

Overview

**Useful For**  
Screening for a diagnosis of thyroid disease

Profile Information

| Test Id | Reporting Name    | Available Separately | Always Performed |
|---------|-------------------|----------------------|------------------|
| STSHC   | TSH, Sensitive, S | Yes, (order STSH)    | Yes              |

Reflex Tests

| Test Id | Reporting Name                   | Available Separately | Always Performed |
|---------|----------------------------------|----------------------|------------------|
| FRT4C   | T4 (Thyroxine), Free, S          | Yes, (order FRT4)    | No               |
| TPOC    | Thyroperoxidase Ab, S            | Yes, (order TPO)     | No               |
| T3C     | T3 (Triiodothyronine), Total, S  | Yes, (order T3)      | No               |
| H2BR    | HER2, Breast Tumor, FISH, Tissue | Yes                  | No               |

**Testing Algorithm**  
If thyrotropin (TSH, formerly thyroid-stimulating hormone) is less than 0.3 mIU/L, then free T4 (thyroxine) is performed at an additional charge.

If FT4 is normal and the TSH is less than 0.1 mIU/L, then T3 (triiodothyronine) is performed at an additional charge.

If TSH is greater than 4.2 mIU/L, then free T4 and thyroperoxidase antibodies are performed at an additional charge.

For more information see [Thyroid Function Ordering Algorithm](#).

**Special Instructions**  
• [Thyroid Function Ordering Algorithm](#)

**Method Name**  
Electrochemiluminescent Immunoassay

**NY State Available**  
Yes

Specimen

Specimen Type

Serum

Specimen Required

Collection Container/Tube:

Preferred: Serum gel

Acceptable: Red top

Submission Container/Tube: Plastic vial

Specimen Volume: 1.5 mL

Collection Instructions:

- 1. Serum gel tubes should be centrifuged within 2 hours of collection.
- 2. Red-top tubes should be centrifuged and the serum aliquoted into a plastic vial within 2 hours of collection.

Forms

If not ordering electronically, complete, print, and send a [Renal Diagnostics Test Request](#) (T830) with the specimen.

Specimen Minimum Volume

1 mL

Reject Due To

|                 |        |
|-----------------|--------|
| Gross hemolysis | Reject |
| Gross lipemia   | OK     |
| Gross icterus   | OK     |

Specimen Stability Information

| Specimen Type | Temperature              | Time     | Special Container |
|---------------|--------------------------|----------|-------------------|
| Serum         | Refrigerated (preferred) | 7 days   |                   |
|               | Ambient                  | 72 hours |                   |
|               | Frozen                   | 30 days  |                   |

Clinical & Interpretive

Clinical Information

This test utilizes a cascaded testing approach to efficiently evaluate and monitor functional thyroid status.

The cascade begins with thyrotropin (TSH, formerly thyroid-stimulating hormone) as a screening assay. In patients with an intact pituitary-thyroid axis, TSH provides a physiologic indicator of the functional level of thyroid hormone activity. Increased TSH indicates inadequate thyroid hormone, and suppressed TSH indicates excess thyroid hormone.

Transient TSH abnormalities may be found in seriously ill, hospitalized patients, so this is not the ideal setting to assess thyroid function. However, even in these patients, TSH works better than total T4 (thyroxine, an alternative screening

---

test).

When TSH is normal, no additional testing will be necessary. However, when the TSH result is abnormal, appropriate follow-up tests will automatically be performed.

If TSH is below 0.3 mIU/L or above 4.2 mIU/L, free T4 is performed. The supplemental measurement of free T4 in patients with abnormal TSH measurements allows one to better assess the severity of the changes.

Serum T3 (triiodothyronine) levels often are depressed in sick and hospitalized patients, caused in part by the biochemical shift to the production of reverse T3. Therefore, T3 generally is not a reliable predictor of hypothyroidism. However, in a small subset of hyperthyroid patients, hyperthyroidism may be caused by overproduction of T3 (T3 toxicosis). To help diagnose and monitor this subgroup, T3 is measured on all specimens with suppressed TSH and normal free T4 concentrations.

Detectable concentrations of antithyroperoxidase (anti-TPO) antibodies are observed in patients with autoimmune thyroiditis and may cause the destruction of thyroid tissue, eventually resulting in hypothyroidism. Anti-TPO antibodies are measured in all specimens with elevated TSH concentrations.

For more information, see [Thyroid Function Ordering Algorithm](#).

**Reference Values**

0-5 days: 0.7-15.2 mIU/L

6 days-2 months: 0.7-11.0 mIU/L

3-11 months: 0.7-8.4 mIU/L

1-5 years: 0.7-6.0 mIU/L

6-10 years: 0.6-4.8 mIU/L

11-19 years: 0.5-4.3 mIU/L

> or =20 years: 0.3-4.2 mIU/L

**Interpretation**

In primary hypothyroidism, thyrotropin (TSH, formerly thyroid-stimulating hormone) levels will be elevated. In primary hyperthyroidism, TSH levels will be low.

The ability to quantitate circulating levels of TSH is important in evaluating thyroid function. It is especially useful in the differential diagnosis of primary (thyroid) from secondary (pituitary) and tertiary (hypothalamus) hypothyroidism. In primary hypothyroidism, TSH levels are significantly elevated, while in secondary and tertiary hypothyroidism, TSH levels are low or normal.

