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TSH

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Also known as: Thyrotropin

Formal name: Thyroid-stimulating Hormone

Related tests: [Free T4](#), [Free T3 and Total T3](#), [Thyroid Panel](#), [Thyroid Antibodies](#)



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At a Glance

Why Get Tested?

To screen for and help diagnose [thyroid disorders](#); to monitor treatment of [hypothyroidism](#) and [hyperthyroidism](#)

When to Get Tested?

For screening: Newborn screening is widely recommended; however, there is no consensus within the medical community as to the age adult screening should begin or whether screening should be done.

For monitoring treatment: as directed by your healthcare provider

Otherwise: when a person has symptoms of hyperthyroidism or hypothyroidism and/or an enlarged thyroid

Sample Required?

A blood sample drawn from a vein in your arm or from pricking the heel of an infant

Test Preparation Needed?

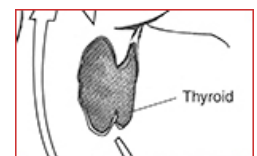
None needed; however, certain medications can interfere with the TSH test, so tell your health practitioner about any drugs that you are taking. If you take thyroid hormone as treatment for thyroid disease, it is recommended that your blood sample be drawn before you take your dose for that day.

The Test Sample

What is being tested?

Thyroid-stimulating hormone (TSH) is produced by the [pituitary gland](#), a tiny organ located below the brain and behind the sinus cavities. TSH stimulates the thyroid gland to release the [hormones thyroxine \(T4\)](#) and [triiodothyronine \(T3\)](#) into the blood. These thyroid hormones help control the rate at which the body uses energy. This test measures the amount of TSH in the blood.

TSH, along with its regulatory hormone thyrotropin releasing hormone (TRH), which comes from the [hypothalamus](#), is part of the [feedback system](#) that the body uses to maintain stable amounts of thyroid hormones in the blood. When thyroid hormone concentrations decrease, the production of TSH by the pituitary gland is increased. TSH in turn stimulates the production and release of T4 and T3 by the thyroid gland, a small butterfly-shaped gland that lies at the base of the throat flat against the windpipe. When all three organs are functioning normally, thyroid production turns on and off to maintain relatively stable levels of thyroid hormones in the blood.



[View image](#)

If the thyroid releases inappropriately large amounts of T4 and T3, the affected person may experience symptoms associated with [hyperthyroidism](#), such as rapid heart rate, weight loss, nervousness, hand tremors, irritated eyes, and difficulty sleeping. [Graves disease](#) is the most common cause of hyperthyroidism. It is a [chronic autoimmune disorder](#) in which the affected person's [immune system](#) produces [antibodies](#) that act like TSH, leading to the production of excessive amounts of thyroid hormone. In response, the pituitary may produce less TSH, usually leading to a low level in the blood.

If there is decreased production of thyroid hormones by the thyroid ([hypothyroidism](#)), the person may experience symptoms such as weight gain, dry skin, constipation, cold intolerance, and fatigue. [Hashimoto thyroiditis](#) is the most common cause of hypothyroidism in the U.S. It is a chronic autoimmune condition in

which the immune response causes inflammation and damage to the thyroid as well as the production of **autoantibodies**. With Hashimoto thyroiditis, the thyroid produces low levels of thyroid hormone. The pituitary may produce more TSH, usually resulting in a high level in the blood.

However, the level of TSH does not always predict or reflect thyroid hormone levels. Some people produce an abnormal form of TSH that does not function properly. They often have hypothyroidism despite having normal or even mildly elevated TSH levels. In a variety of **thyroid diseases**, thyroid hormone levels may be high or low, regardless of the amount of TSH present in the blood.

Rarely, pituitary dysfunction may result in increased or decreased amounts of TSH. In addition to pituitary dysfunction, hyperthyroidism or hypothyroidism can occur if there is a problem with the hypothalamus (insufficient or excessive TRH).

How is the sample collected for testing?

A blood sample is obtained from a needle placed in a vein in the arm or from pricking the heel of an infant.

Is any test preparation needed to ensure the quality of the sample?

No test preparation is needed. Certain medications can interfere with the TSH test, so tell your health practitioner about any drugs that you are taking. If you take thyroid hormone as treatment for thyroid disease, it is recommended that your blood sample be drawn before you take your dose for that day.

