INTRODUCTION

Scientists consider vitamin D deficiency a widespread epidemic, as low levels of vitamin D have been observed in populations worldwide. Vitamin D research has escalated in recent years, finding a deficiency can correlate with chronic diseases such as depression, Alzheimer’s, multiple sclerosis, asthma and hypertension, among countless other ailments. Similarly, vitamin D has been linked to premature aging, as it can cause abnormal function in the central nervous system.

Though it is not completely understood, researchers attribute low vitamin D levels to modern lifestyle factors, including minimal sun exposure from using sunscreen and staying indoors. Furthermore, few foods contain vitamin D, making it difficult to obtain sufficient amounts of this essential nutrient. Supplementation is a beneficial way to ensure you are receiving a sufficient amount of vitamin D.

Even so, how much should you take? What are the benefits of maintaining vitamin D levels?

This issue will review the basics and benefits of vitamin D supplementation, in which researchers continue to find sufficient serum levels of vitamin D can prevent many chronic health problems. We will spotlight the role of vitamin D in protecting your heart and reducing asthma symptoms, as well as summarize the optimum administration and dosage that should be used to prevent a deficiency.

VITAMIN D BASICS

Vitamin D comes in two major forms, D2 (ergocalciferol) and D3 (cholecalciferol). It is a pre-hormone meaning it has no hormone activity until the liver and kidneys convert it into the active steroid hormone known as calcitrol. First, the liver converts both forms into calcidiol (25-hydroxyvitamin D), and then the kidneys convert calcidiol into calcitrol (125-hydroxyvitamin D - the active form used by the body).

Vitamin D2 and D3 supplements can be taken to reduce deficiency, but vitamin D3 is more effective in sustaining vitamin D levels in the blood. Vitamin D2 is quickly broken down by the body and is only 20-40% as effective.

Vitamin D is typically created in the skin by UVB irradiation delivered from sunlight. Unfortunately, aging skin and limited sun exposure can reduce vitamin D absorption and lead to deficient levels in the blood. Specific foods contain vitamin D, including sardines, salmon, cod liver oil, egg yolks, and fortified dairy products. Even so, you would need to consume a large quantity of these foods to reach adequate vitamin D levels.
KEY ANALYSIS: VITAMIN D AND HEART HEALTH

Cardiovascular disease affects approximately 80 million individuals and is the leading cause of death in the United States. While many risk factors are associated with heart disease, vitamin D deficiency may be a key component that is commonly overlooked. Several studies have shown a vitamin D deficiency correlates with high blood pressure and congestive heart failure. Vitamin D receptors are found in the vascular system, indicating it is a necessary component of normal cardiovascular function.

High blood pressure is an extremely prevalent cardiovascular risk factor. Among premenopausal women, vitamin D deficiencies can cause a threefold increased risk in high blood pressure later in life. Researchers followed more than 500 women between the ages of 22 and 45 for 15 years. Vitamin D levels were measured at the beginning and end of the study finding low levels were significantly related to high blood pressure in midlife. Furthermore, vitamin D treatment can decrease high blood pressure by lowering systolic blood pressure by 9%.

Though it may seem like an odd correlation, heart failure is more likely to occur during the winter. European studies have indicated heart failure deaths were 20% above average in January and 15% below average in August. This could be due to insufficient vitamin D levels that occur during the winter months, because individuals have reduced exposure to the sun.

A study of 90 people (age 60 and older) found vitamin D deficiencies were highly prevalent and severe among subjects with chronic heart failure. Among African Americans with chronic heart failure, a vitamin D deficiency was present in 90% of individuals with short-term cardiac decompensation. These statistics increased to 96% among subjects with long-term cardiac decompensation (more than 4 weeks).

Researchers recommend individuals with heart disease should have their serum vitamin D levels measured to ensure they do not have a significant deficiency. Maintaining optimum vitamin D levels can be a key component to lowering cardiovascular risks.

VITAMIN D & ASTHMA

Approximately 35 million Americans suffer from asthma and hay fever, spending an estimated $3.4 billion on over-the-counter allergy treatments that have irritating side effects. Scientists have found that individuals with low levels of vitamin D are more likely to suffer from asthma. Fifty-four asthma patients were recruited to participate in a study, where lung function and vitamin D serum levels were measured. Subjects with vitamin D levels below 30 ng/mL had hyper-responsive constriction in their lungs, which led to difficult breathing. Inflammation was high in patients with low vitamin D levels and lung function was impaired. Additionally, the use of glucocorticoids to treat asthma reduces vitamin D levels in the body to augment the deficiency. Vitamin D supplementation has been shown to replenish low serum levels, as well as enhance the action of glucocorticoid asthma treatments.

HOW MUCH SHOULD I PRESCRIBE?

Research indicates that the recommended dietary amount (RDA) of vitamin D (400 IU/day) is not sufficient enough to meet all of your body’s needs. When vitamin D levels are low, optimal levels can be reached by taking 1,000 IU or more each day.

Studies have found vitamin D toxicity is unlikely to occur in doses less than 10,000 IU/day. In order to sustain health, it has been suggested that blood serum levels should be 32 ng/mL or greater. Research even suggests optimum serum levels should stay between 40-80 ng/ml, which requires 2,750 to 5,500 IU/day of vitamin D.

Pharmaceutical preparations of vitamin D contain high doses of D2 (ergocalciferol) administered for eight weeks at 50,000 IU (one dose each week). These treatments are done under medical supervision to treat severe vitamin D deficiencies or malabsorption syndromes.

ROUTES OF VITAMIN D ADMINISTRATION

The sun is the most predominantly recognized source of vitamin D, but concerns over sun exposure and long winter months can significantly reduce vitamin D levels in the body. These low levels can lead to skin disorders and chronic diseases. Fortunately, vitamin D can be safely administered through topical or oral forms. In severe cases, vitamin D injections may be given under the direction of a physician.

Topical Application: Topical vitamin D is used to treat psoriasis and inflammatory skin disorders. It may also protect the skin from UV-induced damage. Studies have shown that topical vitamin D can restore permeability and the skin’s natural antimicrobial barrier that are often disrupted by topical corticosteroids.

Oral Forms: Vitamin D supplements are available in two different forms: ergocalciferol (D2) and cholecalciferol (D3). While D2 is a good source of vitamin D, studies are finding D3 is more effective in raising vitamin D serum levels. More supplement manufacturers have reformulated their products to contain vitamin D3, instead of D2. Sublingual vitamin D formulas are also found on the market today in rapid dissolve tablets or liquid drops. Similar to supplements, the sublingual form effectively increases low vitamin D levels.

After a review of literature comparing the different routes of vitamin D administration, including oral (supplement and sublingual forms), transdermal, topical, and injections, it was found that few studies demonstrate the most effective route of vitamin D administration. Though comparisons could not be evaluated, researchers continue to find oral vitamin D significantly improves serum vitamin D levels and consider it a safe alternative to ultraviolet irradiation exposure from the sun. Research focusing on transdermal or topical applications of vitamin D discussed the effects on psoriasis and other skin disorders, instead of the overall increase in serum vitamin D levels.