TEST

Free T4 test

A free T4 test measures unbound thyroxine to help assess thyroid function.

WHAT IT MEASURES
Unbound thyroxine hormone available to the body's tissues

SAMPLE
Blood

FASTING NEEDED?
No, unless required for other tests

HOW LONG IT TAKES
About 5 to 10 minutes

RESULTS IN
Usually 1-3 days; timing varies by laboratory

USED FOR
Diagnosis and monitoring of thyroid and pituitary disorders

MAIN LIMITATION
Immunoassays can misread free T4 when binding proteins change

Overview

Free T4 is a blood test that measures the unbound form of thyroxine, one of the main hormones made by the thyroid gland. The thyroid helps regulate energy use, temperature, heart rate, and other body functions.

Most T4 in the blood is attached to proteins. Only a small amount is "free," meaning it is available to tissues. The test is usually reported as free T4 or FT4.

Free T4 is generally interpreted with thyroid-stimulating hormone, or TSH. TSH is made by the pituitary gland and tells the thyroid how much hormone to produce. Together, the results help show how the thyroid and pituitary are working.

Why the test is ordered

A free T4 test can help investigate an underactive or overactive thyroid. It may be ordered after an abnormal TSH result or at the same time as TSH.

It may be used to:

Possible symptoms include tiredness, weight change, heat or cold intolerance, heart-rate changes, tremor, bowel or menstrual changes, and neck swelling. These symptoms have many possible causes, so the test cannot diagnose the cause by itself.

For many people taking levothyroxine, TSH is the main monitoring test. Free T4 is more important when TSH may be unreliable, including in some pituitary conditions.

- Investigate possible thyroid-related symptoms
- Clarify an abnormal TSH result
- Monitor treatment for an overactive thyroid
- Assess thyroid function when pituitary disease is possible
- Check thyroid function during pregnancy when appropriate
- Follow up an abnormal newborn thyroid screening result

Who should have the test

Free T4 testing is most useful when there is a specific reason to assess thyroid function. It is not usually used alone for general screening.

You may be offered the test because of an abnormal TSH result, possible thyroid symptoms, a known thyroid or pituitary condition, or medicines that can affect thyroid function.

Pregnancy changes thyroid hormones and binding proteins. Results should therefore be interpreted using pregnancy- and method-appropriate ranges where available.

How to prepare

Fasting is not normally needed. You can usually eat and drink as normal unless another test requires fasting.

Tell the healthcare professional about all prescription medicines, over-the-counter products, vitamins, and supplements. Do not stop prescribed medicine unless instructed.

Biotin, or vitamin B7, can interfere with some thyroid tests. It is found in certain hair, skin, and nail supplements and high-dose treatments. Ask whether you should pause it and for how long, as advice depends on the dose, testing method, and reason you take it.

If you take levothyroxine, the interval between your dose and the blood draw can affect free T4. Follow the instructions you receive and use consistent timing for repeat tests.

What happens during the test

A healthcare professional inserts a small needle into a vein, usually in your arm, and collects blood into a tube. The needle is generally in place for less than a minute, and the appointment often takes 5 to 10 minutes.

Results may appear online before review. Free T4 should be interpreted with TSH, symptoms, medicines, health history, and previous results.

Understanding your results

Your report should show the result and laboratory reference range. Check the units and ranges before comparing results from different laboratories. Interpretation may vary with the testing method, age, pregnancy, medicines, illness, and clinical context.

Common patterns include:

These patterns are not diagnoses. Repeat testing, thyroid antibody tests, total T4, free T3, imaging, or pituitary assessment may be needed.

Small changes can reflect normal biological or laboratory variation, although consistent changes may matter during treatment.

- High TSH with low free T4: may support an underactive thyroid caused by a problem within the thyroid gland
- Low TSH with high free T4: may support an overactive thyroid
- Low free T4 with low or unexpectedly normal TSH: can occur with pituitary or hypothalamic problems, serious illness, medicines, or test interference
- Abnormal TSH with free T4 within range: may indicate an earlier or milder thyroid change

What affects the results

Only a tiny fraction of circulating T4 is unbound, which makes free T4 difficult to measure. Important influences include:

Age and pregnancy status also affect interpretation. Ordinary exercise usually has little effect, although extreme exertion or acute illness may temporarily alter results.