The Test

How is it used?

The thyroid-stimulating hormone (TSH) test is often the test of choice for evaluating thyroid function and/or symptoms of a **thyroid disorder**, including **hyperthyroidism** or **hypothyroidism**.

TSH is produced by the **pituitary gland**, a tiny organ located below the brain and behind the sinus cavities. It is part of the body's **feedback system** to maintain stable amounts of the thyroid hormones **thyroxine (T4)** and **triiodothyronine (T3)** in the blood and to help control the rate at which the body uses energy.

A TSH test is frequently ordered along with or preceding a **free T4 test**. Other thyroid tests that may be ordered include a **free T3 test** and **thyroid antibodies** (if autoimmune-related thyroid disease is suspected). Sometimes TSH, free T4 and free T3 are ordered together as a **thyroid panel**.

TSH testing is used to:

- Diagnose a thyroid disorder in a person with symptoms
- Screen newborns for an underactive thyroid
- Monitor thyroid replacement therapy in people with hypothyroidism
- Monitor anti-thyroid treatment in people with hyperthyroidism
- Help diagnose and monitor **infertility** problems in women
- Help evaluate the function of the pituitary gland (occasionally)
- Screen adults for thyroid disorders, although expert opinions vary on who can benefit from screening and at what age to begin

When is it ordered?

A health practitioner may order a TSH test when someone has symptoms of **hyperthyroidism** or **hypothyroidism** and/or when a person has an enlarged thyroid gland (goiter).

Signs and **symptoms** of hyperthyroidism may include:

- Increased heart rate
- Anxiety
- Weight loss
- Difficulty sleeping
- Tremors in the hands
- Weakness
- Diarrhea (sometimes)
- Light sensitivity, visual disturbances

- The eyes may be affected: puffiness around the eyes, dryness, irritation, and, in some cases, bulging of the eyes.

Signs and symptoms of hypothyroidism may include:

- Weight gain
- Dry skin
- Constipation
- Cold intolerance
- Puffy skin
- Hair loss
- Fatigue
- Menstrual irregularity in women

TSH may be ordered at regular intervals when an individual is being treated for a known **thyroid disorder**. When a person's dose of thyroid medication is adjusted, the American Thyroid Association recommends waiting 6-8 weeks before testing the level of TSH again.

TSH screening is routinely performed in the United States on newborns soon after birth as part of each state's **newborn screening program**.

In 2004, the U.S. Preventive Services Task Force found insufficient evidence to recommend for or against routine screening for thyroid disease in **asymptomatic** adults. However, the American Thyroid Association and the American Association of Clinical Endocrinologists released clinical practice guidelines in 2012 that recommend that screening for hypothyroidism should be considered in people over the age of 60. Because the signs and symptoms of both hypothyroidism and hyperthyroidism are so similar to those seen in many common disorders, health practitioners often need to rule out thyroid disease even though the patient has another problem.

What does the test result mean?

A high TSH result may mean that:

- The person tested has an underactive thyroid gland that is not responding adequately to the stimulation of TSH due to some type of **acute** or **chronic** thyroid dysfunction
- A person with **hypothyroidism** or who has had their thyroid gland removed is receiving too little thyroid hormone replacement medication and the dose may need to be adjusted
- A person with **hyperthyroidism** is receiving too much anti-thyroid medication and the dose needs adjusting
- There is a problem with the **pituitary gland**, such as a **tumor** producing unregulated levels of TSH

A low TSH result may indicate:

- An overactive thyroid gland (hyperthyroidism)
- Excessive amounts of thyroid hormone medication in those who are being treated for an underactive (or removed) thyroid gland
- Insufficient anti-thyroid medication in a person being treated for hyperthyroidism; however, it may take a while for TSH production to resume after successful anti-thyroid treatment. This is why the American Thyroid Association recommends monitoring this treatment with tests for thyroid hormones (**T4** and **T3**) as well as TSH levels.
- Damage to the pituitary gland that prevents it from producing adequate amounts of TSH

Whether high or low, an abnormal TSH indicates an excess or deficiency in the amount of thyroid hormone available to the body, but it does not indicate the reason why. An abnormal TSH test result is usually followed by additional testing to investigate the cause of the increase or decrease.

