Test Definition: T4BPE

Thyroxine-Binding Protein Electrophoresis, Serum

Overview

Useful For

Explaining unusual thyroxine (T4), free T4, and thyroxine-binding globulin test results that do not correlate with the patient's clinical presentation

Detecting the presence of aberrant thyroxine-binding proteins, such as abnormal forms of albumin and prealbumin

Detecting selective deficiency of one of the thyroxine-binding proteins

Detecting antibodies to T4

An adjunct to the diagnosis of patients with high T4 concentration due to peripheral hormone resistance by ruling out thyroxine-binding abnormalities

Profile Information

Test Id	Reporting Name	Available Separately	Always Performed
TBPE	Thyroxine-Binding Protein Electro	No	Yes
T4	T4 (Thyroxine), Total Only, S	Yes	Yes

Method Name

TBPE: Electrophoresis
T4: Electrochemiluminescence Immunoassay (ECLIA)

NY State Available

Yes

Specimen

Specimen Type

Serum

Ordering Guidance

This assay measures thyroxine binding to various proteins.

For analysis of thyroxine-binding globulin, see TBGI / Thyroxine-Binding Globulin (TBG), Serum.

For immunologic assay of prealbumin, see PALB / Prealbumin, Serum.

This test **should not be requested** in patients who have recently received radioisotopes, therapeutically or diagnostically, because of potential assay interference. A recommended time period before collection cannot be made because it will depend on the isotope administered, the dose given, and the clearance rate in the individual patient.

The total thyroxine (T4) test **should not be used** in patients receiving treatment with lipid-lowering agents containing dextrothyroxine unless therapy is discontinued for 4 to 6 weeks to allow the T4 physiological state to become re-established prior to testing.

Specimen Required

Patient Preparation: For 12 hours before specimen collection, patient **should not** take multivitamins or dietary supplements (eg, hair, skin, and nail supplements) containing biotin (vitamin B7).
Supplies: Sarstedt Aliquot Tube, 5 mL (T914)
Collection Container/Tube:
Preferred: Serum gel
Acceptable: Red top
Submission Container/Tube: Plastic vial
Specimen Volume: 1.6 mL
Collection Instructions: Centrifuge and aliquot serum into a plastic vial.

Specimen Minimum Volume

0.8 mL

Reject Due To

Gross hemolysis	Reject
Gross lipemia	Reject
Gross icterus	Reject

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Serum	Refrigerated (preferred)	7 days	
	Ambient	24 hours	
	Frozen	30 days	

Clinical & Interpretive

Clinical Information

Normally, almost all thyroxine (99.5%) is bound to thyroxine-binding globulin, prealbumin, and albumin. Deficiencies and aberrant forms of these binding proteins can occur, causing difficulties interpreting thyroid function test results. Such

abnormalities may be identified by thyroxine-binding protein electrophoresis.

Reference Values

THYROXINE-BINDING PROTEIN ELECTROPHORESIS:
10.3-24.9 mcg T4/dL bound to thyroxine-binding globulin
11.5-34.1 mcg T4/dL bound to albumin
48.8-70.4 mcg T4/dL bound to prealbumin

T4 (THYROXINE), TOTAL ONLY:
Pediatric:
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

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

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

Interpretation

An interpretive comment will be provided based on the total thyroxine concentration and the thyroxine-binding protein profile observed in the electrophoresis.

Cautions

Thyroxine-binding globulin values may be elevated in women taking estrogens and during pregnancy.

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. Caution should be used in interpretation of results and the laboratory should be alerted if the result does not correlate with the clinical presentation.

Clinical Reference

1. Hay ID, Klee GG. Thyroid dysfunction. Endocrinol Metab Clin North Am. 1988;17(3):473-509
2. Bartalena L, Robbins J. Thyroid hormone transport proteins. Clin Lab Med. 1993;13(3):583-598
3. Mimoto MS, Refetoff S. Clinical recognition and evaluation of patients with inherited serum thyroid hormone-binding protein mutations. J Endocrinol Invest. 2020;43(1):31-41. doi:10.1007/s40618-019-01084-9
4. Pappa T, Ferrara AM, Refetoff S. Inherited defects of thyroxine-binding proteins. Best Pract Res Clin Endocrinol Metab. 2015;29(5):735-747

Performance

Method Description

Thyroxine-binding protein electrophoresis:
Radioactive (125)I-thyroxine (T4) is incubated with patient serum, the mixture is electrophoresed on polyacrylamide gel, and the profile of binding proteins is quantitated by counting the radioactivity in slices of the gel. The binding proteins are separated by both charge and size with prealbumin on the anode side followed by albumin and thyroxine-binding globulin (TBG). Gamma globulin remains at the origin, and free T4 migrates between albumin and prealbumin. The concentration of (125)I-T4 added will saturate TBG but not the other T4-binders. The binding is expressed as thyroxine-binding capacity at 100 mcg T4/dL serum.(Unpublished Mayo method).

Thyroxine:
The Roche T4 (thyroxine) assay is a competitive assay using electrochemiluminescence detection. Bound T4 is released from binding proteins by 8-anilino-1-naphthalene sulfonic acid. 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. This signal is measured against a calibration curve to determine patient results.(Package insert: Elecsys T4. Roche Diagnostics; V 2.0 English, 03/2020)

PDF Report

No

Day(s) Performed

Fourth Friday of the month

Report Available

29 to 35 days

Specimen Retention Time

90 days

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

Test Definition: T4BPE

Thyroxine-Binding Protein Electrophoresis, Serum

This test was developed and its performance characteristics determined by Mayo Clinic in a manner consistent with CLIA requirements. It has not been cleared or approved by the US Food and Drug Administration.

CPT Code Information

84436
82664

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
T4BPE	Thyroxine-Binding Protein Electro	48073-1

Result ID	Test Result Name	Result LOINC® Value
T4	T4 (Thyroxine), Total Only, S	83119-8
2860	TBG	14016-0
2861	Albumin	11062-7
2862	Pre-Albumin	14014-5
2863	Abnormal Binding Protein	48767-8
3345	Comment	50681-6