After that, switch to the magnesium form you prefer. I recommend magnesium threonate, as it doesn't cause loose stools like magnesium citrate.

Mind Your Sodium to Potassium Balance

Sodium and potassium are two other key nutrients that need to be in balance for optimal health. It's particularly important for heart health. In addition to getting too little

potassium in their diet, most people also get too much sodium. If you eat mostly processed foods, you're virtually guaranteed to end up with this imbalance.

According to the American Heart Association (AHA), an excess of sodium in your body causes you to retain water, putting an extra burden on your heart, blood vessels and kidneys. Past recommendations have assumed that in some people this could lead to high blood pressure.¹⁹ But, sodium is just one-half of the ratio needed to keep your body healthy. The second half of the equation is potassium.

The protective effects of potassium are associated with the actions of nitric oxide release, which increases the relaxation of your arterial system and maintains blood pressure.²⁰

The separate roles of sodium and potassium, and their relationship to heart health, have been studied over the years. Researchers have also evaluated the relationship between a combination of sodium and potassium and heart health. One study showed the sodium-to-potassium ratio was more strongly associated with blood pressure maintenance than either sodium or potassium individually.²¹

Other studies have also suggested that the ratio of sodium to potassium is one of the most important risk factors for managing normal cardiovascular function.^{22,23,24} Women who eat a higher amount of potassium-rich foods are able to better manage their normal cardiovascular function.²⁵

Data from over 12,000 individuals participating in the Third National Health and Nutrition Examination also showed that higher sodium was associated with increased health risks, while a higher potassium level was also associated with increased risks.²⁶

Potassium-Rich Foods Low in Sodium

The best way to balance your sodium and potassium ratio is to increase your intake of foods rich in potassium, while maintaining a moderate amount of sodium intake. Whole foods naturally high in potassium and low in sodium include:^{27,28}

Garlic	Spinach	Sweet potatoes
Broccoli	Cantaloupe	Cherry tomatoes
Blackberries	Oranges	Red grapefruit
Plums	Prunes	Raisins
Bananas	Artichokes	Apricots
Acorn squash	Bee pollen	

Vitamin E for Brain Health

Vitamin E is particularly important for brain health, so the fact that an estimated 65% of 2- to 8-year-olds, 99% of teenagers and 94% of adults are at risk for deficiency is disconcerting, to say the least.²⁹ Research warns that vitamin E deficiency affects the brain, and studies have also found it helps delay the loss of cognitive function.³⁰

Vitamin E also helps protect against free radical damage and the effects of aging. The term "vitamin E" refers to a family of at least eight fat-soluble antioxidant compounds, divided into two main categories – tocopherols (which are considered the "true" vitamin E) and tocotrienols, each of which has subfamilies of four different forms.

Your best source of intake is [vitamin E-rich foods](#). When opting for a supplement, choose a full-spectrum vitamin E (meaning the broader family of mixed natural tocopherols and tocotrienols). Avoid the synthetic form. You can tell what you're buying by carefully reading the label. Natural vitamin E is always listed as the "d-" form (d-alpha-tocopherol, d-beta-tocopherol, etc.), while synthetic vitamin E is listed as "dl-" form.

Vitamins A and D Work in Tandem

An estimated 57% of teens and 51% of American adults are at risk for insufficiency or deficiency of vitamin A, an essential fat-soluble vitamin important for maintaining healthy skin, teeth, bones, cell membranes, vision and healthy immune function.

Vitamins A and D work in tandem, and there's evidence suggesting that without vitamin D, vitamin A is ineffective or even toxic. On the other hand, if you're deficient in vitamin A, vitamin D cannot function properly either, so a balance of these two vitamins is essential.

Unfortunately, we do not yet know the optimal ratios between these two vitamins. Moreover, both vitamin A and vitamin D production is tightly controlled in your body, and taking either of them in supplemental form ends up bypassing important controls that keep you from experiencing potential toxic effects. For these two reasons, it's best to get vitamins A and D from food and sun exposure, rather than relying on supplements.

The best sources of vitamin A are animal products such as grass fed meat and poultry, liver and raw organic dairy products like butter. These foods contain retinol, preformed vitamin A that your body can easily use.³¹ It's very difficult to get sufficient amounts of vitamin A from beta-carotene (pre-vitamin A, found in plant foods like fruits and vegetables) alone.

