Instructions for Use

Free Thyroxine (CLIA)

[Product Name]

Free Thyroxine (CLIA)

[Packing Size]

24×1 Tests/Pkg (Calibrators included); 60×1 Tests/Pkg (Calibrators included);

60×1 Tests/Pkg

[Intended Use]

Free thyroxine (FT4) assay is a chemiluminescent immunoassay (CLIA) used for the quantitative determination of free thyroxine (FT4) in human serum, plasma, and whole blood, and it is mainly used for the auxiliary assessment and diagnosis of thyroid diseases.

Thyroxine (T4), 3,5,3′,5′-tetraiodothyronine, with a molecular weight of approximately 776.93 Da, is the main hormone secreted by the thyroid gland and released into blood circulation. While more than 99% of T4 is bound to serum thyroxine binding proteins (TBP), less than 0.05% of the total circulating T4 is unbound, which is called free thyroxine (FT4) [1, 2] and is biologically active. T4 is an integral component of the hypothalamus-anterior pituitary-thyroid regulating system. It functions to increase the basal metabolic rate, maintains growth and development of the nervous system, generates cardiovascular effects, and affects the growth of long bones and brain development [3, 4]. The concentration of FT4 correlates with the secretion and metabolism of thyroxine. In patients with hypothyroidism and hyperthyroidism, FT4 concentration generally changes in parallel with the concentration of total thyroxine. Determination of FT4 concentration is of great clinical significance when total thyroxine concentration changes due to the fluctuation of thyroxine-binding protein (especially thyroid-binding globulin, TBG) [4~6]. In healthy individuals, TBG concentration is relatively stable, but under certain conditions (e.g. normal pregnancy and steroid therapy), TBG concentration may change, leading to the variation of total thyroxine concentration, but the concentration of FT4 remains stable [7]. Therefore, determination of FT4 is an important laboratory method for routine clinical diagnosis. When thyroid dysfunction is suspected, FT4 and TSH are often tested in parallel [5, 6]. FT4 is also suitable for monitoring the efficacy of thyroid suppressive therapy [7, 8].

[Principle of the Assay]

FT4 immunoassay adopts a competition format. The test principle is described below:

(1) Sample, acridinium-labeled anti-T4 antibody, and reaction diluent are mixed and incubated. FT4 in the sample binds to anti-T4 antibody;

(2) Transfer all solution mixture to react with magnetic microparticle coated with T4-derivative. After incubation, free acridinium-labeled anti-T4 antibody unbound by FT4 in the reaction mixture will bind to the T4-derivative microparticle, and forms a complex;

(3) A magnet captures the microparticle, and then unbound substance in solution is washed off. Add pre-trigger and trigger solution to the reaction mixture sequentially to initiate chemiluminescence reaction;

(4) A photomultiplier tube is used to measure photons generated from the reaction. The count is inversely proportional to FT4 concentration in the sample. Concentration of FT4 is determined by an internal calibration curve.

[Main Components]

Packing Size

Component \ Packing Size		Fill Volume		
		24×1 Tests/Pkg (Calibrators included)	60×1 Tests/Pkg (Calibrators included)	60×1 Tests/Pkg
FT4 Reagent Cartridge	Microparticle (R1)	24×50 μL	60×50 μL	60×50 μL
	Conjugate (R2)	24×100 μL	60×100 μL	60×100 μL
	Reaction diluent (R3)	24×150 μL	60×150 μL	60×150 μL
FT4 Calibrator	FT4 Calibrator C1	1×1.0 mL	1×1.0 mL	/
	FT4 Calibrator C2	1×1.0 mL	1×1.0 mL	/
Calibration Card		1 pcs	1 pcs	/

