

Immunoassay

REF

CME0401 / CME0402 / CME0403 / CME0404 / CME0405

50 tests*1 / 100 tests*1 / 100 tests*2 / 100 tests*5 / 50 tests*2

FT3 CLIA Microparticles

This assay is based on a chemiluminescent microparticle immunoassay (CLIA Microparticles) for the quantitative determination of FT3 (free triiodothyronine) in human serum.

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Key to Graphical Symbols Used

LOT

batch code



use by



manufacturer



contains sufficient for <n> tests

IVD
in vitro diagnostic medical device


temperature limitation

REF

catalogue number



consult instructions for use

EC REP

authorized representative in the European Community

EC REP

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Introduction

FT3 (free triiodothyronine) is the physiologically active form of the T3. Despite FT3 levels are not the most accurate indicator of thyroid function, and have limited applicability, but the determination of FT3 has the advantage of being independent of changes in the concentrations and binding properties of the binding proteins. FT3 measurements, like FT4 (free thyroxine), measure the hormone that is not bound to binding proteins such as TBG. Free hormone measurements are difficult since concentrations measured are very small - in fact the measurements actually estimate the free levels rather than measuring them directly. Compared with FT4 and TSH (thyrotropin), FT3 concentration is not frequently determined. First its concentration remains normal until hypothyroidism is severe, and FT3 is restricted to particular diagnosis where hyperthyroidism needs to be confirmed, finally, determinations of FT3 are frequently restricted to specialized departments.¹ T3 (triiodothyronine) circulates in blood almost completely bound (>99.5%) to carrier proteins. Further, the concentrations of the carrier proteins are altered in many clinical conditions, such as pregnancy. For clinical studies of protein effects, FT3 is independent of serum protein concentration for TBG and TBPA binding proteins.² In normal thyroid function, as the concentrations of the carrier proteins alter, the total T3 level changes so that the FT3 concentration remains constant.³ Thus, measurements of FT3 concentrations correlate more reliably with clinical status than total T3 levels. For example, the increase in total T3 levels associated with pregnancy, oral contraceptives and estrogen therapy result in higher total T3 levels while the FT3 concentration remains basically unchanged.⁴ In addition, it has been found that the mean FT3 value has a gradient decreasing from young to older.⁵

Measurement Principle

This assay is based upon the one-step competitive method. The sample, T3 derivant coated microparticles and enzyme labeled anti-T3 are combined. During the incubation, T3 derivant coated on microparticles and FT3 present in the sample compete for binding to the enzyme labeled antibodies. After washing, a complex is generated between the solid phase and enzyme-linked antibodies by immunological reactions. Chemiluminescent Substrate is added and the complex catalyzes substrate, resulting in a chemiluminescent reaction. The resulting chemiluminescent reaction is measured as RLUs. The RLU is inversely proportional to the amount of FT3 in the samples.

Materials provided


1. Calibrators

6 vials each containing 1.0 mL of calibrator A through F. The matrix is human serum. Contains a selection of preservatives.

Calibrators provided ready to use.

2. Reagent pack

Reagent pack provided ready to use.

	50*1	100*1	100*2	100*5	50*2
Microparticles Solution	1.2mL*1	2.3mL*1	2.3mL*2	2.3mL*5	1.2mL*2
Enzyme Conjugate	5.5mL*1	11.0mL*1	11.0mL*2	11.0mL*5	5.5mL*2

● Microparticles Solution

T3 derivant coated microparticles in PBS (phosphate buffered saline) buffer containing BSA. Contains a selection of preservatives.

● Enzyme Conjugate

Horseshoe-peroxidase labeled anti-T3 in Tris-NaCl buffer containing BSA (bovine serum albumin). Contains a selection of preservatives.

Assay Analyzers on which the kit can be used

- AutoLumo A2000 Plus
- AutoLumo A2000 Plus B
- AutoLumo A1000

The chemiluminescent microparticle immunoassay (CLIA Microparticles) is intended for use on Assay Analyzer which is AutoLumo A2000 Plus, AutoLumo A2000 Plus B or Autolumo A1000.

