Vitamin D 25 Hydroxy

Background Information

Although vitamin D was originally described as a vitamin, it is now recognized as a prohormone that is biologically inactive until metabolized into a secosteroid, similar to the classic steroid hormones. Vitamin D in the circulation is derived from the conversion of 7-dehydrocholesterol in the skin via exposure to ultraviolet rays. It is then metabolized by hepatic 25-hydroxylase into biologically inactive 25-hydroxy vitamin D [25(OH)D; calcidiol], which by renal 1α-hydroxylase is converted into 1-25 dihydroxyvitamin D [1-25(OH)2D; calcitriol], the active vitamin D metabolite. Renal production of 1-25(OH)2D is tightly controlled by the parathyroid hormone and is important in the regulation of serum calcium homeostasis. Furthermore, based on the discovery that most tissues and cells have vitamin D receptors and that several possess the enzymatic machinery to convert the primary circulating form [25(OH)D] to the active form [1-25(OH)2D], an expanded role of vitamin D has been suggested in decreasing the risk of many chronic diseases including infectious diseases, cancers, and autoimmune diseases.

25(OH)D, the principal circulating form of vitamin D in plasma, is the most reliable measure of overall vitamin D status even though it is biologically inactive. Testing for 25(OH)D is useful in ruling out vitamin D deficiency as a cause of hypocalcemia, rickets, or osteomalacia, as well as in securing a differential diagnosis of hypercalcemia that could be indicative of excess parathyroid hormone, sarcoidosis, some forms of lymphoma, or other disorders.

Clinical Indications

Vitamin D is crucial to bone health, calcium metabolism, and overall well-being. Although sunlight exposure to skin may provide adequate levels of vitamin D, hypovitaminosis D (vitamin D deficiency) is common due to minimal or no sun exposure coupled with low dietary vitamin D intake. Lack of 25-hydroxy vitamin D [25(OH)D] results in hypocalcemia, osteomalacia, and related disorders. Testing for 25(OH)D is also useful in diagnosing intestinal malabsorption and vitamin D deficiency or intoxication, including the following: differentiating primary hyperparathyroidism for hypercalcemia of cancer, distinguishing between vitamin D-dependent and vitamin D-resistant rickets, monitoring the vitamin D status of patients with chronic renal failure, and monitoring therapeutic response in patients being treated for vitamin D-related disorders.

Decreased 25-hydroxy vitamin D levels indicate a deficiency due to poor diet, decreased exposure to the sun, malabsorption of vitamin D, or liver and kidney diseases. When associated with hypercalcemia, there may be hypersensitivity to vitamin D, as in sarcoidosis.

Interpretation

Vitamin D levels are inversely associated with parathyroid hormone (PTH) levels and are directly related to intestinal calcium absorption. Therefore, the optimal level of vitamin D is defined as 30 ng/mL, as at this level the PTH begins to level off and intestinal calcium absorption is maximal. Vitamin D levels between 15-29 ng/mL are considered as insufficient, and levels < 15 ng/mL are considered as deficient. Based on these definitions, vitamin D deficiency or insufficiency is highly prevalent worldwide.

In contrast, vitamin D intoxication is rare and levels > 150 ng/mL can be considered toxic. Vitamin D toxicity can occur by inadvertent ingestion of very high doses (> 50,000 U), raising serum vitamin D levels to > 150 ng/mL. It has been shown that doses up to 10,000 U/day for many months do not cause toxicity.

Limitations of the Assay

Values of 25-hydroxy vitamin D can vary with exposure to sunlight and the season of the year and geographic location. There are also variations depending on race, age, and during menstrual cycles, particularly at the time of ovulation. Because of the complex nature of calcium balance, it may also be useful to measure parathyroid hormone in conjunction with vitamin D.
Test Information

Fasting specimen is preferred. (Patient should not eat for four hours before blood draw.)

Methodology

Vitamin D 25-hydroxy is measured using chemiluminescence immunoassay (CLIA). The antibody used in this assay measures both D₂ and D₃.

References


Test Overview

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<th>Test Name</th>
<th>Vitamin D 25 Hydroxy</th>
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<tr>
<td>Methodology</td>
<td>Chemiluminescence Immunoassay (CLIA)</td>
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<td>Specimen Requirements</td>
<td>Volume/Size: 1 mL; Type: Serum; Tube/Container: No additive SST (Gold); Transport temperature: Refrigerated.</td>
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<td>Minimum Specimen Requirements</td>
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<td>Alternate Specimen Requirements</td>
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