Main Composition

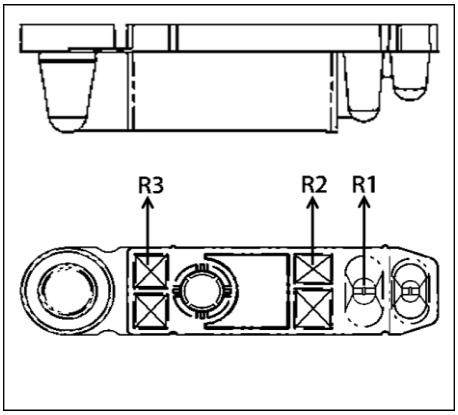
Component		Main Composition
FT4 Reagent Cartridge	Microparticle (R1)	T4-derivative coated microparticle, ~0.3 g/L; Tris buffer, 50 mmol/L; ProClin 300, 0.5 g/L
	Conjugate (R2)	Acridinium labeled mouse anti-T4 antibody, ~200 μg/L; MES buffer, 50 mmol/L; ProClin 300, 0.5 g/L
	Reaction diluent (R3)	Tris buffer, 50 mmol/L; ProClin 300, 0.5 g/L
FT4 Calibrator	FT4 Calibrator C1	T4; Tris buffer, 25 mmol/L; ProClin 300, 0.5 g/L
	FT4 Calibrator C2	T4; Tris buffer, 25 mmol/L; ProClin 300, 0.5 g/L
Calibration Card		Calibration curve and calibrator information

Note: (1) Components in different lots of reagent cannot be mixed or exchanged for use.

(2) Traceability: This quantification method can be traced back to Roche Elecsys FT4 III.

(3) Information about the calibrators (such as lot number and concentration etc.) can be found on the instrument interface after scanning the Calibrator Card.

The position of each component in the reagent pack is shown in the front view (Upper) and vertical view (Down) of the reagent cartridge.



Instruments and accessories needed but not supplied (Medcaptain has the supplies)

(1) Medcaptain Immu F6/F6S Automatic Chemiluminescent Immunoassay Analyzers;

(2) Pre-trigger solution;

(3) Trigger solution;

(4) Washing solution;

(5) 500 μL pipette tips;

(6) Thyroid Function Controls.

[Storage and Shelf-life]

Storage: Store sealed reagent cartridges and calibrators at 2~8℃ in upright position, and avoid freezing.

Shelf life: 14 months.

Stability of Calibrators: Sealed vial of calibrators can be kept at 2~8℃ in dark for 14 months. After calibrator C1 or C2 is opened and capped again, it can be stored at 10~30℃ for 5 days, and at 2~8℃ for 60 days.

The dates of manufacturing and expiration can be found on the labels.

[Matched Instruments]

Medcaptain Immu F6/F6S Automatic Chemiluminescent Immunoassay Analyzers

[Specimen Types]

Serum, plasma, and whole blood (collected with EDTA-K_2, EDTA-K_3, lithium heparin, and sodium heparin as the anti-coagulants) can be used in the testing.

Sample volume for each test: 20 μL.

The collected sample should be tested as soon as possible. Whole blood must be tested within 4 hours after sample collection.

Serum and plasma can be kept at 10~30℃ for 24 hours, at 2~8℃ for 7 days, and at -20℃ or below for 60 days. Frequent freeze-thaw cycles should be avoided, and only one freeze-thaw cycle is allowed. If the sample contains precipitate or frozen floccule, centrifugation is needed to clear the sample before testing.

Sample collection tubes from different manufacturers may lead to variation in testing results, due to the difference in tube material and additives in the tubes. Medcaptain has not evaluated all types of sample collection tubes from different manufacturers. Each laboratory should make its own judgment about the usability of sample collection tubes.

[Test Procedure]

Reagent Preparation

Reagent: FT4 reagent cartridge (containing magnetic microparticle R1, acridinium labeled conjugate R2, and reaction diluent R3) is ready for use. It can be loaded directly into the instrument after opening the package.

Calibrators: Calibrator C1 and C2 are ready for use. Each calibrator can be added to a sample cup, and the cups are loaded to a sample rack. The sample rack can be pushed directly into the instrument for calibration tests.