Materials Required but not Provided

1. Assay Analyzer
2. Reaction vessel(s) for sample and reagent reaction
3. Sample cup(s) or tube(s) for sample containing
4. Chemiluminescent Substrate
5. System Wash for washing the pipetting needles
6. Wash Buffer used in the washing procedure
7. Distilled water or deionized water

Metrological Traceability of Calibrators

The measurand or analyte in these FT3 calibrators is traceable to the manufacturer's working calibrators. Traceability process is based on EN ISO 17511. The assigned values were established using representative samples from this lot of calibrator and are specific to the assay methodologies of the reagents. Values assigned by other methodologies may be different. Such differences, if present, may be caused by inter-method bias.

Warnings and Precautions

1. For professional use only.
2. Follow the instruction for use carefully. Reliability of assay results cannot be guaranteed if there are any deviations from the instructions in this instruction for use.
3. Refer to the material safety data sheet and product labeling for any chemical hazards that may be present in this assay.
4. Handle the potentially contaminated materials and wastes safely according to local requirement.
5. CAUTION: the calibrators contain material of human origin, which has been tested and found non-reactive for HBsAg, HIV-1 and HIV-2, HCV and syphilis. This assay contains materials of animal origin. Bovine components originate from countries where BSE has not been reported.
6. Do not smoke, drink, eat or use cosmetics in the working area.
7. Wear protective clothing and disposable gloves when dealing with samples and reagents. Wash hands after operations.
8. Use caution when handling patient samples to prevent cross contamination. Use of disposable pipettes or pipette tips is recommended.
9. Conduct the assay away from bad ambient conditions. e.g. ambient air containing high concentration corrosive gas such as sodium hypochlorite acid, alkaline, acetaldehyde and so on, or containing dust.
10. Do not use reagents beyond the labeled expiry date.
11. Do not mix or use components from kits with different batch codes.
12. When storing the calibrators, be certain the vials are securely sealed.
13. Ensure the microparticles are re-suspended before loading it on the analyzer.
14. Avoid foam formation in all reagents and sample types (samples, calibrators and controls).
15. Do not substitute any reagent in this kit from other manufacturers or other lots.
16. When any damage to the protective packaging or any change of analytical performance is observed, do not use the kit.

Storage

1. Store the kit at 2-8 °C. Do not freeze. Avoid strong light.
2. Refrigerate the reagent pack at 2-10 °C for a minimum of 2 hours prior to use.
3. Store the unsealed reagents pack upright on the analyzer or 2-10°C for a maximum of 28 days. After 28 days, the reagent pack must be discarded. Once they are removed from the analyzer, store them at 2-10 °C in an upright position.
4. Seal and return the remaining calibrators at 2-8 °C immediately after the experiment, under which conditions the stability will be retained for 2 months; for longer use, store opened calibrators in aliquots and freeze at -20 °C. Avoid multiple freeze-thaw cycles.

