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18. TROUBLE SHOOTING CHART

PROBLEM	POSSIBLE CAUSE	SOLUTION
1. Controls out of validation limit	a) Controls deterioration due to improper storage or used after expiry.	Use controls within 30 days once opened and Check storage temp. It should be 2-8^{0}C.
	b) Cross contamination of Controls	Pipette carefully and do not interchange caps.
	c) Reagents deterioration to improper storage or used after expiry.	Use reagents within 30 days once opened and Check storage temp. It should be 2-8^{0}C.
	d) Magnetic microsphere are not properly mixed before loading in the analyzer.	Ensure proper mixing of bottle containing microparticles by gentle shaking/ inversion before use.
2) High Ferritin Test results	a) Use of turbid, lipaemic or hemolyzed sample.	Use clear fresh sample. Refer specimen collection, handling and processing for more details.
	b) Sample position is wrongly defined while loading the sample details in analyzer.	check the sample position and run the test meticulously.
	c) Magnetic microsphere are not properly mixed before loading in the analyzer.	Ensure proper mixing of bottle containing microparticles by gentle shaking/ inversion before use.
	d) Wrong sample identitification.	Mark the sample I.D. at the time of sample collection.
3) Low Ferritin Test results	a) Sample deterioration due to improper Storage or microbially contaminated sample.	Use clear fresh sample immediately after collection. Refer Specimen collection, and handling processing for more details.
	b) Sample position is wrongly defined while loading the sample details in analyzer.	check the sample position and run the test meticulously.
	c) Magnetic microsphere are not properly mixed before loading in the analyzer.	Ensure proper mixing of bottle containing microparticles by gentle shaking/ inversion before use.
	d) Wrong sample identitification.	Mark the sample I.D. at the time of sample collection.

in vitro diagnostic Reagent, not for medicinal use

VER-01 R-00

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FERRITIN *i*Clia

Chemiluminescence microparticle immunoassay for quantitative measurement of Ferritin in Human Serum/ Plasma

1. INTRODUCTION

Ferritin, a major iron storage protein found in most living organisms, is composed of a 24-subunit protein cage with a hollow interior cavity. Serum ferritin serves as a critical marker to detect total body iron status. Recently, several lines of evidence have demonstrated that ferritin is a multi-functional protein with possible roles in proliferation, angiogenesis, immunosuppression, and iron delivery. In the context of cancer, ferritin is detected at higher levels in the sera of many cancer patients, and the higher levels correlate with aggressive disease and poor clinical outcome. Elevated ferritin is common in acute leukemia, Hodgkin's disease, lung, colon, liver, and prostate cancers. Ferritin determination has proved valuable in the confirmation of liver metastasis. The study showed that ferritin levels were above 400 ng/mL in 76% of patients with liver metastasis, which may be caused by cell necrosis, blocked erythropoiosis, or increased tumor tissue synthesis.

2. INTENDED USE

Ferritin iCLIA) is a chemiluminiscent microparticle immunoassay (CMIA)designed the quantitative measurement of Ferritin in human serum/plasma as an aid in monitoring the recurrence and metastasis of malignant tumors. The assay kit is intended for in-vitro diagnostic use. This kit is only operational in conjuction with J.Mitra CLIA Analyzer.

3. PRINCIPLE

Ferritin iClia Kit is a sandwich immunoassay using microparticle acridinium ester-labeled chemiluminescent technology.

In the first step, assay buffer , human serum/plasma and anti-Ferritin labeled magnetic microparticle are mixed and incubated in an assay cup, which allows Ferritin in sample to bind to microparticle and forms microparticle-anti-Ferritin antibody/antigen complex. Next, after washing, anti-Ferritin antibodies labeled acridinium ester conjugate (AE Conjugate) is added and incubated. The above complex is combined with AE Conjugate and formed microparticle-anti-Ferritin antibody/antigen/antibody immune complex. Excess AE conjugate is removed by washing and finally the bound enzyme is detected by addition of chemiluminescent substrate. Pre-trigger & Trigger solution containing hydrogen peroxide and sodium hydroxide to the reaction mixture. The relative light unit (RLU) intensity is proportional to the amount of Ferritin in the sample. According to the Ferritin RLU-concentration standard curve, the RLU observed can be interpreted to Ferritin concentration in the sample expressed as ng/mL.

4. DESCRIPTION OF SYMBOLS USED

The following are graphical symbols used in or found on J. Mitra diagnostic products and packing. These symbols are the most common ones appearing on medical devices and their packing. They are explained in more detail in the European Standard EN ISO 15223-1:2021.

