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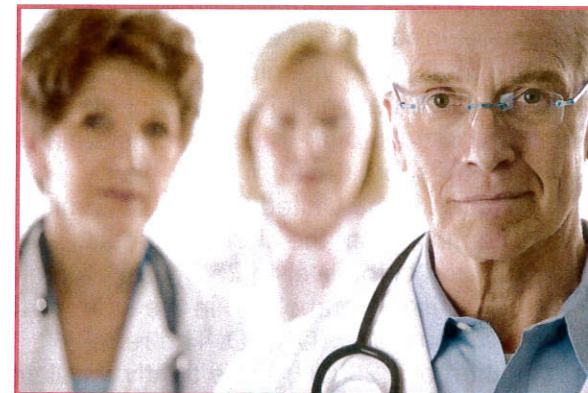
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*Vitamin D Deficiency and
Chronic Kidney Disease*

Nebraska Kidney Association
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Doctor to Doctor

*Vitamin D Deficiency and
Chronic Kidney Disease*



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Vitamin D Deficiency and Chronic Kidney Disease

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We get vitamin D from sunlight exposure, from our diet and from dietary supplements. Solar ultraviolet B radiation converts 7-dehydrocholesterol to previtamin D₃, which is rapidly converted to vitamin D₃. Few foods naturally contain or are fortified with vitamin D. Vitamin D₂ is manufactured through the ultraviolet irradiation of ergosterol from yeast (dietary vit D), and vitamin D₃ through the ultraviolet irradiation of 7-dehydrocholesterol. Both are used in over-the-counter vitamin D supplements, but the form available by prescription in the United States is vitamin D₂. Vitamin D from the skin and diet is metabolized in the liver to 25-hydroxyvitamin (OH) D. This is metabolized in the kidneys to its active form, 1,25(OH)₂ D. The renal production of 1,25(OH)₂ D is tightly regulated by plasma PTH levels and serum calcium and phosphorus levels.

Vitamin D Deficiency.

25-hydroxyvitamin D levels are a reflection of the body's vitamin D status. Although there is some controversy on optimal levels of serum 25-(OH) D, vitamin D deficiency is a level of less than 20 ng/ml. Once foods were fortified with vitamin D many health care providers thought the major health problems resulting from its deficiency had been cured, however deficiency remains common in children and adults. During childhood, vitamin D deficiency can cause growth retardation and skeletal deformities. Vitamin D deficiency in adults can precipitate or exacerbate osteopenia and osteoporosis, cause osteomalacia and muscle weakness.

Emerging research of Vitamin D function suggests it plays a role in decreasing the risk of many chronic illnesses, including common cancers, autoimmune diseases, infectious diseases, and cardiovascular disease.

Recommendations for adequate daily intake of vitamin D are 200 IU for children and adults up to 50 years of age, 400IU for adults 51-70 years of age, and 600 IU for adults 71 years of age or older. However without adequate sun exposure, children and adults require approximately 800 to 1000 IU per day.

Vitamin D₂ is approximately 30% as effective as vitamin D₃ in maintaining serum 25-(OH) D levels and up to three times as much vitamin D₂ may be required to maintain sufficient levels. Vitamin D deficiency can be corrected and levels adequately maintained by giving patients a 50,000-IU capsule of vitamin D₂ once a week for 8 weeks, followed by 50,000 IU of vitamin D₂ every 2 to 4 weeks. Alternatively, either 1000 IU of vitamin D₃ per day (available in most pharmacies) or 3000 IU of vitamin D₂ per day is effective.

Patients with Chronic Kidney Disease

In patients with any stage of CKD, 25-(OH) D should be measured annually, and the level should be maintained at 30 ng/ml or higher. Patients with stage 4 or 5 CKD and an eGFR of less than 30 ml/min/1.73 m², as well as those requiring dialysis, are unable to make enough 1,25-(OH)₂D and need to take 1,25-dihydroxyvitamin D₃ or one of its analogues (paricalcitol or doxercalciferol) to maintain calcium metabolism and to decrease PTH levels and the risk of renal bone disease.

The 1,25-(OH)₂D assay should never be used for detecting vitamin D deficiency because levels will be normal or even elevated as a result of secondary hyperparathyroidism. Many patients taking an active vitamin D analogue do not have sufficient vitamin D. Levels of 25-(OH) D are inversely associated with PTH levels, regardless of the degree of CKD. New areas of investigation include novel aspects of vitamin D function in patients with CKD because the vitamin D receptor is widely distributed in many tissues that are not involved in calcium homeostasis. There is data linking low levels of 1,25-(OH)₂ D to insulin resistance, left ventricular hypertrophy, increased levels of inflammatory mediators, and increased blood pressure.

Reference: Holick MF. Vitamin D deficiency. N Engl J Med 2007;357:266-81.

FOR MORE INFORMATION

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