

REF



AU242009

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Intended Use

The Aurora Ferritin Assay is a chemiluminescent microparticle immunoassay (CMIA) for the quantitative determination of Ferritin (Ferr) in human serum and plasma. The Aurora Ferritin Assay is intended for in vitro diagnostic use.

Summary

Ferritin is a large globulin with a molecular weight of about 450000 and composed of 24 non covalently linked subunits. The subunit forms a shell around a center containing an indefinite amount of ferric hydroxyphosphate. A ferritin molecule can bind 4000 to 5000 iron atoms, so ferritin becomes the main iron storage protein in the body. Ferritin can mainly be found in the cytoplasm of the reticuloendothelial cells, in liver cells and to a small extent in the precursors of the red cells in the bone marrow. It stores iron in a biologically mobilizable form. Thus, it gives a measure of the amount of iron available for hemoglobin synthesis. The determination of serum ferritin has its significance in the diagnosis and monitoring of iron deficiency. Reduced ferritin serum levels indicate iron deficiency; iron overload or idiopathic haemochromatosis are associated with elevated ferritin serum concentrations.

Test Principles

The Aurora Ferritin Assay is a quantitative sandwich immunoassay to determine the presence of Ferr in human serum and plasma using CMIA technology with flexible assay protocols.

1. Sample, paramagnetic anti-Ferr coated microparticles and a conjugate containing acridinium-labeled anti-Ferr are mixed, Ferr present in the sample binds to anti-Ferr coated microparticles and acridinium-labeled anti-Ferr, forming an antigen antibody complex.
2. After further incubation and washing, Pre-Trigger and Trigger Solutions are added to the reaction mixture.
3. The resulting chemiluminescent reaction is

measured as relative light units (RLUs). There is a relationship between the amount of Ferr in the sample and the RLUs detected by the Optical system. Results are calculated automatically based on the previously established calibration curve.

Reagents

R1	3.0 mL
R2	3.0 mL
CAL	Contains 3 levels, 1.0 mL each level
CON	Contains 2 levels, 1.0 mL each level
R1:	Microparticles. Anti-Ferr coated microparticles. Preservative: 0.05% ProClin 300
R2:	Conjugate. Acridinium-labeled anti-Ferr. Preservative: 0.05% ProClin 300
CAL:	Calibrator. Solutions of different concentrations of Ferr. Preservative: 0.05% ProClin 300
CON:	Control. Tris buffer solution for quality control of Ferritin (Ferr)

Required Materials

- Pre-Trigger Solution: Hydrogen peroxide solution.
- Trigger Solution: Sodium hydroxide solution.
- Wash Buffer: Phosphate buffered saline solution with 0.05% ProClin 300.
- Reaction vessels.

Safety Precautions

- Exercise the normal precautions required for handling all laboratory reagents.
- Disposal of all waste material should be in accordance with local guidelines.
- Wear gloves when handling specimens or reagents.
- Clean and disinfect all spills of specimens or reagents using a suitable disinfectant.
- Trigger solution contains sodium hydroxide (NaOH) and should be avoided contact with eyes.

Warning (Contains Proclin 300)

Hazardous Component: 0.05% Proclin 300

- Reaction mass of:
5-chloro-2-methyl-4-isothiazolin [EC no. 247-500-7]
and 2-methyl-4-isothiazolin-3-one [EC no. 200-239-6] (3:1)

Hazard Statement

- H317: May cause an allergic skin reaction.
- H319: Causes serious eye irritation.
- H410: Very toxic to aquatic life with long-lasting effects.

Precautionary Statement

- P261: Avoid breathing dust/fume/gas/mist/vapors/spray.
- P264: Wash hands thoroughly after handling.
- P272: Contaminated work clothing should not be allowed out of the workplace.
- P280: Wear protective gloves/protective clothing/eye protection/face protection.
- P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- P337+P313: If eye irritation persists: Get medical advice/attention.
- P333+P313: If skin irritation or rash occurs: Get medical advice/attention.
- P302+P352: IF ON SKIN: Wash with plenty of soap and water.
- P321: Seek immediate care from a doctor.
- P363: Wash contaminated clothing before reuse.
- P273: Avoid release to the environment.
- P391: Collect spillage.
- P501: Dispose of contents/container in a safe way.