	Manufactured By	IVD	*In vitro* diagnostic medical device
Σ	No. of tests Lot Number		Instruction for use
LOT	Batch Number	2°C 8°C	Temperature Limitation
	Manufacturing Date		Caution - See instruction for use
	Expiry Date	REF	Catalogue Number
	Do not use if package is damaged		Keep away from sunlight
BIO	Contains biological Material of Human Origin	BIO	Contains biological Material of Animal Origin
IN	Country of Manufacture		Keep Dry

5. KIT PRESENTATION

- 25 Test Pack
- 50 Test Pack
- 100 Test Pack

6. KIT & ITS COMPONENTS

COMPONENT	DESCRIPTION
Microparticle Buffer	Magnetic Microspheres coated with anti-Ferritin antibodies with preservatives.
Assay Buffer	Tris buffer and BSA with preservative.
Sample Diluent	Buffer containing protein stabilizer and antimicrobial agent as preservatives.
AE Conjugate	anti-Ferritin antibodies linked to acridinium ester with Protein stabilizers.
Control-1	Purified ferritin in Tris buffer (pH7.4) with stabilizer.
Control-2	Purified ferritin in Tris buffer (pH7.4) with preservatives.
Calibrator-1	Low concentration of ferritin in human serum containing preservatives.
Calibrator-2	High concentration of ferritin in human serum containing preservatives.
Reagent Plugs	Silicon caps to cover the opened reagents.

7. STORAGE AND STABILITY

The shelf-life of the kit is 12 months from the date of manufacturing, when stored at 2-8^{0}C. **Once the kit is opened, onboard stability of reagents, calibrator and control is 30 days at 2-8^{0}C.**

8. ADDITIONAL MATERIAL AND INSTRUMENTS REQUIRED

- **Pre-Trigger Solution:** Hydrogen peroxide solution.
- **Trigger Solution:** Sodium hydroxide solution.
- **Wash Buffer:** Phosphate buffered saline solution with surfactant.
- **Assay Cup**
- **Sample Diluent**
- **J. Mitra CLIA Analyzer**

All materials and analyzer to be used for running the Ferritin iClia shall be from J. Mitra & Co. Pvt. Ltd.

9. SPECIMEN COLLECTION & HANDLING

1. Only human serum or plasma samples should be used for the test.
2. For serum collection use serum vacutainer. While preparing serum samples, remove the serum from the clot as soon as possible to avoid hemolysis. Fresh serum/plasma samples are preferred.
3. For plasma collection: use Dipotassium EDTA, Tripotassium EDTA, Sodium heparin and lithium heparin gel vacutainer.
4. Specimens should be free of microbial contamination and may be stored at 2-8^{0}C for one week, or frozen at -20^{0}C or lower. Avoid repeated freezing and thawing.
5. Do not use heat inactivated samples as their use may give false results. Hemolyzed and Icteric hyperlipemic samples may give erroneous results.
6. Serum specimens from patients receiving anticoagulant or thrombolytic therapy may contain fibrin due to incomplete clot formation.
7. Always use clear specimens. Centrifuge viscus/ thick or turbid specimen at 10,000 RPM for 15 minutes prior to use to avoid inconsistent result.
8. Use of disposable pipettes or pipette tips is recommended to prevent cross contamination.

10. SPECIMEN PROCESSING

(A) FROZEN SAMPLE

Ferritin iClia test is best used with fresh samples that have not been frozen and thawed. However most frozen samples will perform well if the procedure suggested below is followed.

Allow the frozen sample to thaw in a vertical position in the rack. Do not shake the sample. This allows particles to settle to the bottom. Centrifuge the sample at 10,000 rpm for 15 minutes.

(B) TRANSPORTATION

If the specimen is to be transported, it should be packed in compliance with the current Government regulations regarding transport of aetiologic agents.

11. WARNING & PRECAUTION

⚠ **CAUTION:** THIS KIT CONTAINS MATERIALS OF HUMAN ORIGIN. NO TEST METHOD CAN OFFER COMPLETE ASSURANCE THAT HUMAN BLOOD PRODUCTS WILL NOT TRANSMIT INFECTION. NEGATIVE CONTROL, POSITIVE CONTROL & ALL THE SAMPLES TO BE TESTED SHOULD BE HANDLED AS THOUGH CAPABLE OF TRANSMITTING INFECTION.

1. The use of disposable gloves and proper biohazardous clothing is STRONGLY RECOMMENDED while running the test.
2. In case there is a cut or wound in hand, DO NOT PERFORM THE TEST.
3. Do not smoke, drink or eat in areas where specimens or kit reagents are being handled.
4. Tests are for *in vitro* diagnostic use only and should be run by competent person only.
5. Do not pipette by mouth.
6. All materials used in the assay and samples should be decontaminated in 5% sodium hypochlorite solution for 30-60 min. before disposal or by autoclaving at 121ºC at 15psi for 60 minutes. Do not autoclave materials or solution containing sodium hypochlorite. They should be disposed off in accordance with established safety procedures.
7. Wash hands thoroughly with soap or any suitable detergent, after the use of the kit. Consult a physician immediately in case of accident or contact with eyes, in the event that contaminated material are ingested or come in contact with skin puncture or wounds.
8. Spills should be decontaminated promptly with Sodium Hypochlorite or any other suitable disinfectant.