Calibration

Refer to the relevant chapters in the operation manual of each chemiluminescent immunoassay analyzer. Calibration tests should be ordered before the first time use of FT4 assay. Medcaptain provides FT4 reagent pack and matched calibrators to calibrate the instrument.

Before calibration, scan the calibration card provided in the kit, and the calibration curve and calibrator information will be scanned into the system. Take out reagent cartridges from the package, and load them into the instrument. The instrument scans two-dimensional barcode on the reagent pack automatically to obtain information of the reagent (reagent name, Lot No., and expiration date, etc.). Put calibrators on a sample rack, load the sample rack into the instrument.

On the screen interface of “Reagent > Request Calibration”, select test name and lot number to request a calibration. Select the position of each calibrator on the sample rack, set the number of repeat tests, start calibration.

Automatic immunoassay analyzer makes use of calibration data to validate the calibration, and adjust the calibration curve automatically. Instrument calibration is effective for 60 days.

A new calibration is needed in the following situation:

(1) Change into a new lot of reagent;

(2) Control test results are out of the target range;

(3) The lot of reagent has been used on the same instrument for more than 60 days.

Refer to the Chapter of “Calibration” in the instruction manual of Automatic Chemiluminescent Immunoassay Analyzer for detailed information about calibration.

Control Testing

Thyroid Function Controls are matched with FT4 reagent pack. There are two levels of controls: Low Control (L) and High Control (H).

Test two levels of controls with FT4 reagent on the instrument in accordance with any local applicable regulations. Control testing is highly recommended every time the lot of reagent has been changed, the instrument has been re-calibrated, or after trouble shooting/ maintenance service.

Before the control testing, take out reagent cartridges from the package, and load them into the instrument. The instrument scans two-dimensional barcode on the reagent pack automatically to obtain information of the reagent (reagent name, Lot No., and expiration date etc.).

Put controls on a sample rack, and load the sample rack into the instrument; Select “Control” on the interface of test menu, select test name and control lot; Click on “Start” and begin the testing. Check the results after control test is finished.

Control test results should fall into a specific range. If it is out of the target range, the user should check the system, such as expiration date of the controls, storage condition, instrument performance and status. After root cause analysis and corrective action, the user should test controls again. If the same problem exists, please contact customer service of Medcaptain.

Each laboratory should set up its own control range and frequency of control testing, based on its own practice.

Refer to the Chapter of “Control Testing” in instruction manual of Automatic Chemiluminescent Immunoassay Analyzer for detailed information about control testing.

Sample Testing

Before sample testing, take out reagent cartridges from the package, and load them into the instrument. The instrument scans two-dimensional barcode on the reagent pack automatically to obtain information of the reagent (reagent name, Lot No., and expiration date etc.).

If a sample collection tube is directly loaded to the instrument for testing, the sample volume should be at least 1.0 mL; Un-cap sample collection tubes, put samples on a sample rack, and push the sample rack into the instrument; Select “Sample” on the interface of test menu, enter information of samples, select test name; Click on “Start” and begin the testing. Check the results after sample test is finished.

The reagent usage for each test is: R1 50 μL, R2 100 μL, and R3 150 μL. The instrument aspirates and mixes each component in the reagent cartridge and incubates at 37℃. Time duration from sampling to result is about 18 min.

Refer to the Chapter of “Sample Testing” in instruction manual of Automatic Chemiluminescent Immunoassay Analyzer for detailed information about sample testing.

Result Calculation

Based on the built-in calibration curve, the instrument automatically calculate FT4 concentration of each sample, either in a unit of pmol/L or ng/dL. Unit conversion factor: 1.0 pmol/L=0.077688 ng/dL, 1.0 ng/dL = 12.872 pmol/L.

[**Reference Intervals**]

Samples for the study of reference intervals come from local area in Guangdong Province. A total of 248 healthy and normal people have been recruited (Male: 128; Female: 120), age ranges from 12 to 85 years old. Serum tests give a reference interval (2.5^{th}-97.5^{th} percentile) of 11.50~20.82 pmol/L, or 0.89~1.62 ng/dL .

