2. **Sensitivity**
The sensitivity of this test kit is 0.67ng/ml. The sensitivity was determined by calculating the mean plus 2SD of the standard zero point tested 20 times in the same run.

3. **Reference Range**
Calbiotech Inc., strongly recommends that each laboratory should establish its own reference range for the population it serves. But, until such local specific ranges are established, the following literature based references can be used.

Level	Reference Range
Deficient	<10ng/ml
Insufficient	10ng/ml – 30ng/ml
Sufficient	30ng/ml – 100ng/ml
Intoxication	>100ng/ml

For our local, apparently healthy donors, reference range (serum) = 15 – 60ng/ml

QUALITY CONTROL:
We recommend that each laboratory uses 25-OH Vitamin D controls to validate the performance of reagents.

RESULTS:
Results are expressed in ng/mL. Note: To convert to nmol/L, multiply results by 2.5. Example: 10ng/ml = 25nmol/L.

REFERENCE RANGE:
It is recommended that each laboratory establishes the range of normal values that corresponds to the population of their region.

REFERENCES:

1. Holick, MF. Vitamin D Status: Measurement, Interpretation and Clinical Application. Ann Epidemoil. 2009, 19(2):73 - 78
2. Morris H. A. Vitamin D: A Hormone for All Seasons-How Much is enough? Clin. Biochem. Rev., 2005, 26, 21-32.
3. Bikle D. D. Vitamin D and the skin. J. Bone Miner. Metab., 2010, 28, 117-30.
4. Zerwekh J. E. Blood biomarkers of vitamin D status. Am. J. Clin. Nutr., 2008, 87, 1087S-91S.
5. Moyad M. A. Vitamin D: a rapid review. Dermatol Nurs., 2009, 21, 25-30.

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Cat#: VD315B (96 Tests)
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CALBIOTECH
A life science company

25(OH) Vitamin D ELISA

Catalog No.: VD315B (96 Tests)

INTENDED USE
The Calbiotech, Inc. 25-hydroxy (25-OH) Vitamin D ELISA is intended for the quantitative determination of total 25-OH Vitamin D in human serum and plasma.

SUMMARY AND EXPLANATION
Vitamin D is a steroid hormone involved in the active intestinal absorption of calcium and in the regulation of its homeostasis. Vitamin D has two isomers: Vitamin D2 and Vitamin D3. Vitamin D2 is obtained from dairy products whereas Vitamin D3 is produced in the skin after exposure to ultraviolet light. In the liver, Vitamin D is hydroxylated at its carbon 25 to form 25-OH Vitamin D. This metabolite is the predominant circulating form of Vitamin D and is considered to be an accurate indicator of the general Vitamin D status of an individual. Vitamin D deficiency has been linked to many diseases including osteoporosis, rickets, osteomalacia, cancers, and cardiovascular diseases. Both dietary supplements of Vitamin D that are currently available in the market (Vitamin D2 and Vitamin D3) are converted to 25-OH Vitamin D in the liver. The sum of the concentrations of 25-OH Vitamin D2 and 25-OH Vitamin D3, in serum or plasma, is referred to as "Total 25-OH Vitamin D". Accurate monitoring of total 25-OH Vitamin D level is critical in clinical settings. Vitamin D deficient patients who are prescribed a daily Vitamin D supplement should regularly monitor their serum or plasma Vitamin D levels in order to reach an optimal level and prevent their 25-OH Vitamin D concentrations from reaching excessive levels that are considered toxic[1-5]

PRINCIPLE OF THE TEST
The 25-OH Vitamin D is a solid phase ELISA based on the principal of competitive binding. Vitamin D calibrators, controls and samples are dispensed into pre-designated anti-Vitamin D coated microwells. After this, Biotin is dispensed into each well and Vitamin D competes with the endogenous Vitamin D in the sample, calibrator and control serum for a fixed number of binding sites on the anti-Vitamin D Antibody. The microwells are washed, and the bound Vitamin D Biotin is detected by the Streptavidin HRP. The Streptavidin HRP Conjugate bound to the wells decrease as the concentration of Vitamin D in the specimen increases; unbound Streptavidin HRP Conjugate is then removed and the microwells are once again washed. TMB is added and incubated, which results in the development of the blue color and stopped with the addition of stop solution. The absorbance is measured spectrophotometrically at 450nm. A standard curve is obtained by plotting the concentration of the standard versus the absorbance. The color intensity will be inversely proportional to the amount of 25-OH Vitamin D in the sample. This assay procedure run time is 100 minutes and measures both 25-OH Vitamin D2 and D3

MATERIALS PROVIDED		Size
1.	anti-Vitamin D Coated Microplate	12x8x1
2.	Vitamin D Calibrators	7 x 0.5 ml
3.	Vitamin D Controls	2 x 0.5 ml
4.	Biotin Concentrate (51X)	1 x 0.55 ml
5.	Assay Buffer	1 x 24 ml
6.	SAV-HRP Conjugate	1 x 23 mL
7.	Stop Solution	1 x 12 mL
8.	TMB Substrate	2 x 12 ml
9.	Microplate sealing film	2
10.	Wash Buffer 20X	1 x 25 ml

MATERIALS NOT PROVIDED
1. Precision pipettes

2. Disposable pipette tips
3. ELISA reader capable of reading absorbance at 450nm
4. Flat-head Vortex mixer
5. Plate shaker
6. Graph paper