Reagent Handling

- Do not use reagent kits beyond the expiration date.
- Do not pool reagents within a kit or between kits.
- Before loading the reagent kit on the system for the first time, the microparticle bottle requires mixing to resuspend microparticles that may have settled during shipment.
- Septums MUST be used to prevent reagent evaporation and contamination and to ensure reagent integrity. Reliability of assay results cannot be guaranteed if septums are not used according to the instructions in this package insert.
- To avoid contamination, wear clean gloves when placing a septum on an uncapped reagent bottle.

- Once a septum 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.

Reagent Storage

REAGENT	Storage Temperature	Maximum Storage Time
Unopened	2°C~8°C Do not freeze.	12 months
On board/Opened	2°C~8°C Do not freeze.	28 days

- 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 septums and replacement caps) in an upright position. For reagents stored off the system, it is recommended that they be stored in their original trays and boxes to ensure they remain upright. If the microparticle bottle does not remain upright (with a septum installed) while in refrigerated storage off the system, the reagent kit must be discarded.

Calibrator & Control Storage

CAL	CON	Storage Temperature	Maximum Storage Time
Unopened		2°C~8°C	12 months
Opened		2°C~8°C	30 days

Applicable Analyzer

Automatic Chemiluminescence Immunoassay Analyzer (model: Aurora S-01).

Specimen Types

Verified specimen types to be used with this assay:

Specimen Types	Collection Tubes
Serum	Serum separator tubes (SST)
Plasma	Dipotassium EDTA Tripotassium EDTA Sodium heparin Lithium heparin powder Plasma separator tubes (PST) -lithium heparin gel

- Other specimen collection tube types have not been tested with this assay.
- Liquid anticoagulants may have a dilution effect

resulting in lower concentrations for individual patient specimens.

- The instrument does not provide the capability to verify specimen type. It is the responsibility of the operator to verify that the correct specimen types are used in the assay.

Specimen Conditions

Do not use specimens with the following conditions:

- Heat-inactivated
- Pooled
- Grossly hemolyzed (> 500 mg/dl hemoglobin)
- Obvious microbial contamination
- Fungal growth
- For accurate results, serum and plasma specimens should be free of fibrin, red blood cells, and other particulate matter. Serum specimens from patients receiving anticoagulant or thrombolytic therapy may contain fibrin due to incomplete clot formation.
- To prevent cross contamination, use of disposable pipettes or pipette tips is recommended.

Preparation for Analysis

- Follow the tube manufacturer’s processing instructions for collection tubes. Gravity separation is not sufficient for specimen preparation.
- Mix thawed specimens thoroughly by low speed vortexing or by inverting 10 times. Visually inspect the specimens. If layering or stratification is observed, continue mixing until specimens are visibly homogeneous.
- Avoid more than 3 freeze/thaw cycles.
- To ensure consistency in results, specimens must be transferred to a centrifuge tube and centrifuged for a minimum of 30,000 g-minutes before testing if they contain fibrin, red blood cells, or other particulate matter, they were previously frozen.
- Examples of acceptable time and force ranges that meet this criterion are listed in the table below. Centrifugation time using alternate Relative Centrifugal Force values (RCF) can be calculated using the following formula:

Centrifugation Time (Minutes)	RCF (×g)	g × minutes
10	3,000	30,000

Centrifugation Time (Minutes)	RCF (×g)	g × minutes
15	2,000	30,000
20	1,500	30,000

- Transfer clarified specimen to a sample cup or secondary tube for testing. For centrifuged specimens with a lipid layer, transfer only the clarified specimen and not the lipemic material.
- Inspect all specimens for bubbles. Remove bubbles with an applicator stick before analysis. Use a new applicator stick for each specimen to prevent cross contamination.

