

Thyroid Stimulating Hormone Test and its Effect on the Human Body

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Abstract:- Hypercholesterolemia is most common in both women and men, patients who have radiotherapy can also suffer from hypothyroidism people who have taken medication like lithium drugs can suffer from hypothyroidism. Your thyroid can secrete too much hormone for so many reasons. Hyperthyroidism can be caused by any genetic disorder. Hypothyroidism and hyperthyroidism is the disease caused by the misbalance of the T3, T4, and TSH. The test is been performed for the detection of these types of disease. The thyroid name gland plays the most important role in body processing like metabolism and mood swings, the thyroid hormone is responsible for weight gain and loss, sleepless nights, and anxiety-like problems. The thyroid hormone is also responsible for causing the genetic disorder. the disorder also causes thyroid cancer which leads to chronic death. Chronic disease is due to the abundance of cell growth that is infected by the cancerous cell. The increasing and decreasing of the thyroid hormone cause the major problem in the pregnant female. Hypothyroidism can lead to chronic cancerous disease.

Keywords:- TSH, T3,T4, Hypothyroidism , Hyperthyroidism.

I. INTRODUCTION

Thyroid tests are used to check for thyroid problems. This test is used to measure the amount of (TSH), (T4), (T3) in your blood.[1] The pituitary gland in our brain makes the TSH and sends the message to our thyroid gland. TSH controls the production of thyroid hormone [2]. TSH is usually tested first. The combination of a TSH test and a test for thyroid hormones T3 and T4 is known as a thyroid function test (TFT) [3]. The thyroid gland has an important role in controlling our metabolism. A hormone made by your thyroid gland influences us: Our Heart rate, Our Blood pressure, Our Body temperature, and Our Weight.[4]

The thyroid function test is needed if you face all these symptoms: Hyperthyroidism (overactive thyroid), Hypothyroidism (under-active thyroid), and Taking thyroid hormone replacement treatment.

You are female and being investigated for infertility.

Signs if you face hyperthyroidism: Like Sensitivity to heat, Like Weight loss, Like a Fast heartbeat, Like Nervousness, Like Sweating, Like Increased frequency of stool.

Sign if you are facing hypothyroidism: Tiredness, Weakness, Weight gain, Muscle aches, Constipation, Slow heart rate, and Sensitivity to cold.

According to the latest news and data estimated all newborn babies in Australia are screened for thyroid problems. This is because blood samples are taken from the heel prick. One in every 5000 babies is born without a working thyroid gland.[5]Thyroid hormones are chemicals that coordinate different functions in our body that carry messages to the whole body by the blood. These signals tell our body what to do or not to do. Metabolism complex process that means the body transforms food into energy. The thyroid hormone represents the combination of two main hormones that are thyroxine (T4) and triiodothyronine (T3). The production releases the thyroid hormone – thyroxine (T4) and triiodothyronine (T3) is controlled by a loop system it involves the Hypothalamus, Pituitary gland, Thyroid gland, And multiple hormones.

The hypothalamus region of our brain control function like blood pressure, heart rate, and body temperature [6]. The pituitary gland is a very small, pea-sized gland that is located at the base of the brain it functions to release eight hormones.

II. MATERIALS AND METHODS

➤ *MALGUMI TSH (CLIA) Purposes of examination:*

The kit in-vitro chemiluminescence immunoassay for the quantitative determination of (TSH) in human serum using MAGLUMI series Fully chemiluminescence immunoassay analyzer, Maglumi 2000.

➤ *Principle:*

The TSH is a competitive chemiluminescence immunoassay. The sample(or calibrator/control), ABEI labeled anti-TSH monoclonal antibody, buffer mixed thoroughly and incubated, at 37°C, then a solution of magnetic micro-beads coated with TSH antigens incubated at 37-degree Celsius. The binding sites on ABEI-labeled anti-T3 antibodies form immune complexes. Starter 1+2 are

added to initiate chemo-luminescent reaction. The light signal is measured by a photomultiplier for 3 seconds as relative light units (RLUS), which is inversely proportional to the concentration of TSH present in the sample.

➤ *Methodology:*

Chemiluminescence immunoassay (CLIA) SCOPE The scope of this Standard Operating Procedure covers, total thyroid stimulating hormone (TSH) in human serum chemiluminescent micro-particle immune assay (CMIA) using the MAGLUMI series at CORE Diagnostics.

➤ *Clinical Significance:*

Thyroid stimulating hormone, also called TSH, a thyroid hormone, affects every physiological process in the body such as growth and development, metabolism, body temperature, and heart rate. The thyroid synthesizes (TSH) and produces approximately 20% of TSH. The majority of TSH is generated by a microsomal enzyme with activity in the brain, muscle, pituitary, and placenta; the remaining 35% is derived from type I kinase activity, a plasma membrane located in the thyroid, liver, and kidney. Changes in binding protein concentrations occur in several conditions and can significantly affect total thyroid hormone concentrations. Hormones are considered the biologically active forms because the free hormone is accessible to peripheral tissue". TSH concentrations may be altered in conditions affecting the capacity of thyroid-hormone binding proteins, e.g. pregnancy, including acute and chronic disease. TSH determination serves a great important role in diagnosing thyroid disorders, which is elevated in most classical causes of hyperthyroidism, and decreased in primary hypothyroid diseases such as neonatal hypothyroidism or secondary hypothyroidism. TSH test is in addition to a test such as T4, Free T4, Free T3, and Total T3.