Calcium Must Be Balanced with Vitamin D, Magnesium and K2

Calcium is one of several nutrients required for strong, healthy bones. However, it's important to not overdo it on calcium supplements, as it needs to be balanced with **vitamins D, K2 and magnesium**. Excessive amounts of calcium end up causing more harm than good.

- Too much calcium and not enough magnesium typically causes muscle spasms, and in extreme cases leads to a heart attack and sudden death.
- Too much calcium and not enough vitamin K2 will promote the hardening of the arteries and softening of your bones. The reason for these effects is that the biological role of vitamin K2 is to remove calcium from areas where it shouldn't be

(such as in your arteries and soft tissues), and shuttle it into the appropriate areas (such as your bones and teeth).

- Too much vitamin D and not enough vitamin K2 is what produces the symptoms of vitamin D toxicity, which includes inappropriate calcification of your arteries.

Ideal Sources of Vitamin K2, Silica and Calcium

One of the best ways to achieve a healthy balance between vitamin D, magnesium, K2 and calcium is to get plenty of sensible sun exposure and eat a diet rich in fresh whole foods. Good sources of calcium are raw milk from pasture-raised cows, leafy green vegetables and the pith of citrus fruits, carob and wheatgrass.

You also need sources of silica, which some researchers say is enzymatically "transmuted" by your body into the kind of calcium your bones can use. Good sources of silica are cucumbers, bell peppers, tomatoes and a number of herbs, including horsetail, nettles, oat straw, alfalfa and raw cacao, which is also extremely rich in highly bioavailable magnesium.

Vitamin K2 is only present in fermented foods, such as natto (a fermented soy product), fermented vegetables like sauerkraut, certain cheeses, raw butter and kefir made from raw milk. If you decide to use a supplement, menaquinone-7 (MK-7) is the kind of vitamin K2 you want to look for, as this form is extracted from real food.³²

Tips to Supercharge Your Diet with Nutrients

As much as possible, I recommend getting the nutrients your body needs from whole foods. Trading processed foods for real, whole foods goes a long way toward correcting an array of nutritional imbalances and/or insufficiencies. Following are a few additional tips to boost your intake of the wide variety of nutrients your body needs:

- **Homemade bone broth** – Bone broth contains high amounts of calcium, magnesium and other nutrients.

- **Sprouts** – Sprouts contain up to 100 times more enzymes than raw fruits and vegetables, allowing your body to extract more vitamins, minerals, amino acids and essential fats from the foods you eat.
- **Fermented foods** – Fermented foods support the beneficial bacteria in your gut, which helps with mineral absorption and plays a role in producing nutrients such as B vitamins and vitamin K2, the latter of which is important for the proper functioning of other nutrients, such as calcium and vitamin D.

Sources and References

- ¹ Authority Nutrition October 2015 (Archived)
- ^{2, 10} Journal of American College of Nutrition 2014;33(2):94-102
- ^{3, 29} EWG.org June 19, 2014
- ^{4, 11} Medtech Boston July 26, 2016 (Archived)
- ⁵ Mother Earth News August 17, 2023
- ⁶ Daily Mail June 10, 2016
- ⁷ Huffington Post April 30, 2011
- ⁸ Impact ADHD, Top Vitamin and Mineral Deficiencies in ADHD
- ⁹ Cleveland Clinic, Omega-3 Fatty Acids
- ¹² BMC Bioinformatics. 2012;13 Suppl 14:S10
- ¹³ Nutrients September 27, 2013
- ¹⁴ Diabetic Medicine December 2013
- ¹⁵ J Am Coll Nutr. December 2006
- ¹⁶ ADA Diabetes Care October 2, 2013
- ¹⁷ Adv Biomed Res. 2022; 11: 54
- ¹⁸ University Health News September 27, 2019
- ¹⁹ American Heart Association, Common High Blood Pressure Myths
- ²⁰ Proceedings of the National Academy of Sciences, 106(8), 2829-2834
- ²¹ Advances In Nutrition: An International Review Journal, 5(6), 712-741
- ²² European Journal of Epidemiology 22(11), 763-770
- ²³ American Journal of Kidney Diseases 54(4), 598-601
- ²⁴ New England Journal of Medicine 2007; 356:1966-1978
- ²⁵ Stroke. 2014 Oct;45(10):2874-80
- ²⁶ Forbes July 12, 2011
- ²⁷ Harvard, Sodium Potassium Balance
- ²⁸ Natural News October 20, 2008
- ³⁰ NIH, April 15, 2015
- ³¹ MedlinePlus, Vitamin A

- ³² *Molecules*. 2019 Mar; 24(5): 829