Vitamin B12: Essential for Vigorous Good Health

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Vitamin B12 is fittingly known as the energy vitamin, and your body requires it for a number of vital functions. Among them: energy production, blood formation, DNA synthesis, and myelin formation. Myelin is insulation that protects your nerve endings and allows them to communicate with one another.

If you know or suspect you're vitamin B12 deficient, you're not alone. Recent studies from the U.S. Framingham trial show one in four adults in the United States are deficient in this vitally important nutrient, and nearly half the population has suboptimal blood levels.

Vitamin B12, also known by the scientific name cobalamin, is water-soluble. Unlike other water-soluble vitamins, B12 doesn't exit your body quickly in urine. It is stored in your liver, kidneys and other body tissues. As a result, a deficiency may not show itself for a number of years, depending on your diet and your body's ability to efficiently absorb B12. This time lag is a serious concern, because after about seven years of B12 deficiency, irreversible brain damage can result.

Vitamin B12 is a powerhouse micronutrient for a whole host of reasons. Your body needs B12 for:

- proper digestion, food absorption, iron use, carbohydrate and fat metabolism
- healthy nervous system function
- promotion of normal nerve growth and development
- help with regulation of the formation of red blood cells
- cell formation and longevity
- proper circulation
- adrenal hormone production
- healthy immune system function
- support of female reproductive health and pregnancy
- feelings of well-being and mood regulation
- mental clarity, concentration, memory function
- physical, emotional and mental energy

As you can see from this list, your B12 level impacts a number of very important systems in your body -- everything from your DNA to how happy you feel. If you think you might be deficient in this vitamin, you need to take steps to get your B12 levels into the healthy range.

I'll discuss the proper test to determine your B12 blood level as well as the latest information on what constitutes a healthy range a little later in this article.

Symptoms of Vitamin B12 Deficiency

If you don't have adequate vitamin B12 levels in your bloodstream, you might notice some of the following warning signs:

1. mental fogginess
2. problems with your memory
3. mood swings
4. lack of motivation
5. feelings of apathy
6. fatigue and a lack energy
7. muscle weakness
8. tingling in your extremities

One of the most important functions of vitamin B12 is building the myelin which insulates and protects your nerve endings and allows them to communicate with one another.

If you're B12 deficient and your myelin is depleted, you can experience health problems as widespread as depression, dementia and even symptoms which mimic multiple sclerosis.

Depression

Depression is thought to be linked to a shortage of compounds called monoamines, which are manufactured by your central nervous system. Vitamin B12 helps your body make these compounds. There is also evidence high levels of homocysteine associated with B12 deficiency may promote depression.

Dementia and Alzheimer's

Research also indicates a B12 deficiency may lead to cognitive problems and reversible dementia in the elderly. This type of treatable dementia differs from Alzheimer's, however, B12 may play a role in this growing epidemic as well.

A study of over 100 senior volunteers showed older individuals with low levels of vitamin B12 are more apt to suffer from brain atrophy or shrinkage. Brain atrophy is a well-established characteristic of Alzheimer's disease.

Anemia

A lack of vitamin B12 can result in a condition called pernicious anemia. Pernicious anemia is characterized by a lack of healthy red blood cells, and a larger size of existing cells.

Since vitamin B12 helps in the formation of red blood cells, a chronic lack of adequate B12 will naturally affect your body's ability to create red blood cells, eventually leading to anemia. "Pernicious" was the adjective applied to the often fatal condition back in the days before it was understood to be caused by a lack of vitamin B12.

Left untreated, pernicious anemia can do permanent, serious damage to your body. It can increase your risk for heart problems and strokes. It can damage your nerve cells and affect everything from your balance to your sense of smell. It can also cause changes to the surface of your digestive tract, increasing your risk of stomach cancer.

Sleep Problems

If you have trouble sleeping, it could be due to a lack of melatonin in your system. If you're a regular reader of my newsletter you know the importance I place on adequate good quality sleep for optimum health.