12. PRECAUTIONS FOR USE & REAGENT HANDLING

1. Do not use kit components beyond the expiration date which is printed on the kit.
2. Store the reagents & samples at 2-8ºC.
3. Do not pool reagents from within a batch or between different batches, as they are optimised for individual batch to give best results.
4. Before loading the reagent kit in the clia analyzer for the first time, ensure proper mixing of microparticle bottle to resuspend microparticles that may have settled during transport or storage.

5 Once reagents are opened, reagent plugs must be used to prevent reagent evaporation and contamination and to ensure reagent integrity. Reliability of assay results cannot be guaranteed if reagent plugs are not used according to the instructions given.

6. Mark the test specimen with patient's name or identification number. Improper identification may lead to wrong result reporting.

7 To avoid contamination, wear clean gloves when placing a reagent plug on an uncapped reagent bottle.

8. Once a reagent plug has been placed on an open reagent bottle,do not invert the bottle as this will result in reagent leakage and may compromise assay results.
9. Reagents may be stored on or off the Chemiluminescence immunoassay analyzer. If reagents are removed from the analyzer, store them at 2-8°C (with Reagent plugs) in an upright position. For reagents stored off the system, it is recommended that they should be stored in their original trays and boxes to ensure they remain upright. If the microparticle bottle does not remain upright (with a Reagent plug placed) while in refrigerated storage off the system, the reagent kit must be discarded.
10. Run FERRITIN Control-1 & FERRITIN Control-2 in each assay to evaluate validity of the kit.
11. Distilled or deionised water must be used for wash buffer preparation.
12. Avoid strong light exposure during the assay.
13. In case of any doubt the run should be repeated.

13. TEST PROCEDURE

Assay Procedure

1. Refer to the Clia-181 user manual for detailed information on preparing the analyzer.
2. Before loading the Ferritin iClia reagent tray on the analyzer for the first time, mix contents of the microparticle buffer bottle to resuspend microparticles that may have settled during transporation/ storage. Once the microparticles have been loaded, no further mixing is required.

Note: Gently shake the microparticle buffer 1 bottle. Visually inspect the bottle to ensure microparticle are resuspended. If microparticle are still adhered to the bottle, mix the contents of the microparticle buffer bottles till they are completely resuspended. If the microparticle do not resuspend, DO NOT USE. Once the microparticle have been resuspended, place a reagent plug on the bottle.

3. Load the Ferritin iClia reagent tray on the Chemiluminescence immunoassay analyzer.
4. Verify that all necessary reagents are available in the reagent tray.
5. Ensure that adequate sample volume (not less than 250 μL) is present in sample tube prior to running the test.
6. Sample volume required for each additional test from same sample tube is 10 μL. Sample is diluted 1:10 in sample diluent.
7. The FERRITIN test-specific parameters are stored in reagent barcode placed on the reagent tray and read through barcode reader. In cases, the barcode cannot be read, contact customer support at: 011-47130300, 500 or write us at: jmitra@jmitra.co.in.
8. Run calibration, if required.
9. Mix Ferritin iClia calibrators and controls by gentle inversion before use. Open the the cap and place the FERRITIN Calibrator-1 & FERRITIN Calibrator-2 and FERRITIN Control-1 & FERRITIN Control-2 vials into each respective sample positions. Read the barcode for calibrator and controls provided with the kit.
10. Press START. The test result for first sample will be obtained at 17 minutes.
11. The Chemiluminescence immunoassay analyzer performs all the functions automatically and calculate the results.

Calibration

1. Traceability: This assay has been standardized against the Roche FERRITIN reagent kit.
2. Every Ferritin iClia kit has a two-dimension code label containing the predefined master curve of the particular reagent lot.
3. Test all 2 Calibrators in triplicate. Both FERRITIN Control-1 and FERRITIN Control-2 must be tested in each run to evaluate the assay calibration. Ensure that controls values are within the validity range specified in the Ferritin iClia QC data sheet.
4. Once calibration is accepted (within range) and stored, all subsequent samples may be tested without further calibration unless:
5. Recalibrate the analyzer in following conditions:

a) After each exchange/use of new lot (Test reagent and pritrigger/ Trigger solution/wash buffer).
b) Every 15 days and/or at the time of any component to be changed.
c) Controls are out of validation range.
d) Required by pertinent regulations.
e) After specified service procedures have been performed or maintenance to critical part or subsystems that might influence the performance of the Ferritin iClia.

Result Calculation

The analyzer automatically calculates the concentration of each sample. The results are given in ng/ml.

