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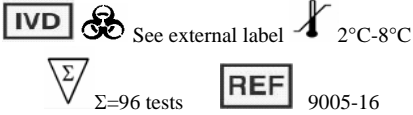
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## **TSH**

**CAT No: 9005-16**

### ***Chemiluminescence Immunoassay***

Chemiluminescence Enzyme Immunoassay for the Quantitative Determination of Thyroid Stimulating Hormone (TSH) in Human Serum

#### **INTRODUCTION OF CHEMILUMINESCENCE IMMUNOASSAY**

Chemiluminescence Immunoassay (CLIA) detection using Microplate luminometers provides a sensitive, high throughput, and economical alternative to conventional colorimetric methodologies, such as Enzyme-linked immunosorbent assays (ELISA).

ELISA employs a label enzyme and a colorimetric substrate to produce an amplified signal for antigen, haptens or antibody quantitation. This technique has been well established and considered as the technology of choice for a wide variety of applications in diagnostics, research, food testing, process quality assurance and quality control, and environmental testing. The most commonly used ELISA is based on colorimetric reactions of chromogenic substrates, (such as TMB) and label enzymes.

Recently, a chemiluminescent immunoassay has been shown to be more sensitive than the conventional colorimetric method(s), and does not require long incubations or the addition of stopping reagents, as is the case in some colorimetric assays. Among various enzyme assays that employ light-emitting reactions, one of the most successful assays is the enhanced chemiluminescent immunoassay involving a horseradish peroxidase (HRP) labeled antibody or antigen and a mixture of chemiluminescent substrate, hydrogen peroxide, and enhancers.

The CLIA Kits are designed to detect glow-based chemiluminescent reactions. The kits provide a broader dynamic assay range, superior low-end sensitivity, and a faster protocol than the conventional colorimetric methods. The series of the kits covers Thyroid panels, such as T3, T4, TSH, Hormone panels, such as hCG, LH, FSH, and other panels. They can be used to replace conventional colorimetric ELISA that have been widely used in many research and diagnostic applications. Furthermore, with the methodological advantages, Chemiluminescent immunoassay will play an

important part in the Diagnostic and Research areas that ELISAs can not do.

The CLIA Kits have been validated on the *MPL2* microplate luminometer from Berthold Detection System, *Lus2* microplate luminometer from Anthos, *Centro LB960* microplate luminometer from Berthold Technologies, and *Platelumino* From Stratec Biomedical Systems AG. We got acceptable results with all of those luminometers.

#### **INTRODUCTION OF TSH IMMUNOASSAY**

The determination of serum or plasma levels of thyroid stimulating hormone (TSH) is recognized as a sensitive method in the diagnosis of primary and secondary hypothyroidism. TSH is secreted by the anterior lobe of the pituitary gland and induces the production and release of thyroxine and triiodothyronine from the thyroid gland. It is a glycoprotein with a molecular weight of approximately 28,000 daltons, consisting of two chemically different subunits, alpha and beta. Although the concentration of TSH in the blood is extremely low, it is essential for the maintenance of normal thyroid function. The release of TSH is regulated by a TSH-releasing hormone (TRH) produced by the hypothalamus. The levels of TSH and TRH are inversely related to the level of thyroid hormone. When there is a high level of thyroid hormone in the blood, less TRH is released by the hypothalamus, so less TSH is secreted by the pituitary. The opposite action will occur when there is decreased thyroid hormone in the blood. This process is known as a negative feedback mechanism and is responsible for maintaining the proper blood levels of these hormones. TSH and the pituitary glycoproteins: luteinizing hormone (LH), follicle-stimulating hormone (FSH), and human chorionic gonadotropin (hCG), have identical alpha chains. The beta chain is distinct but does contain identical amino acid sequences, which can cause considerable cross-reactivity with some polyclonal TSH antisera. The use of a monoclonal antibody in this TSH EIA test eliminates this interference, which could result in falsely elevated TSH values in either menopausal or pregnant females--a population whose evaluation of thyroid status is clinically significant.

#### **Principle of the Test**

The TSH CLIA test utilizes a unique monoclonal antibody directed against a distinct antigenic determinant on the intact TSH molecule. Mouse monoclonal anti-TSH antibody is used for solid phase (microtiter wells) immobilization and a goat anti-TSH antibody is in the antibody-enzyme (horseradish peroxidase) conjugate solution. The test sample is allowed to react simultaneously with the two antibodies, resulting in the TSH molecules being sandwiched between the solid phase and enzyme-linked antibodies. After a 60 minutes incubation at room temperature, the wells are washed 5 times by wash solution to remove unbound anti-TSH conjugate. A solution of chemiluminescent substrate is then added and read relative light units (RLU) in a Luminometers. The intensity of the emitting light is proportional to the amount of enzyme present and is directly related to the amount of TSH in the sample. By reference to a series of TSH standards assayed in the same way, the concentration of TSH in the unknown sample is quantified.