Due to the differences in geography, race, sex, and age of tested population, the

reference interval may vary in different laboratories. It is highly recommended for each clinical lab to establish its own reference intervals.

[Interpretation of Test Results]

The test data is for clinical reference only. It cannot be used as the only confirmatory evidence nor to eliminate the possibility of diseases. Clinical diagnosis of patients should take clinical symptoms, body sign, disease history, other lab test results, and treatment response into comprehensive consideration.

The measurement range of this assay is: 0.50~100.0 pmol/L. If FT4 concentration is lower than LoD, it will be reported as <0.50 pmol/L; If FT4 concentration is over the upper limit, it will be reported as >100.0 pmol/L.

Samples for FT4 determination cannot be diluted, as T4 in the blood is present in free and protein-bound forms which are in equilibrium. A change in the concentration of the binding protein will alter this equilibrium.

When the instrument shows a warning sign of "SMPL", it means there is insufficient sample volume. Make sure enough sample is added for repeating the test. When the instrument shows a warning sign of "SMPJ", it means the sample probe has been blocked. Clean sample clot in the probe before repeating the test. Some results are tagged with other signs. Refer to the Chapter of "Result Signs" in the instruction manual of Automatic Chemiluminescent Immunoassay Analyzer for detailed information about results tagged with signs.

[Limitation of the Test Method]

The test data is for clinical reference only. It cannot be used individually as the evidence to confirm or eliminate the possibility of diseases.

For each endogenous interference substance with concentration less than the value shown in the table below, measurement error caused by the interference is within ±10%.

Endogenous interference substance	Concentration of interference substance
Total Protein	≤12 g/dL
Bilirubin	≤20 mg/dL
Hemoglobin	≤500 mg/dL
Triglyceride	≤1800 mg/dL

For each potential cross-reactant with concentration less than the value shown in the table below, the test result of FT4 is less than 0.5 pmol/L.

Cross-reactant	Concentration
L-triiodothyronine	≤500 μg/dL
Trans triiodothyronine	≤100 μg/dL
3-iodine-L-tyrosine	≤5000 μg/dL
3, 5-diiodine-L-tyrosine	≤5000 μg/dL
3,5-diiodo-L-thyronine	≤5000 μg/dL
3,3'-diiodo-L-thyronine	≤20 μg/dL

When concentration of each special thyroid drug is lower than the value shown in the table below, relative deviation of measured value caused by the interference is within ±10%.

Drug	Concentration
Iodide	≤0.2 μg/mL
Carbimazole	≤6 μg/mL
Thiamazole	≤80 μg/mL
Propylthiouracil	≤300 μg/mL
Perchlorate	≤2000 μg/mL
Propranolol	≤240 μg/mL
Amiodarone	≤200 μg/mL
Prednisolone	≤100 μg/mL
Hydrocortisone	≤200 μg/mL
Fluocortolone	≤100 μg/mL
Octreotide	≤0.3 μg/mL

Heterophilic antibodies in human serum may react with immunoglobulin in the reagent or sample, and interfere with immunoassay in vitro. More clinical or diagnostic information is needed to confirm disease diagnosis of patients. Some patients have frequent contact with animals, or have been treated or diagnosed with mouse monoclonal antibodies. They may have generated heterophilic antibodies. For example, some patients under monoclonal antibody treatment may have human anti-mouse antibodies (HAMA) in blood circulation, leading to false positive or false negative results. Anti-interference components are added to this reagent formulation to minimize the impact of HAMA and ANA, but the problem may not be totally eliminated, and some sample testing may still be impacted. More clinical and diagnostic information is needed to make a solid conclusion.

Samples with the titer of no less than 1:1000 by anti-nuclear IgG test kit (indirect immune-fluorescence method) were studied in the interference tests. It has shown less than ±10% error in testing results. For RF at a concentration of less than 1500 IU/mL, and for multiple representative human HAMA samples, the measurement error caused by the interference is also within ±10%.