Result Interpretation

If sample concentration is lower than the lower limit of the linear range, report the result < 0.50 ng/ml, while > 2000.00 ng/ml when it is higher than the upper limit of linear range.

Determination of Reference Interval

Reference Interval of Ferritin iCia is considered as 30.00 ng/mL ~400.00 ng/mL for healthy men aged 20-60 and 13.00 ng/mL -150.00 ng/mL for healthy women aged 17- 60, which is established referring to literatures, based on the rest results of more than 120 clinical samples

Due to the differences in geography, race, gender or age, it is suggested that each laboratory should establish its own reference range or conduct verification of the existing reference interval.

14. PERFORMANCE CHARACTERISTICS

- Assay results obtained in individual laboratories may vary from data presented in this product insert.

Limit of Blank (LoB)

- The Limit of Blank was determined in accordance with the CLSI (Clinical and Laboratory Standards Institute) EP17-A requirements.
- The Limit of Blank is the 95th percentile value from n >20 measurements of analyte free samples over several independent series. The Limit of Blank corresponds to the concentration below which analyte-free samples are found with a probability of 95%.
- The observed LoB value was <0.45 ng/mL.

Accuracy: The accuracy of Ferritin iClia was detected with 60 clinical specimens and compared with Roche CLIA. The co-relation co-efficient is >0.95.

Precision

Intra Assay Variation

Within run variation was determined by 10 replicate measurements of two different Ferritin control sera(Low) and (High) in one assay in 3 different lots. The within assay variability is <10%.

Inter Assay Variation

Between run variation was determined by 10 replicate measurements in 10 sequential days of two different control sera(Low) and (High) in 3 different lots.The between assay variability is <10%.

Intra-Assay, n=10			Inter-Assay, n=10×2		
Control	Mean (ng/ml)	CV	Sample	Mean (ng/ml)	CV
1	50.85	3.81%	1	51.05	7.53%
2	1034.01	4.90%	2	1005.14	8.91%

Inter machine(CLIA-181 Analyzer) Variation

Between machine variation was determined by 3 replicate measurements of two different Ferritin control sera(Low) and (High)in 3 different lots in 3 different CLIA-181 Analyzer. The between machine variability is <10.0%.

Linearity

The linearity was determined in accordance with the CLSI (Clinical and Laboratory Standards Institute) EP6-A requirements.

The linearity range was verified by more than 6 concentration levels which encompass or be equal to the minimum and the maximum values of linearity range and duplicate assays in triplicate in single run for each lot at all 6 levels.

The Ferritin iClia kit has been demonstrated to be linear from is 0.50 ng/mL to 2000.0ng/ml, regression (R^2) of more than >0.990.

Analytical specificity

Hemoglobin ≤150mg/dL, triglyceride ≤1000mg/dL and bilirubin ≤40mg/dL had no significant interference with the results of Ferritin iClia.

Interference

A study was performed based on guidance from CLSI EP7-A2.

Potentially interfering substances were evaluated to determine whether Ferritin concentrations were affected when using the Ferritin iClia kit. Samples containing the potential interferents were prepared at two Ferritin concentrations. The samples were assayed, and the Ferritin concentrations of the spiked samples were compared to the reference samples.

Potential Interferent	Interferent Concentration	% Interferent Bias
Bilirubin	20 mg/dL	<10%
Hb	500 mg/dL	<10%
Triglyceride	1000 mg/dL	<10%
Total protein	10 mg/dL	<10%
RF	1000 mg/dL	< 10%
ANA	400 mg/dL	< 10%
HAMA	600ng/mL	< 10%

15. LIMITATION OF THE TEST

- The Ferritin iCia should be used for detection of Ferritin in serum or plasma only and not in other body fluids.
- Results should be used in conjunction with other data; e.g., symptoms, results of other tests, and clinical impressions.
- If the Ferritin results are inconsistent with clinical evidence, additional testing is recommended.
- Clinical diagnosis should not be made on the findings of a single test result, but should be integrated with all clinical and laboratory findings.

16. LIMITED EXPRESSED WARRANTY DISCLAIMER

The manufacturer limits the warranty to the test kit, as much as that the test kit will function as an *in vitro* diagnostic assay within the limitations and specifications as described in the product instruction-manual, when used strictly in accordance with the instructions contained therein. The manufacturer disclaims any warranty expressed or implied including such expressed or implied warranty with respect to merchantability, fitness for use or implied utility for any purpose. The manufacture's liability is limited to either replacement of the product or refund of the purchase price of the product and in no case liable to for claim of any kind for an amount greater than the purchase price of the goods in respect of which damages are likely to be claimed.

The manufacturer shall not be liable to the purchaser or third parties for any injury, damage or economic loss, howsoever caused by the product in the use or in the application there of.

17. REFERENCES

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