Vitamin D deficiency is well known as the cause of bone diseases such as rickets, osteoporosis, and osteomalacia. However, in epidemiological studies, vitamin D deficiency has also been linked to nonskeletal illnesses. The ones most commonly cited are cardiovascular disease (CVD), cancer (especially colorectal and breast), and certain infectious and autoimmune diseases.

Cardiovascular Disease
The potential link between vitamin D and CVD may have a biologic basis. For example, vitamin D receptors and related metabolic enzymes are found in blood vessels and tissues of the heart. Vitamin D may reduce platelet cell adhesion, suppress inflammation, and decrease renin gene expression, leading to less vasoconstriction.1-4

Most of the literature exploring a link between vitamin D and CVD consists of observational studies. Some, but not all, of these studies show an association between decreased 25(OH)D concentration and a higher incidence of CVD surrogate markers and risk factors.1-4 Observational studies have also shown similar data regarding CVD events.1,2,4 However, there are no clinical trials that show raising vitamin D levels to the therapeutic range reduces the risk of CVD.

Cancer
The story is similar for cancer. Epidemiologic data show that higher levels of vitamin D are associated with a lower incidence of cancer. For example, McDonnell et al reported that concentrations ≥40 ng/mL are associated with a >65% lower cancer risk in women 55 years and older. In this study, 13 types of cancer were diagnosed in women during the 4-year follow-up period. Breast cancer accounted for 43% of the cancers.5

Again, evidence points to a potential biologic basis. Vitamin D receptors have been found in a number of tissues, including colon, breast, prostate, and brain. The active form of vitamin D is involved in the control of more than 200 genes, including those involved in immune function and regulating cell growth and apoptosis.

As with CVD and vitamin D, it is unknown whether raising vitamin D blood levels will reduce cancer risk. Some studies do suggest, however, that having a level in the optimal range increases the chance of recovery from cancer.6

What the Guidelines Say
The Endocrine Society recommends screening people at high risk. These include people with7:

- Bone disorders
- Certain lymphomas
- Chronic kidney disease
- Dark complexions
- Granuloma-forming disorders
- Hepatic failure
- Hyperparathyroidism
- Malabsorption syndromes (cystic fibrosis, inflammatory bowel disease, bariatric surgery, radiation enteritis)
- Medications that increase vitamin D metabolism (eg, anticonvulsants, antiretrovirals, antifungals, cholestyramine, glucocorticoids)

Obese people, pregnant or lactating women, and elderly people with a history of falls or nontraumatic fracture are also at high risk for vitamin D deficiency.

The Society further recommends against screening people who are not at high risk.7

Spotlight on Health
Vitamin D Beyond Bone Health
**Infectious Diseases**

Vitamin D receptors are present in immune cells as well as bronchial and pulmonary epithelial cells. Thus, studies have looked for links between vitamin D and infectious diseases. These studies primarily focused on upper respiratory tract infections (RTIs) (eg, cold and influenza), pneumonia, and tuberculosis. Once again, observational studies show a link between low blood levels and elevated disease risk, but the effect of supplementation on prevention and treatment is not clear. For example, some studies show healthy children and adults have a lower risk of RTI when taking 300 to 2,000 IU/day. Others showed no benefit. Vitamin D appears to have no benefit for treating or reducing the risk of pneumonia, and adjunctive vitamin D does not appreciably alter the clearance of *Mycobacterium tuberculosis*. People with tuberculosis and initially very low vitamin D blood levels may benefit in other ways during treatment, however.

**Autoimmune Diseases**

In epidemiological studies, low levels of vitamin D have been linked to certain autoimmune diseases. These include Crohn disease, diabetes mellitus type 1, multiple sclerosis, rheumatoid arthritis, antiphospholipid syndrome, autoimmune thyroiditis, primary biliary cirrhosis, Sjögren syndrome, and systemic lupus erythematosus.

At this time, it’s uncertain whether the low levels of vitamin D are a consequence of the autoimmune disease or if they contribute to the pathogenesis. However, some data suggest supplementation may help prevent type 1 diabetes and multiple sclerosis.

**Tests Offered by Quest Diagnostics**

Quest Diagnostics offers an immunoassay and 2 LC/MS/MS methods, 1 for adults and children and 1 for infants. All methods are certified by the Centers for Disease Control and Prevention Vitamin D Standardization-Certification Program.

The immunoassay measures total 25-hydroxyvitamin D (25(OH)D). Results are typically available within a day; thus, results can be reported at the same time as many other “routine” tests.

