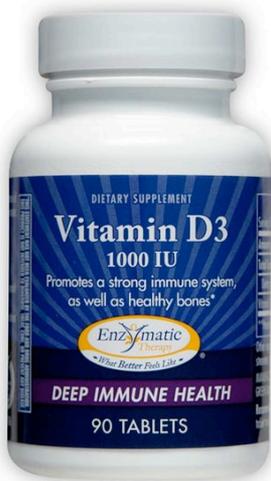


Vitamin D3

Promotes a strong immune system, as well as healthy bones

Introduction:

Vitamin D is considered to be both a vitamin and a prohormone. Because human skin cells can synthesize adequate vitamin D after exposure to UV-B rays from sunlight, it is sometimes called the “sunshine vitamin.”² A precursor (7-dehydrocholesterol) of vitamin D can be converted by skin cells into cholecalciferol, or vitamin D3. Vitamin D3 is then converted in the kidneys and liver to 1,25-dihydroxyvitamin D3, or calcitriol, which is the principal active hormonal form of vitamin D.³ As a vitamin, vitamin D can also be absorbed from food.



How Does It Work?: The most well known benefit of vitamin D is its role in supporting bone health. Vitamin D helps regulate calcium and phosphorus absorption through the intestines, reduces kidney excretion of calcium, and regulates the amount of calcium in bones.⁴

This nutrient is critical for healthy skeletal development and bone mineralization.⁵ New research has focused on the ability of vitamin D to enhance healthy cell replication and division, as well as influencing healthy glucose metabolism.^{6,7} The primary source of vitamin D is through exposure to sunlight. However, many Americans, particularly the elderly, are lacking in vitamin D. From 38-60% of elderly institutionalized adults have been found to have inadequate intake of vitamin D (depending on time of year tested).^{8,9} This is believed to be due to both a failure to gain exposure to adequate amounts of sunlight (many elderly spend little time outdoors), and because the vitamin D synthesis process becomes less efficient with aging.¹⁰ Supplemental vitamin D intake is therefore especially important in older adults.²

Vitamin D and immune health

Many epidemiological studies have found vitamin D intake is associated with immune function. New research is clarifying how the hormonal form of vitamin D – 1,25-dihydroxyvitamin D – impacts the immune system. The first mechanism of action is through the regulation of cellular proliferation, differentiation, apoptosis, and angiogenesis.^{11,12} Many cells, including breast, brain, prostate, and colon tissue, as well as immune cells, have receptors which can be activated by 1,25-

dihydroxyvitamin D.¹³ Cell studies have shown that vitamin D, in the form of cholecalciferol, supports normal prostate cell replication and division.¹⁴ Secondly, vitamin D is a potent immunomodulator, and has been shown to stimulate human macrophage cell activity.¹⁵

Vitamin D and bone health*

Vitamin D influences bone density both through its facilitation of calcium absorption through the intestinal tract, and its affect on bone deposition and bone resorption. In women with low serum levels of vitamin D, increasing vitamin D intake has been shown to increase intestinal calcium absorption by up to 65%.¹⁶ In bone, vitamin D stimulates bone turnover, while exerting a protective effect on osteoblasts (bone building compounds).¹⁷

The classic bone disease associated with vitamin D deficiency is rickets. Characterized by bowed legs, a bent spine, and weak, toneless muscles, rickets was thought to have been a disease of the past in the United States. However, a 2004 case review found 166 cases of children with rickets reported in the medical literature between 1986 and 2003.¹⁸

Many clinical trials have demonstrated the benefits of vitamin D to support bone strength and density. Supplementation with vitamin D at dosages of 700-800 IU daily or higher has been associated with a 23-26% improvement in bone health, especially for older adults.¹⁹ Experimental vitamin D (cholecalciferol) dosages have been as high as 100,000 IU (given as one 100,000 IU capsule taken 4 times a year) in trials documenting benefits for bone health.²⁰

Cholecalciferol vs. Ergocalciferol

Vitamin D supplements generally provide this vitamin as either cholecalciferol (vitamin D3) or ergocalciferol (vitamin D2). Ergocalciferol is derived from plant or fungal sources. It is not produced in the body. Cholecalciferol is from animal sources and is the form synthesized by the body.⁸ Although ergocalciferol may be preferred by vegetarians, research has established that cholecalciferol is the more potent form of this vitamin.¹ Clinical trials have noted that cholecalciferol raises serum levels of vitamin D3 2-3 times higher than equivalent doses of ergocalciferol.¹

Vitamin D intake and dosage

As noted above, dosages given in clinical trials have been much higher than the current 200 IU daily Adequate Intake (adults) recommended by the Institutes of

Medicine (IOM). The IOM has also set the no-observed-adverse-effect-level (NOAEL) at 2000 IU daily (based on the serum levels of vitamin D associated with hypercalcemia).²¹ As a comparison, the United Kingdom has published a guidance level of 1000 IU daily as the recommended intake.²²

Suboptimal levels of Vitamin D intake has been documented, especially among older adults. From 38-60% of elderly institutionalized adults have been found to be lacking in vitamin D intake (depending on time of year tested).^{8,9} In a study of women living in Michigan, 67% were lacking in vitamin D, as indicated by a 25-hydroxyvitamin D (the hormonal form of vitamin D) level of less than 20 ng/mL. Non-Caucasians were 3 times more likely than Caucasians to have low vitamin D levels. Participants with total vitamin D intake <400 IU/day from diet and supplements were 10 times more likely to have low vitamin D levels than others.²³ A study of pregnant women living in the northern United States found that 85% of black mothers had insufficient levels of vitamin D, while 47% of white mothers had insufficient levels.²⁴

Many experts disagree with the guidelines set by the IOM, and feel that the minimum recommended intake for Americans needs to be raised.^{25,26} Although extremely high levels of vitamin D intake have been associated with hypercalcemia, toxicity of vitamin D has not been reported in dosages up to 10,000 IU daily.²⁷

Conclusion

Vitamin D-3 provides a convenient way to increase intake of cholecalciferol – the natural form of vitamin D – to promote a strong immune system, as well as healthy bones. **Recommendations:** One tablet daily. May increase to two tablets daily or as directed by your healthcare practitioner. **Precautions:** If pregnant, nursing, or taking prescription drugs, consult your healthcare practitioner prior to use.

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