- Biotin: may cause falsely high free T4 and falsely low TSH with some systems
- Levothyroxine timing: free T4 may temporarily rise after a dose

- Pregnancy: changes binding proteins and may reduce the reliability of routine methods
- Estrogen-containing medicines: increase thyroid-binding proteins
- Heparin: can produce an artificially high result in some samples
- Severe or recent illness: may temporarily alter thyroid hormones
- Medicines: amiodarone, lithium, glucocorticoids, dopamine-related medicines, antiseizure medicines, and thyroid treatments can affect results
- Kidney or liver disease: may change protein binding and hormone handling
- Interfering antibodies: can disrupt some laboratory assays

Accuracy and limitations

Most laboratories use automated immunoassays, which estimate free T4 through antibody-based reactions. Different systems may produce different results from the same sample.

A test can show high or low free T4 when thyroid function is normal, particularly when binding proteins are altered or during pregnancy, serious illness, medicine use, biotin use, or antibody interference. It can also miss mild dysfunction because TSH may become abnormal while free T4 remains within range.

There is no single false-positive or false-negative rate. Accuracy depends on the assay, condition, and person being tested.

If the result conflicts with TSH, symptoms, or previous tests, it may be repeated. A laboratory may use another platform or a specialised method such as equilibrium dialysis or ultrafiltration. Total T4 or a calculated free T4 index may sometimes be more informative when protein binding is unusual.

Risks and complications

A blood draw may cause brief discomfort, minor bleeding, or a small bruise. Some people feel light-headed or faint, but serious complications are uncommon.

What happens next

A result within range may need no further action, depending on why the test was ordered.

During monitoring, your healthcare professional may compare it with previous results.

An unexpected result is usually reviewed with TSH and may be repeated. Follow-up can include reviewing medicines and supplements, testing thyroid antibodies, or ordering other hormone tests.

Arrange timely follow-up if you are pregnant, have a known pituitary condition, or take thyroid treatment and the result is outside your intended range.

Seek urgent medical care based on symptoms, not only an abnormal result. Emergency assessment is appropriate for severe difficulty breathing, chest pain, fainting, marked confusion, or a very fast or irregular heartbeat with significant illness.

Common questions

Can I drink coffee before a free T4 test?

Usually, yes. However, coffee can reduce levothyroxine absorption if taken close to the medicine, so follow your dosing instructions and any test-specific advice.

Does the time of day matter?

TSH varies more during the day than free T4. Timing still matters if you take levothyroxine because free T4 may rise after a dose. Consistent timing helps with comparison.

Can I exercise beforehand?

Ordinary activity is unlikely to matter. Avoid unusually intense exercise if it leaves you dehydrated or unwell.

Do I need to stop biotin?

Possibly. Tell the healthcare professional or laboratory the product, dose, and when you last took it. Do not stop medically prescribed biotin without advice.

Is free T4 the same as total T4?

No. Total T4 includes protein-bound and free hormone. Free T4 estimates only the unbound portion, although it still has measurement limitations.

Why was my TSH tested as well?

TSH often changes before free T4 moves outside its range. Interpreting both helps distinguish thyroid problems from pituitary disease, medicine effects, illness, or test interference.

Sources

- MedlinePlus: Thyroxine (T4) Test
- American Thyroid Association: Thyroid Function Tests
- NICE guideline NG145: Thyroid disease-assessment and management
- US Food and Drug Administration: Biotin interference with laboratory tests
- Endotext: Assay of Thyroid Hormone and Related Substances
- ARUP Consult: Analytical Considerations in Testing Thyroid Function
- American Thyroid Association: 2017 Guidelines for Thyroid Disease During Pregnancy and the Postpartum