Specimen Storage

Specimen Type	Storage Temperature	Maximum Storage Time
Serum/Plasma	Room temperature	≤ 8 hours
	2°C~8°C	≤ 7 days
	-20°C	≤ 90 days

- Remove serum or plasma from the clot, red blood cells, or separator gel if stored longer than the maximum room temperature storage time.
- Remove serum or plasma from the clot, red blood cells, or separator gel if stored longer than the maximum 2-8°C storage time and store frozen.
- Frozen specimens must be mixed thoroughly after thawing.
- Use caution in handling patient specimens to prevent cross-contamination.
- Do not exceed the storage limitations listed above.

Assay Procedure

- Refer to the system operating instruction or the online help system for detailed information on preparing the system.
- Before loading the reagent kit on the system for the first time, the microparticle bottle requires mixing to resuspend microparticles that may have settled during shipment. After the first time the microparticles have been loaded, no further mixing is required.
- Invert the microparticle bottle 30 times. Visually inspect the bottle to ensure microparticles are

resuspended. If microparticles are still adhered to the bottle, continue to invert the bottle until the microparticles have been completely resuspended. If the microparticles do not resuspend, DO NOT USE. Once the microparticles have been resuspended, place a septum on the bottle.

- Load the reagent kit on the chemiluminescence immunoassay analyzer.
- Verify that all necessary reagents are present.
- Verify adequate sample volume is present prior to running the test.
- Sample volume for first test: 250 μL
- Sample volume for each additional test from same sample cup: 5 μL
- The test-specific parameters stored in barcode on the reagent pack are read in. In cases the barcode cannot be read, enter the sequence numbers
- Order calibration, if necessary.
- Prepare Ferritin Calibrators and Controls.
- Mix calibrator(s) and controls by gentle inversion before use.
- Hold bottles vertically and dispense recommended volumes into each respective sample cup.
- Place the calibrators in the calibrator rack in the sample zone.
- Calibration.
- Load samples. For information on loading samples, refer to the Analyzer's Operations Manual.
- Press RUN.
- The chemiluminescence immunoassay analyzer performs all the functions automatically and calculates the results.

For optimal performance, it is important to perform routine maintenance as described in the Analyzer's Operations Manual. Perform maintenance more frequently when required by laboratory procedures.

Sample Dilution Procedures

- Samples with a Ferr value exceeding 2000 ng/mL may be diluted using the Manual Dilution Procedure.

Manual Dilution Procedure

Suggested dilution: 1:100

- Add 30 μL of the sample to 2970 μL of Stroke physiological saline solution or dilutions.
- The operator must enter the dilution factor in the Patient or Control order screen. The system will use this dilution factor to automatically calculate the concentration of the sample before dilution and report the result.

Calibration

- Traceability: This assay has been standardized against the WHO International Standard 94/572.
- Every Ferr assay kit has a two-dimension code label containing the predefined master curve of the particular reagent lot.
- Test Calibrators in duplicate. The calibrators should be priority loaded. A replicate of each control level must be tested to evaluate the assay calibration. Ensure that assay control values are within the ranges specified in the respective control package insert.
- Once calibration is accepted and stored, all subsequent samples may be tested without further calibration unless:
 - After 28 days when using the same lot reagent.
 - A reagent kit with a new lot number is used.
 - Controls are out of range.
 - Required by pertinent regulations.
- Assay may also need to be recalibrated after specified service procedures have been performed or maintenance to critical part or subsystems that might influence the performance of the assay. For detailed information on how to perform an assay calibration, refer to the Analyzer's Operations Manual.
- Calibration Range: 0.5 ng/mL ~ 2000 ng/mL

Quality Control Procedures

- Order Control, if necessary.
- The recommended control requirement for the Ferr assay is that a single replicate of each control level be tested:
 - Once every 24 hours each day of use
 - After performing calibration
 - After instrument service procedures or maintenance that may affect assay performance

have been performed.