Melatonin is known as the "sleep hormone" and as you age, your body becomes less efficient at producing this chemical.

B12 plays a crucial role in melatonin production, which is another reason it is important to make sure you're receiving an adequate amount of this vitamin into your blood.

Neurological and Neuropsychiatric Conditions

Inadequate vitamin B12 levels have been linked to many neurological conditions in addition to dementia and Alzheimer's, including spinal cord disease and peripheral neuropathy.

Peripheral neuropathy is a disease or dysfunction of your peripheral nerves, and can include numbness and tremor, as well as opposite sensations like tingling, pain, itching and pins and needles. Your skin can become hypersensitive to the point where you can't stand to have anything touching certain areas of your body – clothing and bedding actually cause pain. If your muscles are involved they may feel weak, tired or heavy, and you may experience muscle cramps, tremors, and soreness.

A lack of vitamin B12 might also be implicated in migraine headaches and Parkinson's disease, both of which are neurological conditions.

Vitamin B12 deficiency has also been linked to psychiatric disorders, which are grouped into the following methods of expression:

1. Mood disturbances … apathy, depression, eating abnormalities, and behavior disturbances which occur specifically at night
2. Hyperactivity … agitation, euphoria, irritability, lack of inhibition, and motor disturbances
3. Psychosis … hallucinations and delusions

Optic neuropathy is another outcome of vitamin B12 deficiency. Long-term, chronic B12 deficiency is known to cause deterioration of the optic nerves, resulting in blindness. This is an irreversible condition.

Cardiovascular and Cerebrovascular Diseases

Cardiovascular and cerebrovascular diseases have a common risk factor – increased homocysteine levels in the blood.

Studies show insufficient amounts of folic acid and vitamin B12 can elevate your homocysteine levels, potentially increasing your risk for heart disease and stroke.

Cancer

We know vitamin B12 plays an important role in DNA synthesis, and its presence in your cells, along with folic acid, helps to alleviate the wear and tear on your genetic material. Damage to DNA is a well-known risk factor for cancer.

Low levels of B12 are specifically linked to increased risk for breast and cervical cancer.

How B12 Deficiency Affects Fertility, Pregnancy and Breastfeeding

Elevated homocysteine levels which result from an inadequate intake of B12 are well-known markers for increased risk of heart problems and stroke. Less known is the fact high levels of homocysteine are also very dangerous during pregnancy and can lead to complications and birth defects.

Pregnant women with B12 deficiency carry an increased risk of having a baby born with neural tube defects, a class of birth defects affecting the infant's brain and spinal cord. Spina bifida, which can cause paralysis, is a type of neural tube defect, as is anencephaly, which is fatal.

If you're planning a pregnancy, it's absolutely critical to attain a healthy level of vitamin B12 in your blood stream before you conceive. Neural tube defects develop within the first four weeks of fetal life, so if you wait until you're pregnant to check your B12 levels, it could be too late.

If you've had trouble conceiving or lost pregnancies through miscarriage, you should have your vitamin B12 levels checked. A B12 deficiency has been linked to infertility and repeated miscarriages

If your diet doesn't include animal products and you're breastfeeding, your baby could develop brain abnormalities due to a vitamin B12 deficiency.

How You Get Vitamin B12 Deficiency

Vitamin B12 is present in natural form only in animal sources of food, which is one of the reasons I advise against being a strict vegetarian or vegan. There are many well-documented cases of blindness and brain abnormalities in strict vegetarians resulting from vitamin B12 deficiency.

The older you get the more likely you are to have a vitamin B12 deficiency. The two ways you become deficient are through a lack of vitamin B12 in your diet, or through your inability to absorb it from the food you eat.

I recently visited India, which is primarily a vegetarian based culture. Current studies there show about 80 percent of adults are deficient in vitamin B12.

