MAYO CLINIC LABORATORIES

Test Definition: T3

T3 (Triiodothyronine), Total, Serum

Overview

Useful For

Second-order testing for hyperthyroidism in patients with low thyroid-stimulating hormone values and normal thyroxine levels

Diagnosing triiodothyronine (T3) toxicosis

This test is **not useful for** general screening of the population without clinical suspicion of hyperthyroidism.

Testing Algorithm

For information see Thyroid Function Ordering Algorithm.

Special Instructions

- Thyroid Function Ordering Algorithm

Method Name

Electrochemiluminescence 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 mL
Collection Instructions: Centrifuge and aliquot serum into plastic vial.

Forms

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

Specimen Minimum Volume

0.75 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	
	Frozen	30 days	

Clinical & Interpretive

Clinical Information

Thyroid hormones regulate numerous developmental, metabolic, and neural activities throughout the body. The thyroid gland synthesizes 2 hormones. The 2 main hormones secreted by the thyroid gland are thyroxine (T4), which contains 4 atoms of iodine, and triiodothyronine (T3). T3 production in the thyroid gland constitutes approximately 20% of the total T3; the rest is generated by the conversion (deiodination) of T4 to T3. T3 is also produced by conversion (deiodination) of T4 in peripheral tissues. Circulating levels of T4 are much greater than T3 levels, but T3 is biologically the most metabolically active hormone (3-4 times more potent than T4), although its effect is briefer due to its shorter half-life compared to T4.

Thyroid hormones circulate primarily bound to carrier proteins (eg, thyroid-binding globulin [TBG], prealbumin, and albumin), whereas only a small fraction circulates unbound (free). Only the free forms are metabolically active. While both T3 and T4 are bound to TBG, T3 is bound less firmly than T4. Total T3 consists of both the bound and unbound fractions.

In hyperthyroidism, both T4 and T3 levels are usually elevated, but in a small subset of hyperthyroid patients, only T3 is elevated (T3 toxicosis).

In hypothyroidism, T4 and T3 levels are decreased. T3 levels are frequently low in sick or hospitalized euthyroid patients.

Reference Values

Pediatric
0-5 days: 73-288 ng/dL
6 days-2 months: 80-275 ng/dL
3-11 months: 86-265 ng/dL
1-5 years: 92-248 ng/dL
6-10 years: 93-231 ng/dL
11-19 years: 91-218 ng/dL

Adult (> or =20 years): 80-200 ng/dL

For International System of Units (SI) conversion for Reference Values, see

www.mayocliniclabs.com/order-tests/si-unit-conversion.html

Interpretation

Triiodothyronine (T3) values above 200 ng/dL in adults or over age-related cutoffs in children are consistent with hyperthyroidism or increased thyroid hormone-binding proteins.

Abnormal levels (high or low) of thyroid hormone-binding proteins (primarily albumin and thyroid-binding globulin) may cause abnormal T3 concentrations in euthyroid patients.

Cautions

Triiodothyronine (T3) is not a reliable marker for hypothyroidism.

Therapy with amiodarone can lead to depressed T3 values.

Phenytoin, phenylbutazone, and salicylates cause a release of T3 from the binding proteins, thus leading to a reduction in the total T3 hormone level at normal free T3 levels.

Autoantibodies to thyroid hormones can interfere with the assay.

Binding protein anomalies may cause values that deviate from the expected results. Pathological concentrations of binding proteins can lead to results outside the reference range, although the patient may be in a euthyroid state. Free T3 or free T4 testing is indicated in these cases.

In rare cases, some individuals can develop antibodies to mouse or other animal antibodies (often referred to as human anti-mouse antibodies [HAMA] or heterophile antibodies), which may cause interference in some immunoassays. The presence of antibodies to streptavidin or ruthenium also rarely occur and may interfere with this assay. Caution should be used in interpretation of results, and the laboratory should be alerted if the result does not correlate with the clinical presentation.

Triiodothyronine has a 15-fold higher affinity for thyroid receptor compared to T4.

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)

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

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. Hay ID, Klee GG. Linking medical needs and performance goals: clinical and laboratory perspectives on thyroid disease. Clin Chem. 1993;39(7):1519-1524

4. Klee GG. Clinical usage recommendations and analytic performance goals for total and free triiodothyronine

measurements. Clin Chem. 1996;42(1):155-159
5. Ellervik C, Halsall D, Nygaard B. Thyroid disorders. In: Rifai N, Chiu RWK, Young I, Burnham CAD, Wittwer CT, eds. Tietz Textbook of Laboratory Medicine. 7th ed. Elsevier; 2023:chap 57

Performance

Method Description

The Roche triiodothyronine assay (T3) is a competitive assay using electrochemiluminescence detection. Bound T3 is released from binding proteins by 8-anilino-1-naphthalene sulfonic acid. The patient specimen is incubated with a sheep polyclonal anti-T3 antibody labeled with ruthenium. Streptavidin-coated microparticles and biotinylated T3 are added for a second incubation, during which the still free binding sites of the labeled antibody become occupied. The resulting immunocomplex becomes bound to the solid phase by 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. Unbound substances are removed, and application of a voltage to the electrode induces the electrochemiluminescent emission. This signal is measured against a calibration curve to determine patient results.(Package insert: Elecsys T3. Roche Diagnostics; V 3.0, 05/2024)

PDF Report

No

Day(s) Performed

Monday through Saturday

Report Available

1 to 3 days

Specimen Retention Time

2 weeks

Performing Laboratory Location

Mayo Clinic Laboratories - Rochester Superior Drive

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

84480

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
T3	T3 (Triiodothyronine), Total, S	83124-8

Result ID	Test Result Name	Result LOINC® Value
T3	T3 (Triiodothyronine), Total, S	83124-8