The following table summarizes some examples of typical test results and their potential meaning.

TSH	FREE T4	FREE OR TOTAL T3	PROBABLE INTERPRETATION
High	Normal	Normal	Mild (subclinical) hypothyroidism
High	Low	Low or normal	Hypothyroidism
Low	Normal	Normal	Mild (subclinical) hyperthyroidism

TSH	FREE T4	FREE OR TOTAL T3	PROBABLE INTERPRETATION
Low	High or normal	High or normal	Hyperthyroidism
Low	Low or normal	Low or normal	Non-thyroidal illness; pituitary (secondary) hypothyroidism
Normal	High	High	Thyroid hormone resistance syndrome (a mutation in the thyroid hormone receptor decreases thyroid hormone function)

Is there anything else I should know?

It is important to note that TSH, **free T4**, and **free T3** tests are a "snapshot" of what is occurring within a dynamic system. An individual person's thyroid testing results may vary and may be affected by:

- Increases, decreases, and changes (inherited or acquired) in the proteins that bind T4 and T3
- **Pregnancy**
- Estrogen and other drugs
- **Liver disease**
- **Systemic illness**
- Resistance to thyroid hormones

Many medications — including aspirin and thyroid-hormone replacement therapy — may affect thyroid gland function test results and their use should be discussed with the health practitioner prior to testing.

Illnesses not directly related to the thyroid, "nonthyroidal illnesses," can affect thyroid hormones levels. In particular, the level of T3 can be low in nonthyroidal illness (NTI). Typically, the thyroid hormone levels return to normal after a person recovers from the nonthyroidal illness. Historically, this condition was referred to as "euthyroid sick syndrome" but that term is controversial because there is some question as to whether those affected have a thyroid gland that is functioning normally (euthyroid).

When a health practitioner adjusts a person's thyroid hormone replacement dosage, it is important to wait at least one to two months before checking the TSH again so that the new dose can have its full effect.

Extreme stress and **acute** illness may affect TSH test results. It is generally recommended that thyroid testing be avoided in hospitalized patients or deferred until after a person has recovered from an acute illness.

Results may be low during the first trimester of pregnancy.

Common Questions

1. Do health practitioners test TSH during pregnancy?

Health practitioners do not generally test **asymptomatic** women, but those with symptoms and/or a known **thyroid disorder** may be tested at intervals to detect and evaluate **hyperthyroidism** or **hypothyroidism** both during **pregnancy** and after. For more information, see the National Endocrine and Metabolic Diseases Information Service webpage: [Pregnancy and Thyroid Disease](#).

2. Are there things that I can do to raise or lower my TSH level?

In general, TSH does not respond to lifestyle changes. What is important is that the **pituitary** and **thyroid glands** are healthy and working together to produce appropriate amounts of thyroid hormone.

3. What is a 3rd generation TSH and an ultrasensitive TSH?

The original immunoassays for TSH were not **sensitive** enough to differentiate the very low levels seen in patients with hyperthyroidism from levels seen in normal euthyroid individuals. In the 1980s, more sensitive assays ("second generation") were developed and these were able to identify patients with TSH levels that were suppressed due to the excess amounts of free T4 present in hyperthyroidism. In the 1990s, TSH assays were made even more sensitive and, although these were able to measure even lower levels, they were widely adopted because they performed much better than the second generation assays in the range that was important for differentiating normal from hyperthyroid. Almost all laboratories currently use so-called "third generation" or "ultrasensitive" TSH assays today.

Related Pages

On This Site

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Elsewhere On The Web

[EndocrineWeb: How Your Thyroid Works](#)

[FamilyDoctor.org: Hyperthyroidism](#)

[FamilyDoctor.org: Hypothyroidism](#)

[KidsHealth: Thyroid Disease](#)

[American Association of Clinical Endocrinologists: About Your Thyroid](#)

[Hormone Health Network: Thyroid Disorders](#)

[American Thyroid Association: Patients & The Public - Thyroid Information](#)

[American Thyroid Association: Thyroid Function Tests](#)

[American Thyroid Association: Frequently Asked Questions - Thyroid Disease](#)

[National Endocrine and Metabolic Diseases Information Service: Hyperthyroidism](#)

Article Sources

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