

Overview
Useful For

Estimating the amount of circulating free thyroxine (free thyroxine index) using the total thyroxine and thyroid binding capacity (T-uptake)

Profile Information

Test ID	Reporting Name	Available Separately	Always Performed
TUPC	Thyroxine Binding Capacity, S	No	Yes
T4S	Thyroxine, Total, S	Yes, (order T4)	Yes
FRTI	Free Thyroxine Index	No	Yes

Method Name

Electrochemiluminescence Immunoassay

NY State Available

Yes

Specimen
Specimen Type

Serum

Specimen Required

Patient Preparation: For 12 hours before this test do not take multivitamins or dietary supplements containing biotin (vitamin B7), which is commonly found in hair, skin, and nail supplements and multivitamins.

Container/Tube:

Preferred: Serum gel

Acceptable: Red top

Specimen Volume: 1 mL

Specimen Minimum Volume

0.5 mL

Reject Due To

Hemolysis	Mild OK; Gross OK
Lipemia	Mild OK; Gross OK
Icterus	Mild OK; Gross OK
Other	NA

Specimen Stability Information

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

Clinical and Interpretive**Clinical Information**

The determination of the total thyroxine (T4) concentration is of importance in laboratory diagnostics for differentiating between euthyroid, hyperthyroid, and hypothyroid conditions. As the major fraction of the total thyroxine is bound to transport proteins (thyroxine-binding globulin: TBG, prealbumin, and albumin), the determination of total T4 only provides correct information when the thyroxine-binding capacity in serum is normal. The free thyroid hormones are in equilibrium with the hormones bound to the carrier proteins.

The thyroid binding capacity or T-uptake assay provides a measure of the available thyroxine-binding sites. Determination of the free thyroxine index (FTI) from the quotient of total T4 and thyroxine-binding index (TBI) (TBI=result of the T-uptake determination) takes into account changes in the thyroid hormone carrier proteins and the thyroxine level.

While total T4 is a relatively reliable indicator of T4 levels in the presence of normal binding proteins, it is not a reliable indicator when binding proteins are abnormal. For example, increases in thyroxine-binding proteins may cause increased total T4 levels despite normal free T4 levels and normal thyroid function.

Results are changed by drugs or physical conditions that alter the patient's TBG levels, or drugs that compete with endogenous T4 and T3 for protein-binding sites.

Direct measurement of free thyroxine (FRT4 / T4 [Thyroxine], Free, Serum by immunoassay) has replaced the FTI test in most clinical situations.

Reference Values

THYROXINE BINDING CAPACITY (units are in Thyroxine Binding Index: TBI):

0-19 years: 0.8-1.2 TBI

> or =20 years: 0.8-1.3 TBI

T4 TOTAL (T4):

0-5 days: 5.0-18.5 mcg/dL

6 days-2 months: 5.4-17.0 mcg/dL

3-11 months: 5.7-16.0 mcg/dL

1-5 years: 6.0-14.7 mcg/dL

6-10 years: 6.0-13.8 mcg/dL

11-19 years: 5.9-13.2 mcg/dL

> or =20 years: 4.5-11.7 mcg/dL

FREE THYROXINE INDEX:

0-5 days: 5.1-20.8 mcg/dL

6 days-2 months: 5.5-18.0 mcg/dL

3-11 months: 5.7-16.8 mcg/dL

1-5 years: 5.9-15.0 mcg/dL

6-10 years: 6.0-13.9 mcg/dL

11-19 years: 5.9-13.2 mcg/dL

> or =20 years: 4.8-12.7 mcg/dL

For SI unit Reference Values, see <https://www.mayocliniclabs.com/order-tests/si-unit-conversion.html>

Interpretation

The free thyroxine index (FTI) is determined by the following calculation:

FTI = Thyroxine (T4)/Thyroid Binding Capacity

The FTI is a normalized determination that remains relatively constant in healthy individuals and compensates for abnormal levels of binding proteins.

Hyperthyroidism causes increased FTI and hypothyroidism causes decreased values.

Cautions

Twelve hours before this blood test do not take multivitamins or dietary supplements containing biotin or vitamin B7, which are commonly found in hair, skin, and nail supplements and multivitamins.

The test cannot be used in patients receiving treatment with lipid-lowering agents containing D-T4. If the thyroid function is to be checked in such patients, the therapy should first be discontinued for 4 to 6 weeks to allow the physiological state to become re-established.

Autoantibodies to thyroid hormones can interfere with the assay.

Binding protein anomalies seen with familial dysalbuminemic hyperthyroxinemia, for example, may cause values which, while characteristic of the condition, deviate from the expected results.

Clinical Reference

1. Whitley RJ, Meikle AW, Watts NB: Thyroid function. In Tietz Fundamentals of Clinical Chemistry. Fourth edition. Edited by CA Burtis, ER Ashwood. Philadelphia, WB Saunders Company, 1996, pp 645-646

2. Wilson JD, Foster DW, Kronenburg MD, et al: Williams Textbook of Endocrinology. Ninth edition, WB Saunders Company, 1998, pp 407-477

Performance

Method Description

Thyroxine Binding Capacity:

Testing is performed on Roche Cobas e immunoassay analyzer. Thyroxine (T4) occupies the free binding sites in the serum sample. After addition of a T4-specific antibody labeled with a ruthenium complex, the T4-polyhapten and the antibody derivative react to form a complex, the concentration of which is inversely proportional to the concentration of the excess, exogenous T4. This immunological complex becomes bound to the added streptavidin-coated microparticles via interaction of biotin and streptavidin. Application of a voltage to the electrode then induces chemiluminescent emission which is measured by a photomultiplier. (Package insert: Roche T-Uptake reagent, 2011-11. V18, Indianapolis, IN)

Thyroxine, Total:

Testing is performed on a Roche Cobas e immunoassay analyzer. The Roche T4 assay is a competitive assay using electrochemiluminescence detection. Bound T4 is released from binding proteins by 8-anilino-1-naphthalene sulfonic acid (ANS). Patient specimen is incubated with sheep polyclonal anti-T4 antibody labeled with ruthenium. Streptavidin-coated microparticles and biotinylated T4 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 then removed and application of a voltage to the electrode induces the electrochemiluminescent emission. (Package insert: Roche T4 reagent, 2011-06, V3, Indianapolis, IN)

PDF Report

No

Day(s) and Time(s) Test Performed

Monday through Sunday; Continuously

Analytic Time

Same day/1 day

Maximum Laboratory Time

1 day

Performing Laboratory Location

Rochester

Fees and 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 Regional Manager. For assistance, contact [Customer Service](#).

Test Classification

This test has been cleared or approved by the U.S. 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

84479-Thyroxine binding capacity(TUP)

84436-Thyroxine total (T4S)

LOINC® Information

Test ID	Test Order Name	Order LOINC Value
FRTUP	Free Thyroxine Index(FTI), S	32215-6

Result ID	Test Result Name	Result LOINC Value
T4S	Thyroxine, Total, S	3026-2
TUPC	Thyroxine Binding Capacity, S	74795-6
FRTI	Free Thyroxine Index	32215-6