The LC/MS/MS methods measure 25(OH)D$_2$ and 25(OH)D$_3$. These 2 measurements are added to calculate the total 25(OH)D concentration. All 3 values are reported. The assay for infants includes separation of 3-epimer, the low-activity form of 25(OH)D$_3$, to avoid overestimation of total vitamin D activity. LC/MS/MS results are typically available within 1 to 2 days (adults and children) or 2 to 3 days (infants).

**References**


Spotlight on Health

Vitamin D
Beyond Bone Health

Scientists have long known that we need vitamin D to keep our bones healthy. But they are now learning that vitamin D is not just important for bone health. They have done studies of people with other diseases. These studies have shown a link between vitamin D and other health conditions. In this newsletter we'll talk about how vitamin D is linked to heart disease, cancer, certain infections, and some autoimmune diseases.

Heart Disease
Our blood vessels and heart tissues have chemicals that bind vitamin D. This is a hint that vitamin D has some kind of function in these tissues. Scientists have learned that vitamin D helps keep platelets from sticking to blood vessel walls. It also decreases inflammation and helps keep blood pressure low. All these things are important for a healthy heart.

Does this mean people with low amounts of vitamin D in their blood are at risk for heart disease? They might be. Studies show that people with heart disease often have low amounts of vitamin D. But scientists don't know if the low amounts help cause heart disease. They also don't know if increasing vitamin D from a low amount to a higher amount will reduce the risk of getting heart disease.

Cancer
The story is similar for cancer. Chemicals that bind vitamin D have been found in the colon, breast, and prostate. These are fairly common sites for cancer. Vitamin D helps control many genes that are involved in cell growth, cell death, and the immune system. So vitamin D might help keep cells from growing out of control and forming a cancer. It might also help the immune system fight cancer.

Scientists have found that people with more vitamin D in their blood get cancer less often. But they don't know if raising vitamin D levels in the blood will reduce a person's risk for cancer.

Infectious Diseases
Chemicals that bind vitamin D are found in immune cells and cells in the lungs. So scientists have looked for links between vitamin D and infections that affect the lungs. These include the common cold and flu, pneumonia, and tuberculosis (TB). Scientists found that low levels of vitamin D are linked to a higher risk for these infections. They don't know yet if higher amounts of vitamin D will help keep a person from getting these illnesses. They also don't know if vitamin D can help a sick person feel better.

People at Risk for Vitamin D Deficiency
- People who do not get enough sunlight
- People with dark skin
- Breast-fed infants
- Older adults
- Obese people
- People who have had gastric bypass surgery
- People who have certain medical conditions
- People taking certain medications

If you are one of these people, talk with your doctor. He or she might want to do a blood test to find out if you have enough vitamin D in your blood.
Autoimmune Diseases

As mentioned before, chemicals that bind vitamin D are found in immune cells. Some of these cells produce antibodies that help keep the body healthy. But in autoimmune disease, the antibodies harm the body instead.

Scientists have found a link between vitamin D and certain autoimmune diseases. You may have heard of some of them. They include:

• Antiphospholipid syndrome
• Autoimmune thyroiditis
• Crohn disease
• Multiple sclerosis (MS)
• Primary biliary cirrhosis
• Rheumatoid arthritis
• Sjögren syndrome
• Systemic lupus erythematosus (SLE)
• Type 1 diabetes

At this time, scientists don’t know if an autoimmune disease can cause low levels of vitamin D. Nor do they know if vitamin D plays a role in the development of the disease. Some scientists think that getting more vitamin D might help prevent 2 kinds of autoimmune disease: type 1 diabetes and multiple sclerosis.

In Summary

Scientists know for sure that getting enough vitamin D is important for healthy bones. It can keep people from getting bone disease. It can also be used to treat people who have bone disease.

Although there is still a lot to learn, it now looks like vitamin D is linked to other health conditions, too. These include heart disease, cancer, certain infections, and some autoimmune diseases. More studies are needed to know how important these links are. But in the meantime, make sure you get enough vitamin D to maintain overall good health.

How to Get Enough Vitamin D

Vitamin D is called the sunshine vitamin. Your skin can make all the vitamin D you need if it gets enough sunshine. So let your bare skin get a little sun.

You can also get some vitamin D from food (see list below). It’s hard to get all the vitamin D your body needs from food, though. This is true even if you eat food fortified with vitamin D.

A third way to get vitamin D is by taking supplements. It’s possible to get all the vitamin D you need from supplements.

Be sure to talk with your doctor about how much vitamin D you need and the best way to get it.

Foods with Vitamin D

• Swordfish
• Salmon
• Tuna fish
• Egg yolk
• Orange juice
• Milk
• Yogurt
• Ready-to-eat cereal