Sample

1. Collect serum samples in accordance with correct medical practices.
2. Do not use heat-inactivated samples. Do not use sodium azide preservative in samples.
3. Sediments and suspended solids in samples may interfere with the test result which should be removed by centrifugation. Ensure that complete clot formation in serum samples has taken place prior to centrifugation. Some samples, especially those from patients receiving anticoagulant or thrombolytic therapy, may exhibit increased clotting time. If the sample is centrifuged before a complete clot forms, the presence of fibrin may cause erroneous results. Be sure that the samples are not decayed prior to use.
4. Prior to shipment, it is recommended that samples be removed from the clot, serum separator or red blood cells.
5. Insufficient processing of sample or disruption of the sample during transportation may cause depressed results.
6. Avoid grossly hemolytic, lipemic or turbid samples.
7. Cap and store the samples at 18-25 °C for no more than 8 hours, for longer use samples should be capped and stored at 2-8 °C up to 48 hours. Or freeze the samples that need to be stored or transported for more than 48 hours at -20 °C. Avoid multiple freeze-thaw cycles. Mix thawed samples thoroughly by low speed vortex or by inverting 10 times. Visually inspect the samples, if layering or stratification is observed, continue mixing until samples are visibly homogeneous. After thawing, bring to room temperature and mix well by gently shaking.
8. Centrifuge the thawed samples containing red blood cells or particulate matter, or which are hazy or cloudy in appearance prior to use to ensure consistency in the results.
9. Note that interfering levels of fibrin may be present in samples that do not have obvious or visible particulate matter.
10. If proper sample collection and preparation cannot be verified, or if samples have been disrupted due to transportation or sample handling, an additional centrifugation step is recommended. Centrifugation conditions should be sufficient to remove particulate matter.
11. Do not dilute samples as T3 exists in both free and combined form in blood, and in an equilibrated status. Binding protein concentration variation will break the equilibrated status.
12. For optimal results, inspect all samples for bubbles. Remove bubbles with a tip prior to analysis. Use a new tip for each sample to prevent cross contamination.

Measurement Procedure

1. **Check the consumable materials**
 - Verify adequate volume of consumable materials is present prior to running the test.
 - Refer to the Assay Analyzer's operation manual.
2. **Load the kit**

- Mix contents of new (unpunctured) reagent packs by gently inverting pack several times before loading on the analyzer. Don't invert the open (punctured) packs. If necessary, shake gently to mix horizontally after the first loading.
- Analyzer can read the bar code on the reagent pack automatically to obtain the required parameters for the test.
- If the bar code cannot be read in exceptional cases, they can be recognized manually.
- Refer to the Assay Analyzer's operation manual.

3. Order tests

- Place the sample cups or tubes on the sample rack, 50 µL of samples for each test. But consider the sample container and 150 µL of system dead volumes, which can be refer to the appropriate Assay Analyzer manuals for the minimum sample volume required.
- Load the sample rack and input the sample information on the system software interface.
- Select "run" to start the test, the analyzer automatically operates tests. It performs the following functions:
 - Moves the sample to the set point
 - Loads a reaction vessel into the process path
 - Aspirates and transfers sample into the reaction vessel
 - Adds Microparticles Solution and Enzyme Conjugate to the reaction vessel
 - Mixes, incubates and washes the reaction mixture
 - Adds Chemiluminescent Substrate
 - Measures chemiluminescent emission to determine the quantity of FT3 in the sample
 - Discards the used reaction vessel
 - Calculates the result
- Refer to the Assay Analyzer's operation manual.

4. Calibrate the curve

- Analyzer can read the bar code on the reagent pack automatically to obtain the required parameters for the test.
- If the bar code cannot be read in exceptional cases, they can be recognized manually.
- Transfer the calibrators into the sample cups or tubes and place them on the sample rack. Conduct duplicate detection on the system.
- Load the sample rack and input calibrators' information on the system software interface.
- Select "run" to start the test and generate the calibration curve, calibration is required every 28 days.
- Once a calibration curve is accepted and stored, all subsequent samples may be tested without further calibration unless:
 - Controls are out of range after repeated measurements
 - A reagent kit and substrate solution with new batch code is used
 - Beyond the expiration date of a calibration curve
 - Important parts of the analyzer are replaced or repaired.
- Refer to the Assay Analyzer's operation manual.

Measurement Results

The sample test results are determined automatically by the system software. The amount of FT3 in the samples is determined from the measured light production by means of the stored calibration data. Refer to the Assay Analyzer's operation manual on reviewing the stored data.

The default unit for this assay is pmol/L.

Conversion formula: $\text{pmol/L} \times 0.651 = \text{pg/mL}$

Control Procedure

Controls for the various concentration ranges should be run individually when the test is in use, once per reagent kit, and following each calibra-

tion.