III. SPECIMEN REQUIREMENT

➤ *Preparing for the Tests:*

For the test we don't need anything special.

- Venipuncture, swab (for disinfecting the area), tourniquet. First of all, you need to relax the patient before drawing his or her blood.
- Now tie the above arm with the tourniquet and make a fist.
- Then clean the area of drawing blood with the swab 70% alcohol outward so that the area may get disinfectant and be suitable for drawing blood.
- Now find the midvein from where to draw blood.
- Now insert the venipuncture and draw the blood in SST (serum separating vial) and now labeled the vial with the name.
- Further take the vial for centrifuge so that serum should be separated from the blood.

➤ *Storage and Stability :*

Now we should know that if any samples are coming from far apart then they should be in refrigerated condition. At 2-8 degrees Celsius.

➤ *Specimen Rejection Criteria*

- Mismatched specimens personnel should contact the appropriate location and allow them to correct their problem.
- Unlabeled specimens: submitter is notified and requests for identifying samples to submit another specimen.
- In-complete label: Specimens must have the patient's required details. Contact the collector to correct any problems. Incorrect specimen container/temperature for assay.
- Technician performs a test if the specimen is not in the acceptable container/ transported at the required temperature. Due to the Insufficient quantity of specimens submitted for testing requested. Contact the collector concerned person and have the blood form redrawn.

➤ *Quality Control:*

Take the actions: materials are not expired, required maintenance was performed, the assay was performed according to the instructions for use, Operate the test with the new quality control bottle, and a local technician support provider for engineering issues.[7]

➤ *Test Procedure:*

• *Preparation of the Reagent :*

- ✓ Re-suspension that magnetic micro-beads are automatic, the kit is loaded in the machine.
- ✓ Make sure that the cuvettes should be fresh new ones and that the magnetic micro-beads are suspended.
- ✓ In this Maglumi 2000 series the test are performed automatically only the instruction need to be given.[8]
- ✓ No sample dilution is present in this kit.
- ✓ Samples with the concentration are diluted manually. This manual dilution can multiply with a dilution factor for the result.
- ✓ Ask the device SNIBE for the command before manual dilution.[9]

➤ *Handling Precaution:*

- Never use the kit after its expiration
- Never change the reagents lot and mix them with the left-out reagents.
- Always take care that always mix properly new reagents for 30 minutes and make sure the magnetic microbeads are properly mixed
- Always wear gloves while performing the experiments.
- Always take care of the reagent and change the reagents on time.

Table 1 Showing Interpretation of Changing Reagents

TSH	T4	T3	INTERPRETATION
High range	Normal level	Normal level	Mild(subclinical) hypothyroidism case
High range	Low level	Low or normal level	Hypothyroidism case
Low range	Normal level	Normal level	Mild(subclinical)hyperthyroidism case
Low range	High or normal level	High or normal level	Hyperthyroidism case
Low range	Low or normal level	Low or normal level	Non-thyroidal illness: rare pituitary (secondary) hypothyroidism case.

IV. RESULTS

➤ Calculations of Results

The automatic analyzer automatically declares the results of TSH concentration, in each sample. The results of TSH are given in the uIU/ml units.

For further need always refers to the SNIBE software for any type of information.

➤ Interpretation of Results:

- The expected ranges of the TSH assay were obtained for testing 100 patients in India:
- The expected results are: 0.3-4.5 uIU/ml(2.5th – 97.5th percentiles)
- Results may always be different between laboratories.

➤ Performance Characteristics:

This precision data of TSH assay is of 5 patients in one hour of testing time duration.

Table 2 Shows the results of the patient's sample

Sample	Mean(uIU/ml)	Within- run	Between- run	Total
Sample 1	1.227	0.031	0.025	0.040
Sample 2	11.864	0.209	0.166	0.267
Sample 3	64.187	1.359	1.119	1.760
Sample 4	0.620	0.019	0.012	1.94
Sample 5	6.543	0.137	0.100	1.53

➤ Measuring Range:

- 0.001-100 uIU/ml these ranges are of the limit of blank and the maximum limit.
- Values that are below <0.001 uIU/ml are off the limit of the blank.
- Values that are above >100 uIU/ml are of measuring range.

➤ Analytical Specificity:

- The cross-reactivity of TSH assay is its cross-reactant, the expected values are:
- The amount of TSH required for 50% is the maximum labeled by TSH as an anti-TSH antibody,
- The amount of cross-reactant is by 50% displacement.

V. DISCUSSION

Hypothyroidism is the most common disease, affecting women and men. But this disease more affects women. We saw that people in the 30-50 age group are more affected by hypothyroidism and hyperthyroidism. This measurement is done in the 50 age group of the women and especially when women are during the stage of pregnancy or before and after pregnancy. Hypercholesterolemia is most common in both

women and men, patients who have radiotherapy can also suffer from hypothyroidism people who have taken medication like lithium drugs can suffer from hypothyroidism. Your thyroid can secrete too much hormone for so many reasons. Hyperthyroidism can be caused by any genetic disorder.

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