Vegans and Vegetarians

Vitamin B12 deficiency is extremely common in strict vegetarians and vegans. B12 is not readily available in plants, so if you do not eat meat or animal products you are at risk.

Vitamin B12 is found almost exclusively in animal tissues, including foods like beef and beef liver, lamb, snapper, venison, salmon, shrimp, scallops, poultry and eggs.

The few plant foods that are sources of B12 are actually B12 analogs. An analog is a substance that blocks the uptake of true B12, so your body's need for the nutrient actually increases.

If you are not a vegan/vegetarian, are including food sources of B12 in your diet and are still deficient in the vitamin, it is likely due to one of the following reasons.

Age-Related Insufficient Production of Hydrochloric Acid

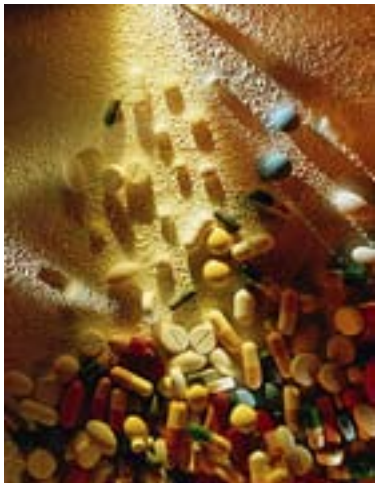
The older you get the more your digestive system breaks down, especially if you've been following the standard American diet. Specifically, the lining of your stomach gradually loses its ability to produce hydrochloric acid which releases vitamin B12 from your food.

If you're over 50, it's safe to assume you are not absorbing vitamin B12 at an optimal level.

Use of Antacids and Anti-Ulcer Drugs

The use of antacids or anti ulcer drugs will also lower your stomach acid secretion and decrease your ability to absorb vitamin B12.

Stomach acid (hydrochloric acid) is a crucial ingredient in your body's ability to absorb B12. If you're taking a medication specifically designed to reduce the amount of stomach acid you produce, your body's ability to use vitamin B12 from the food you eat or the supplements you take will be significantly compromised.



Use of the Drug Metformin©

If you take Metformin© (brand names Glucophage, Glucophage XR, Fortamet, Riomet, Glumetza, and others) for diabetes, the drug may reduce your B12 absorption through interference with the metabolism of calcium in your body. Calcium is another necessary component in your body's ability to absorb B12.

A recent study indicates that the longer a person with Type 2 diabetes takes Metformin© and the higher the dose, the greater the risk for vitamin B12 deficiency.

Use of Other Medications

Many prescription drugs have the potential to diminish the level of B12 in your system, including:

- antibiotics
- anti-cancer medications
- anticonvulsants
- anti-gout medications
- anti-hypertensives
- drugs to treat Parkinson's disease
- antipsychotics
- tuberculosis medications
- birth control pills
- cholesterol-lowering drugs
- potassium replacements

Coffee Drinkers

According to recent research, if you drink four or more cups of coffee a day you are likely to experience a 15 percent reduction in B vitamins compared to people who don't drink coffee.

Bacterial Infection

Infection with Helicobacter pylori, a common contributor to stomach ulcers, can also result in vitamin B12 deficiency.

The H. pylori bacteria damage the cells of the stomach which produce intrinsic factor. Intrinsic factor is a crucial requirement for the absorption of vitamin B12 --I'll discuss its importance in more detail shortly.

Weight Loss Surgery Patients

If you've had gastric bypass surgery, you may be B12 deficient. The surgery often disrupts the mechanisms which aid your body in absorbing vitamin B12 and other vitamins.

Exposure to Nitrous Oxide (Laughing Gas Anesthesia)

There is ample evidence to indicate exposure to nitrous oxide may destroy B12 reserves.

Nitrous oxide is used by dentists for pain management and in operating rooms as a form of anesthesia. Use of the gas can pose a significant risk to those with existing undiagnosed or untreated B12 deficiency.