Elevated or low TSH in the context of normal free thyroxine is often referred to as subclinical hypo- or hyperthyroidism, respectively.

Thyrotropin-releasing hormone (TRH) stimulation differentiates all types of hypothyroidism by observing the change in patient TSH levels in response to TRH. Typically, the TSH response to TRH stimulation is exaggerated in cases of primary hypothyroidism, absent in secondary hypothyroidism, and delayed in tertiary hypothyroidism. Most individuals with primary hyperthyroidism have TSH suppression and do not respond to TRH stimulation test with an increase in TSH over their basal value.

Sick, hospitalized patients may have falsely low or transiently elevated TSH.

**Cautions**

Serum biotin concentrations up to 1200 ng/mL do not interfere with this assay. Concentrations up to 1200 ng/mL may be present in specimens collected from patients taking extremely high doses of biotin up to 300 mg per day.(1) In a study among 54 healthy volunteers, supplementation with 20 mg/day biotin resulted in a maximum serum biotin concentration of 355 ng/mL 1 hour post-dose.(2)

For assays employing antibodies, the possibility exists for interference by human anti-animal antibodies (ie, heterophile antibodies) in the patient specimen. Patients who have been regularly exposed to animals or have received immunotherapy or diagnostic procedures utilizing immunoglobulins or immunoglobulin fragments may produce antibodies (eg, human antimouse antibodies) that interfere with immunoassays. This may falsely elevate or falsely decrease the results. Interference due to extremely high titers of antibodies to analyte-specific antibodies, streptavidin, or ruthenium can occur.

For diagnostic purposes, the results should always be assessed in conjunction with the patient's medical history, clinical examination, and other findings.(3)

**Clinical Reference**

1. Peyro Saint Paul L, Debruyne D, Bernard D, Mock DM, Defer GL: Pharmacokinetics and pharmacodynamics of MD1003 (high-dose biotin) in the treatment of progressive multiple sclerosis. *Expert Opin Drug Metab Toxicol*. 2016;12(3):327-344. doi:10.1517/17425255.2016.1136288
2. Grimsey P, Frey N, Bendig G, et al: Population pharmacokinetics of exogenous biotin and the relationship between biotin serum levels and in vitro immunoassay interference. *J Pharmacokinet Pharmacodyn*. 2017;2(4):247-256. doi:10.4155/ipk-2017-0013
3. Package insert: TSH Reagent. Roche Diagnostics; V2, 03/2020
4. Fatourechi V, Lankarani M, Schryver PG, Vanness DJ, Long KH, Klee GG: Factors influencing clinical decisions to initiate thyroxine therapy for patients with mildly increased serum thyrotropin (5.1-10.0 mIU/L). *Mayo Clin Proc*. 2003;78(5):554-560. doi:10.4065/78.5.554
5. Wilson JD, Foster D, Kronenberg HM, et al: *Williams Textbook of Endocrinology*. 9th ed. WB Saunders Company; 1998
6. Melmed S, Polonsky KS, Larsen PR, et al: *Williams Textbook of Endocrinology*. 12th ed. Elsevier Saunders Company; 2011:348-414
7. Heil W, Ehrhardt V: *Reference Intervals for Adults and Children 2008*. 9th ed. Roche Diagnostics; 09/2009

**Performance****Method Description**

The cobas e immunoassay thyrotropin (TSH) method employs monoclonal antibodies specifically directed against human TSH. A biotinylated monoclonal TSH-specific antibody and a monoclonal TSH-specific antibody labeled with a ruthenium complex react to form a sandwich complex. After the addition of streptavidin-coated microparticles, the complex becomes bound to the solid phase via interaction of biotin and streptavidin. The reaction mixture is aspirated into the measuring cell where the microparticles are magnetically captured onto the surface of the electrode. Application of a voltage to the electrode then induces chemiluminescent emission, which is measured by a photomultiplier.(Package

insert: Elecsys TSH. Roche Diagnostics; V2, 04/2021)

PDF Report

No

Day(s) Performed

Monday through Sunday

Report Available

1 to 2 days

Specimen Retention Time

7 days

Performing Laboratory Location

Mayo Clinic Laboratories - Rochester Main Campus

Fees & Codes

- Fees
- Authorized users can sign in to [Test Prices](#) for detailed fee information.
  - Clients without access to Test Prices can contact [Customer Service](#) 24 hours a day, seven days a week.
  - Prospective clients should contact their account representative. For assistance, contact [Customer Service](#).

Test Classification

This test has been cleared, approved, or is exempt by the US Food and Drug Administration and is used per manufacturer's instructions. Performance characteristics were verified by Mayo Clinic in a manner consistent with CLIA requirements.

CPT Code Information

84443

84439 (if appropriate)

84480 (if appropriate)

86376 (if appropriate)

LOINC® Information

| Test ID | Test Order Name             | Order LOINC® Value |
|---------|-----------------------------|--------------------|
| THSCM   | Thyroid Function Cascade, S | 11579-0            |

| Result ID | Test Result Name  | Result LOINC® Value |
|-----------|-------------------|---------------------|
| STSHC     | TSH, Sensitive, S | 11579-0             |