WARNINGS AND PRECAUTIONS

1. Potential biohazardous materials:
   The standards contain human source components which have been tested and found non-reactive for hepatitis B surface antigen as well as HIV antibody with FDA licensed reagents. However, as there is no test method that can offer complete assurance that HIV, Hepatitis B virus or other infectious agents are absent, these reagents should be handled at the Biosafety Level 2, as recommended in the Centers for Disease Control/National Institutes of Health manual, "Biosafety in Microbiological and Biomedical Laboratories." 1984.
2. This kit is intended for the quantitation of total 25-OH Vitamin D in human serum.
3. Do not pipette by mouth. Do not smoke, eat, or drink in the areas in which specimens or kit reagents are handled.
4. The components in this kit are intended for use as an integral unit. The components of different lots should not be mixed.
5. It is recommended that standards, control and serum samples be run in duplicate
6. Optimal results will be obtained by strict adherence to this protocol. Accurate and precise pipetting, as well as following the exact time and temperature requirements prescribed are essential. Any deviation from this may yield invalid data.

SPECIMEN COLLECTION AND HANDLING

Serum, heparinized plasma or EDTA plasma samples can be used for the assay.

- For serum, collect whole blood by venipuncture and allow clotting.
- For plasma, mix the sample by gentle inversion prior to centrifugation.

Centrifuge and separate serum or plasma as soon as possible after collection. Do not use hemolyzed samples. The specimens may be refrigerated at 2-8°C for two weeks. For long term storage, they can be stored at -20°C. Avoid repeated freeze-thaw cycles. Allow the refrigerated or frozen-thawed samples to equilibrate to room temperature for 30 minutes before use; samples must be mixed before analysis.

REAGENT PREPARATION

Before running the test, prepare the following:

1. Standards and Reagents:
   Standards are serum-based solutions and stable when stored at -2-8°C, protected from light, until the expiration date on the label. Equilibrate the needed volume of standards and reagents to room temperature before use.
2. **51X Biotin conjugate**: Immediately before use, prepare 1X working solution at 1:51 with assay diluent (e.g. Add 0.1ml of the 51X Vitamin D-Biotin conjugate concentrate to 5ml of assay diluent). **Remaining Assay Diluent must be stored at 2-8°C in dark and tightly capped**.
3. **Prepare 1X Wash Buffer** by adding the contents of the bottle (25 ml, 20X) to 475 ml of distilled or deionized water. Store at room temperature (18-24 °C).

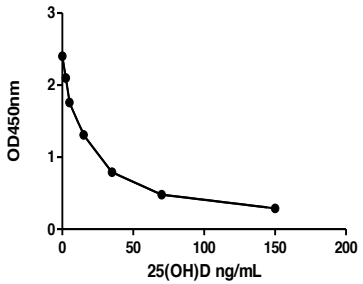
PROCEDURE:

All reagents and specimens must be allowed to come to room temperature before use. All reagents must be GENTLY mixed without foaming. Once the procedure has started, all steps should be completed without interruption.

1. Dispense 10µl of 25-OH Vitamin D Standards, controls and samples into each well, as required.
2. Dispense 200µl working solution of biotinylated 25 (OH) D reagents, into each well.
3. Carefully mix the contents in the wells for 20 seconds using a plate shaker at 200-400 RPM (or equivalent motion). Remove from shaker and cover the plate with the adhesive plate seal making sure there is a complete seal over each well.
4. **INCUBATION #1** – Incubate sealed plate for 60 minutes at room temperature.
5. Carefully remove the plate seal.
6. Briskly shake out the contents of the wells into a waste reservoir.
7. **WASH # 1 -** Dispense 300µl of 1X Wash Buffer into each well, and then briskly shake out the 1X Wash Buffer into a waste reservoir. Strike the wells sharply on absorbent paper to remove residual droplets. Repeat 2 more times for a total of 3 washes.
8. Dispense 200µl of enzyme conjugate (Streptavidin-HRP) into each well.
9. **INCUBATION #2 -** Incubate for 30 minutes, at room temperature.
10. Briskly shake out the contents of the wells into a waste reservoir.
11. **WASH # 2 -** Dispense 300µl of 1X Wash Buffer into each well, and then briskly shake out the 1X Wash Buffer into a waste reservoir. Strike the wells sharply on absorbent paper to remove residual droplets. Repeat 2 more times for a total of 3 washes.
12. Using a multi-channel pipette, dispense 200 µl of TMB Substrate into each well.
13. **INCUBATION #3 -** Incubate for 10 minutes at room temperature, preferably in the dark.
14. **STOP -** Dispense 50 µl of Stop Solution into each well to stop the enzymatic reaction. **Carefully mix plate contents for 20 - 30 seconds.**
15. Read absorbance on ELISA Reader at 450 nm within 10 minutes of adding the Stop Solution.

Standard Curve:

Seven standard levels are included for each run. A typical standard curve is shown below.



25(OH)D, (ng/ml)	Absorbance (450nm)
0	2.20
2.5	1.77
5	1.53
15	1.13
35	0.65
70	0.42
150	0.27

PERFORMANCE CHARACTERISTICS

1. **Precision**

Intra-Assay

Serum	No of Replicates	Mean, ng/ml	Standard Deviation	Coefficient of Variation (%)
1	16	8.9	0.51	5.73
2	16	27.0	1.20	4.40
3	16	42.1	1.74	4.10

Inter Assay

Serum	No of Replicates	Mean, ng/ml	Standard Deviation	Coefficient of Variation (%)
1	10	8.2	0.56	6.83
2	10	26.1	1.44	5.52
3	10	41.3	2.11	5.11