Health care workers who are routinely exposed to nitrous oxide are also at risk. And of grave concern is the abuse of the gas by medical personnel, teenagers and young adults who use it for its euphoric effects. This practice can result in severe neurological damage.

Food-Cobalamin Malabsorption Syndrome

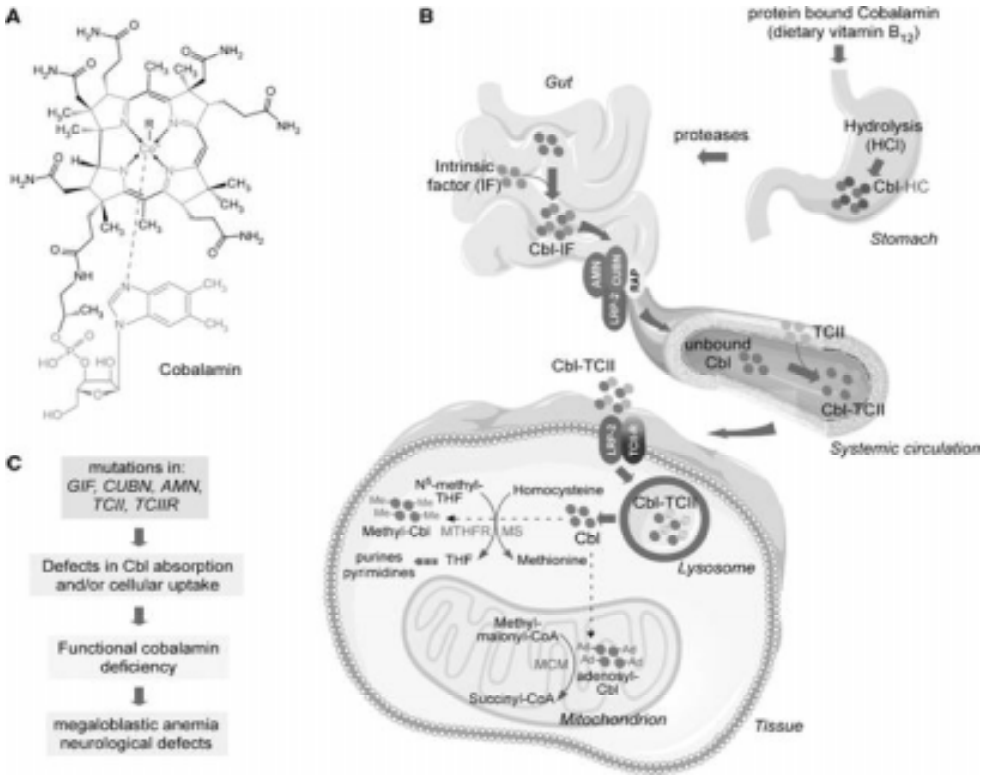
The main cause of vitamin B12 deficiency is a term researchers call food-cobalamin malabsorption syndrome. (Remember cobalamin is the scientific term for vitamin B12.)

This condition typically results when your stomach lining loses its ability to produce intrinsic factor, which is a protein that binds to vitamin B12 and allows your body to absorb it into your bloodstream at the end of your small intestine.

The Fundamental Role of Intrinsic Factor in Vitamin B12 Absorption

The key point to understand here is that if your body is not making intrinsic factor, you could swallow vitamin B12 till the cows come home and you simply won't absorb it.
The Essential Role of Intrinsic Factor
Part of the reason you require a binding protein like intrinsic factor is that vitamin B12 is a very large molecule. It is actually the largest vitamin we know of. In addition, the way it gets absorbed into your body involves a complex series of events.

Intrinsic factor is a molecule protein made by your stomach. It grabs onto the B12 molecule and together they move through your stomach to your small intestine. When they reach the end of your small intestine, the intrinsic factor is absorbed first, pulling the B12 with it into the cells of your large intestine, where they are absorbed for use by the rest of your body.



Cobalamin (cbl) absorption and metabolic pathway.

