

# What is Vitamin D Deficiency?

**Vitamin D** (calciferol) is necessary for maintaining bones by regulating calcium and phosphorus levels within the body. When calcium levels are low, vitamin D acts as a hormone and signals for more calcium to be absorbed and less to be excreted. Thus, vitamin D is actually a hormone as it can be acquired naturally with sun exposure. However, when sun exposure is limited and vitamin D levels are low, it is considered a vitamin because it must then be increased via food sources. Vitamin D deficiency causes *rickets* in children and *osteomalacia* ("soft bones") or *osteoporosis* ("porous bones") in adults that can result in increased bone fractures & teeth problems. In fact, a recent long term study showed children born from mothers with normal vitamin D levels have a decreased risk of osteoporosis in adulthood. Vitamin D also regulates normal cell differentiation & proliferation to help in the prevention & treatment of certain cancers as well as strengthening the immune system. It regulates over 200 genes through binding of receptors to maintain hormonal balance, and it promotes insulin sensitivity & blood sugar regulation which if not working properly in the body, can contribute to weight gain. Calcium and vitamin D together can even help control some PMS symptoms such as anxiety, irritability, & tearfulness. People with renal or intestinal disease or those who have any malabsorption problem may be vitamin D deficient if they cannot absorb or convert the nutrient. It's estimated that 85-90% of people in this area don't get enough vitamin D.

## Factor that decrease Vitamin D levels:

- Clothing
- Window Glass
- Clouds/Shade
- Sunscreen  $\geq$  SPF 8 (prevents Vit D synthesis)
- Higher latitude states (UV waves often not strong enough to make Vit D during Sept - May)
- Dark skin (needs to be exposed to the sun longer to make Vit D)
- Age > 65yrs (has a 4x decrease in Vit D conversion & are more apt to stay inside)
- Malabsorptive & kidney problems
- Lowered estrogen levels (menopause)

**Consequences of Vitamin D deficiency:** depression, mood swings, fatigue, weakened immunity, muscle pain, weak bones/fractures, sleep irregularities, interference with weight loss, and increased risk for osteoporosis, heart disease, stroke, certain cancers (breast, prostate, colorectal), diabetes, and parathyroid problems.

**Vitamin D & Weight Loss:** Although all mechanisms are not known, we do know that Vitamin D plays a role in weight management. People who have a reduced capacity to mobilize vitamin D often weigh more, and have more body fat. A correlation has been shown between higher blood levels of vitamin D and leaner body mass. One main connection of vitamin D to weight loss has to do with insulin resistance which deals in part with sugar processing in the body. Someone low on Vitamin D has a greater risk to the wide set of disorders associated with metabolic syndrome (insulin resistance) as well as PCOS. Worsening of these conditions can lead to weight gain. In fact, a 2004 study revealed a 60% improvement in insulin sensitivity which helped with weight loss in patients who improved their vitamin D levels to normal. These results are often better than two common prescription medications used for insulin resistance. Thus, if you are having difficulty with insulin resistance, weight gain, or weight that keeps coming back, getting a vitamin D level is strongly advised.

**Vitamin D & depression:** A link between worsening depression and Vitamin D deficiency has also been identified. Actually, one natural treatment for seasonal affective disorder, where patients have a change in mood during months with decreased sunlight, is vitamin D. Most physicians thus believe that normal neurotransmitter function depends partly on adequate vitamin D synthesis. Melatonin, another hormone that regulates mood and can effect mood swings and food cravings is also inversely related to Vitamin D. Thus, a definite link between vitamin D and mood is present. Everyone knows moods can improve once spring comes around, but many people don't realize that the UV waves from the sun in Northern states often is not strong enough from September to May to produce Vitamin D in the skin.

**Deficiency Prevention:**

- 10-15 minutes of sun exposure in the summer months (early morning & late afternoon) for light skin. Dark skin may need 40 minutes then. Warning: Although sun exposure can increase vitamin D levels, sunbathing is not recommended as it can lead to skin damage and skin cancers. Tanning beds are also not recommended as they mostly use UVA rays that do not increase vitamin D while still increasing the risk of skin cancers.
- Dietary intake: there are only a few natural food sources of vitamin D. Therefore, most Americans receive it through fortified food products such as milk and breakfast cereals. While the amount in these products is enough to ward off malnutrition with regular use, you'd have to consume an immense amount to reach optimal levels which wouldn't do well for the waistline. See table below.
- Vitamin D supplements: Adequate Intake (AI) of vitamin D levels vary based on a person's age. Previous guidelines put this range from 200- 600 IU (international units) a day, although newer studies have shown that adults need 3000-5000 IU/day and some people can metabolize 10,000 IU/day without problem. However, guidelines currently remain that the upper limits in persons with no known deficiencies are about 2000 IU daily.

Some labels will have Vitamin D amounts listed in micrograms (µcg) instead of IU's. To convert: 1 µcg = 40 IU (thus 10 µcg = 400 IU)

Food Item	IU	Food Item	IU
Atlantic Herring (3.5oz)	1600	Swiss Cheese (1 oz)	13
Cod Liver Oil (1 tsp)	450	Fortified Milk (1 cup)	100
Salmon, cooked (4 oz)	411	Total™ cereal (3/4 c)	40
Mackerel, cooked (4oz)	394	One Large Egg	20
Light canned tuna in oil (3oz)	200	Fortified Orange Juice (1cup)	100
Silk™ soymilk (1 cup)	120	Butter ( 1 Tbsp)	8

**Vitamin D treatment:** Current guidelines define normal vitamin D levels to be over 32 ng/mL, insufficient if 20-32, & deficient if < 20ng/mL. However, these ranges will likely be changed as new studies suggest a level ≥ 50ng/mL being normal & greater than 70 being ideal. Treatments vary but usually include a high dose prescription vitamin D once a week for several weeks followed by a lower daily dose with repeat labs in 2-3 months. Chronic intake of Vitamin D supplements above the recommended upper limits with normal vitamin D levels can cause a Vitamin D toxicity which can lead to calcium deposits in soft tissues. Therefore, repeat blood levels of vitamin D are required in anyone taking higher doses of vitamin D, even if taking because of a past deficiency. The best option is to discuss with your physician the recommended dose for you.