[Property and Performance]

1 Limit of Blank

LoB≤ 0.2 pmol/L.

2 Limit of Detection

LoD≤ 0.5 pmol/L.

3 Accuracy

Test the accuracy reference samples at two concentration levels multiple times. Relative deviation between the measurement result and the target value must not exceed 10.0%.

4 Linearity

Test FT4 samples with concentration in the range of 0.5~100 pmol/L, the linearity correlation coefficient r≥0.9900.

5 Repeatability

Coefficient of variation (CV) for the test results of low (10±2 pmol/L) and high (25±5 pmol/L) corporate reference sample is less than 8.0%.

6 Lot-to-lot Variation

Coefficient of variation (CV) for the test results of low (10±2 pmol/L) and high (25±5 pmol/L) corporate reference sample with three batches of reagents is less than 10.0%.

7 Accuracy of Calibrator Value Assignment

Use primary calibrators with assigned values from higher level measurement procedure, calibrate the immunoassay analyzer, and use the same lot of reagent to measure the value of each product calibrator. The measured value of Calibrator C1 or C2 has a relative deviation within ±10.0% from its assigned value.

8 Homogeneity of Calibrators

8.1 Within-vial Homogeneity

Within-vial homogeneity of Calibrator C1 or C2 is represented with coefficient of variation, and CV≤8.0%.

8.2 Between-vial Homogeneity

Between-vial homogeneity of calibrator C1 or C2 is represented with coefficient of variation, and CV≤5.0%.

[Attention Notes]

1 It is for in-vitro diagnosis only.

2 It can only be used by professionals.

3 Never use expired reagent kit.

4 Never mix components from different kits, or from different reagent lots.

5 Do not put the reagent cartridges upside down.

6 Measurement of FT4 in a sample using different detection systems may yield different results, due to difference in test methods, assay specificity, and factors of interference. The measured values from different systems should not be directly compared to avoid inappropriate clinical interpretation.

7 Strictly follow the protocol in the package insert, and operate according to the lab guidelines.

8 The test results can only be used for clinical reference. Clinical diagnosis of patients should take symptoms, body sign, disease history, other laboratory test results, and response to treatment for comprehensive assessment.

9 User should wear gloves and lab coat. Rinse with water if the skin is in contact with the reagent. Flush eyes with copious of water if eyes are in touch with the reagent, and see a doctor immediately.

10 Take all samples and reaction waste as potential biohazards. All waste must be handled following the local government regulation.

11 This product is a single-use cartridge. Reagent cartridges should be put back into refrigerator and stored at 2~8℃ if they have been placed at room temperature but not opened yet.

[Interpretation of Signs]

	Temperature limit.		Date of manufacturing
	*In vitro* diagnostic medical device		Catalogue number
	Batch Code		Consult instructions for use or consult electronic instructions for use
	Use-by Date		Authorized representative in the European Community/European Union
	This way up		CE marking
	Manufacturer		Unique device identifier
	Biological risks		

[References]

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[Basic Information]

MEDCAPTAIN MEDICAL TECHNOLOGY CO., LTD.

12th Floor, Baiwang Research Building, No. 5158 Shahe West Road, Xili, Nanshan, 518055 Shenzhen, Guangdong, PEOPLE'S REPUBLIC OF CHINA

Telephone: +86-755-26953369

Website: http://www.medcaptain.com

Post-sales service: MEDCAPTAIN MEDICAL TECHNOLOGY CO., LTD.

Telephone: +86-755-26953369

Postal code: 518055

Manufacture Location: Building C, Jiale Science and Technology Industrial Park, Matian Street, Guangming, 518106 Shenzhen, Guangdong, PEOPLE'S REPUBLIC OF CHINA.

R Sight B.V.

Roald Dahllaan 47, 5629 MC, Eindhoven. The Netherlands

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