A. Structure of cobalamin (vitamin B12) with a corrin ring bound to a central cobalt atom.
B. The metabolic journey of cbl from nutrient intake to its intestinal absorption. Endocytic receptors and proteins responsible for vitamin B12 intestinal absorption include cubilin (CUBN), amnionless (AMN), receptor-associated protein (RAP) and megalin (LRP-2). The membrane megalin/transcobalamin II (TCII) receptor complex allows the cellular uptake of cbl. Lysosomal-mediated degradation of TCII and subsequent release of free cbl is essential for vitamin B12 metabolic functions. MS: methonine synthase; THF: tetrahydrofolate; MTHFR: methyltetrahydrofolate reductase; MCM: methylmalonyl coA mutase.
C. Mutations in genes encoding the IF (GIF), CUBN, AMN, TCII or its receptor provoke defects in cbl absorption and/or cellular uptake which translates into functional cbl deficiency and its clinical manifestations.

If your body doesn't produce enough stomach acid, then you're not producing enough intrinsic factor either.

Indigestion, heartburn and gastric reflux disease (GERD) are conditions which normally develop later in life. While symptoms feel like your stomach is making too much acid, in the vast majority of cases, the reverse is true – too little stomach acid is being produced.

To make matters worse, the first thing many people do when they get symptoms of indigestion or heartburn is reach for an antacid, further compromising their ability to produce hydrochloric acid.

Lack of free acid in your stomach interferes with digestion and reduces the amount of nutrients you get from the food you eat.

Since a lack of stomach acid means a lack of intrinsic factor, and since the only way vitamin B12 can be absorbed into your system is through bonding with intrinsic factor molecules, it's easy to understand why so many people are not getting adequate B12 into their bodies.

This is why vitamin B12 shots are so popular. They bypass absorption problems and put the vitamin directly into your bloodstream.

Testing for B12 Deficiency

Blood tests for vitamin B12 deficiency aren't as clear cut or helpful as they are for other nutritional deficiencies. Standard tests to assess vitamin B12 concentrations are limited because the clinical severity of vitamin B12 deficiency is unrelated to vitamin B12 concentrations.

Researchers have established the following recommendations to screen for vitamin B12 deficiency:

- If your vitamin B12 concentration is less than 150 pmol/L, you are considered B12 deficient and you and your health care practitioner should take steps to determine the underlying cause(s) and treatment.
- If your B12 concentration is between 150 and 200 pmol/L, your serum MMA (Methylmalonic Acid) level should be determined to identify whether your situation requires more investigation and treatment. Research suggests elevated levels of MMA (a natural compound found in your body) are an indicator for vitamin B12 deficiency.

Getting your B12 and MMA serum levels lab tested is one way to go, especially if you have a compelling reason to have “official” test results.

However, it is probably a more practical approach if you suspect or are concerned you are vitamin B12 deficient, to simply supplement your diet with B12 and see if your symptoms improve.

Vitamin B12 supplementation is completely non-toxic and inexpensive, especially when compared to the cost of laboratory testing. In fact, the first treatment most doctors and other health care experts will suggest upon receiving B12 deficiency lab test results is supplementation with vitamin B12. So again, it is an entirely reasonable approach to try supplementation first to see if your symptoms improve.

Natural Sources of Vitamin B12

One of the best natural sources for vitamin B12 is certain types of seafood. Unfortunately, it is very difficult to buy commercially produced un-contaminated fish, and it is my firm belief the risks associated with mercury laden seafood outweigh its health benefits.

I do not recommend eating any commercially available fish, as it is just too difficult to determine its purity and safety. This is especially true if you’re pregnant or have a growing family, as methyl mercury is highly toxic to the developing brains and nervous systems of infants and children.

Beef and beef liver are also good sources of B12, but keep in mind grass-fed beef is highly preferable to the grain-fed variety.