#### **Materials and Components**

***Materials provided with the test kit:***

1. Antibody-coated microtiter wells. 96 wells per bag.
2. Set of Reference Standards: 0, 0.5, 2, 5, 10, and 20  $\mu$  IU/ml, Liquid, Ready for use.
3. Enzyme Conjugate Reagent, 12 ml.
4. 20x Wash Buffer, 30 ml
5. Chemiluminescence Reagent A, 6.0 ml.
6. Chemiluminescence Reagent B, 6.0 ml.

**Materials required but not provided:**

- Precision pipettes: 40 $\mu$ l~200 $\mu$ l and 1.0 ml.
- Disposable pipette tips.
- Distilled water.
- Glass tubes or flasks to mix Chemiluminescence Reagent A and Chemiluminescence Reagent B.
- Vortex mixer or equivalent.
- Absorbent paper or paper towel.
- Graph paper.
- Microtiter plate reader.

**Specimen Collection and Preparation**

Serum should be prepared from a whole blood specimen obtained by acceptable medical techniques. This kit is for use with serum samples without additives only.

**Storage of Test Kit and Instrumentation**

1. Unopened test kits should be stored at 2-8°C upon receipt and the microtiter plate should be kept in a sealed bag with desiccants to minimize exposure to damp air. The test kit may be used throughout the expiration date of the kit (One year from the date of manufacture). Refer to the package label for the expiration date.
2. Opened test kits will remain stable until the expiring date shown, provided it is stored as prescribed above.

**Reagent Preparation**

1. All reagents should be brought to room temperature (18-22°C ) before use.
2. To prepare Chemiluminescence Substrate solution, make a 1:1 mixing of Reagent A with Reagent B right before use. Discard the excess after use.
3. Prepare the washing solution by diluting 1 part of the 20X PBS concentrate to 19 parts of distilled water.

**Assay Procedure**

1. Secure the desired number of coated wells in the holder.
2. Dispense 50 $\mu$ l of standards, specimens, and controls into appropriate wells.
3. Dispense 100 $\mu$ l of Enzyme Conjugate Reagent into each well.
4. Thoroughly mix for 30 seconds. It is very important to have complete mixing in this step.
5. Incubate at room temperature (18-22°C) for about 60 minutes.
6. Rinse and flick the microtiter wells 4 times with washing solution and final 1 time with distilled water.
7. Strike the wells sharply onto absorbent paper to remove residual water droplets.
8. Dispense 100  $\mu$ l Chemiluminescence substrate solution into each well. Gently mix for 5 seconds.

9. Read wells with a chemiluminescence microwell reader 5 minutes later. (between 5 and 20 min. after dispensed the substrates).

**Important Note:**

1. The wash procedure is critical. Insufficient washing will result in poor precision and falsely elevated absorbance readings.
2. If there are bobbles existing in the wells, the false readings will be created. Please use distilled water to remove the bobbles before adding the substrate.

**Calculation of Results**

1. Calculate the average read relative light units (RLU) for each set of reference standards, control, and samples.
2. We recommend to use a proper software to calculate the results. If the software is not available, construct a standard curve by plotting the mean RLU obtained for each reference standard against TSH concentration in uIU/ml on linear graph paper, with absorbance on the vertical (y) axis and concentration on the horizontal (x) axis.
3. Using the mean absorbance value for each sample, determine the corresponding concentration of TSH in uIU/ml from the standard curve.

**Example of Standard Curve**

Results of a typical standard run are shown below. This standard curve is for the purpose of illustration only, and should not be used to calculate unknowns. It is required that running assay together with a standard curve each time. The calculation of the sample values must be based on the particular curve, which is running at the same time.

TSH ( $\mu$ IU/ml)	Relative Light Units (RLU) ( $10^5$ )
0	0.01
0.5	0.33
2	1.52
5	4.37
10	9.12
20	18.31

**Expected Values and Sensitivity**

The mean TSH values based on 160 random normal adult blood samples, is 1.6 (0.4-7.0)  $\mu$ IU/ml. The minimum detectable concentration of TSH by this assay is estimated to be 0.2  $\mu$ IU/ml.

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