The control intervals and limits should be adapted to each laboratory's individual requirements. Values obtained should fall within the defined limits. Each laboratory should establish corrective measures to be taken if values fall outside the defined limits.

Follow the applicable government regulations and local guidelines for quality control.

Limitations of the Procedure

1. This assay is intended as an aid for the clinical diagnosis. Conduct this assay in conjunction with clinical examination, patient's medical history and other test results.
2. If the results are inconsistent with clinical evidence, additional testing is suggested to confirm the result.
3. Heterophilic antibodies and rheumatoid factors in samples may interfere with test results. Heterophilic antibodies in human serum can react with reagent immunoglobulin, interfering with *in vitro* immunoassays. Patients routinely exposed to animals or animal serum products can be prone to this interference and anomalous values may be observed. Additional information may be required for diagnosis.
4. In severe NTI (nonthyroidal illness), the assessment of thyroid status becomes very difficult. TSH measurements are recommended to identify thyroid dysfunction.
5. Familial dysalbuminemic conditions may yield erroneous results on direct free T3 assays.
6. Samples cannot be diluted for the FT3 determinates.
7. This test measures concentrations within the range of 0.2-50 pmol/L.

Biological Reference Interval

A normal range of 3.5 pmol/L to 7.0 pmol/L (central 95% interval) was obtained by testing serum samples from 236 individuals defined as normal by clinician. It is recommended that each laboratory establish its own normal range which may be unique to the population it serves depending upon geographical, patient, dietary, or environmental factors.

Performance Characteristics

1. Measurement Precision

3 samples were assayed in duplicate, twice per day across 20 testing days. Data from this study are summarized in the following table.

Sample	n	Mean (pmol/L)	Within-run	Total
			%CV	%CV
1	80	7.09	4.24	5.32
2	80	11.69	2.78	4.02
3	80	34.27	3.81	5.24

*Representative data; results in individual laboratories may vary from these data

2. Analytical Sensitivity

Limit of Blank: 0.2pmol/L.

Limit of Detection: 1.0pmol/L.

Limit of Quantitation: 1.5pmol/L with a coefficient of variation of $\leq 20\%$.

3. Analytical Specificity

Cross reaction: No cross reaction with following substances at listed concentration levels.

Substance	Concentration (ng/mL)	Cross reactivity (%)
T4	500	≤ 0.01
rT3	2000	≤ 0.001

Interference: Interference: No interference with 40 mg/dL of bilirubin, 500 mg/dL of hemoglobin, 1000 mg/dL of triglycerides.

4. Measurement Accuracy by Correlation

A comparison study was performed where samples were tested using this assay and a microparticle based FT3 test which was available on the market. Data were analyzed and are summarized in the following table.

Correlation Method	Number of Samples	Intercept	Slope	Correlation Coefficient
Linear Regression	200	0.0673	1.011	0.9908

Literature References

1. Piketty M, d' Herboomez M, Le Guillouzic D, et al. Clinical comparison of three labeled-antibody immunoassays of free triiodothyronine. *Clin Chem.* 1996;42(6):933-941.
2. Wilkins T, Midgley J, Stevens R, Caughey I, Barron N. Assay performance and tracer properties for two analog-based assays of free triiodothyronine. *Clin Chem.* 1986;32(3):465-469.
3. Bartalena L, Robbins J. Variations in Thyroid Hormone Transport Proteins and Their Clinical Implications. *Thyroid.* 1992;2(3):237-245.
4. Carrero JJ, Qureshi AR, Axelsson J, et al. Clinical and biochemical implications of low thyroid hormone levels (total and free forms) in euthyroid patients with chronic kidney disease. *J. Intern. Med.* 2007;262(6):690-701.
5. Verheecke P. Free triiodothyronine concentration in serum of 1050 euthyroid children is inversely related to their age. *Clin Chem.* 1997;43(6):963-967.