Chicken is also a natural source of vitamin B12. Organic chicken is the way to go, as conventionally raised chickens may harbor antibiotic-resistant strains of bacteria.

Pork is another source of vitamin B12. It is not a food I recommend, however. Pigs are scavengers and will eat almost anything, making them susceptible to retroviruses and parasites. These bugs have a high probability of making it into pork food supplies, and no amount of cooking can insure they have been killed.

If you must eat pork, your safest bet is to eat the meat of non farm-raised animals, fed organically. However, you should avoid all processed pork products like bacon and sausage.

Regardless of which meat you prefer, keep in mind -- how it is cooked can also mean the difference between a nutritious meal and an unhealthy one.

Drinking milk is another way to get vitamin B12. However, avoid pasteurized milk even if it’s organic. The only milk I recommend is raw milk. Look for Certified Grade A milk, produced under government supervision and guaranteed absolutely clean.

Eggs are another source of vitamin B12, and there's a bonus: eggs are one of the healthiest all-around foods in the world.

Ideally you'll be able to buy your eggs locally from a free-range pasture farm. Second choice would be to buy free-range organic from the grocery store. Don't go for the omega-3 added eggs – they are actually less healthy for you than regular eggs.

As with all foods, how you prepare your eggs makes a big difference in their nutritional value. I recommend eating eggs raw, however, if you choose to cook them, soft-boiling is your next best option. Scrambling is the least desirable of all cooking methods, especially if you have high cholesterol.

A Word about Vitamin B12 Fortified Breakfast Cereals

In doing your research on food sources of vitamin B12, you'll likely find vitamin fortified breakfast cereals on most mainstream lists. I completely disagree with this recommendation I completely disagree with this recommendation.

Vitamin fortified or not, cereals are not a healthy food. The highly processed grains in cereals quickly break down to sugar in your system, and stimulate insulin production. Infants and children also do not fare well eating cereal.

Supplementation: Science Develops a Better Way to Replenish Your B12 Stores

Part of the reason vitamin B12 is so difficult to absorb and requires an additional protein is because it is a massively large molecule when compared with the other vitamins. It is far larger than any other vitamin and requires extraordinary measures to actually push this molecule into your blood.

Since the primary challenge your body faces in absorbing vitamin B12 is the large size of the molecule, a B12 delivery system which shrinks the molecules makes perfect sense.

Science has recently developed a technology that can reduce the effective size of the vitamin B12 molecule and help you absorb this molecule into the fine capillaries under your tongue. The delivery system for these microscopic droplets of vitamin B12 is a fine mist you spray into your mouth.

This delivery system bypasses the intrinsic factor problem and is much easier, safer and less painful than a vitamin B12 shot.

Next Steps

Vitamin B12 deficiency is a potentially life-threatening condition. A best case scenario if you're B12 deficient is you aren't in optimal good health, which is always the goal.

To review, if you fall into one of the following categories, you should investigate whether you are B12 deficient:

- You are a vegan or vegetarian
- You are over 50
- You take antacids or anti-ulcer medication
- You take Metformin© for diabetes
- You take other prescription drugs known to deplete your B12 stores (see list above)
- You drink four or more cups a coffee a day
- You have or had an H. pylori bacterial infection
- You've had weight loss surgery
- You've been exposed to nitrous oxide (laughing gas)
- You suffer from indigestion, heartburn or GERD

Symptoms or warning signs of a possible B12 deficiency include:

1. Mental fogginess or problems with your memory
2. Mood swings, a feeling of apathy or lack of motivation
3. Fatigue, a lack of energy, muscle weakness, tingling in your arms or legs

If you aren't getting sufficient B12 in your diet, or you suspect your body isn't able to efficiently absorb the vitamin, I recommend you begin supplementation immediately with either an under-the-tongue fine mist spray or vitamin B12 injections.

Ensuring your body has adequate B12 can vastly improve the quality of your life today, and prevent debilitating, even life-threatening diseases which result from a deficiency of this all-important nutrient.

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