- If the quality control procedures in your laboratory require more frequent use of controls to verify test results, follow your laboratory-specific procedures.
- Each laboratory should establish control ranges to monitor the acceptable performance of the assay. If a control is out of its specified range, the associated sample results are invalid and the samples must be retested. Recalibration may be indicated.
- These results should be applied to your laboratory's quality control practices. In addition, the laboratory must ensure that the matrix of the control material is suitable for use in the assay per the assay package insert.
- Unless specified, target values and ranges provided with the commercial control product insert are guidelines only and should not be used for quality control purposes.
- Refer to Clinical and Laboratory Standards Institute (CLSI) Document C24-A3, or other published guidelines for general quality control recommendations.

Results

Calculation

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

Limits

Results should be used in conjunction with other data; e.g., symptoms, results of other tests, and clinical impressions.

- If the Ferr results are inconsistent with clinical evidence, additional testing is recommended.
- Specimens from patients who have received preparations of mouse monoclonal antibodies for diagnosis or therapy may contain human anti-mouse antibodies (HAMA). Such specimens may show either falsely elevated or depressed values when tested with assay kits that employ mouse monoclonal antibodies. Additional information may be required for diagnosis.
- Heterophilic antibodies in human serum can

react with reagent immunoglobulins, interfering with in vitro immunoassays. Patients routinely exposed to animals or to animal serum products can be prone to this interference, and anomalous values may be observed. Additional information may be required for diagnosis.

- Rheumatoid factor (RF) in human serum can react with reagent immunoglobulins, interfering with in vitro immunoassays. Additional information may be required for diagnosis.
- The Aurora Ferritin Assay is susceptible to interference effects from triglycerides at > 1000 mg/dL.
- There is no high-dose HOOK effect at Ferr concentrations up to 1000000 ng/mL.

Expected Values

- It is recommended that each laboratory establish its own reference range, which may be unique to the population it serves depending upon geographical, season, patient, dietary, or environmental factors. A study was performed based on guidance from Clinical and Laboratory Standards Institute (CLSI) C28-A3c.
- Human serum specimens from apparently healthy individuals were collected the 288 specimens, 138 were female and 150 were male, age between 21 and 90 years old.

The population	n	Reference range*
Male	138	28~413 ng/mL
Female	150	11~160 ng/mL

*According to the 2.5th -97.5th percentile.

*Representative data; results in individual laboratories and in different geographical areas may vary from these data.

Specific Performance Characteristics

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

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 $n \geq 20$ 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 ≤ 0.5 ng/mL.

Accuracy

Intra Assay Variation

- Within run variation was determined by replicate determination ($n=10$) of two different control sera in one assay. The within assay variability is $\leq 8.0\%$.

Inter Assay Variation

- Between run variation was determined by replicate measurements ($n=10$) of two different control sera in 3 different lots. The between assay variability is $\leq 10.0\%$.

Intra-Assay, n=10			Inter-Assay, n=10x3		
Sample	Mean (ng/mL)	CV	Sample	Mean (ng/mL)	CV
1	49.0	2.8%	1	48.4	2.4%
2	999.7	1.7%	2	996.1	1.5%

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 ($n=3$) at all levels.
- The Aurora Ferritin Assay has been demonstrated to be linear from 1.0 ng/mL to 2000 ng/mL, regression ≥ 0.99 and max diff $\leq 15\%$ in this interval.

Interference

- A study was performed based on guidance from CLSI EP7-A2.
- Potentially interfering substances were evaluated to determine whether Ferr concentrations were affected when using Aurora Ferritin Assay. Samples containing the potential interferents were prepared at two Ferr concentrations. The samples were

assayed, and the Ferr concentrations of the spiked samples were compared to the reference samples.

Potential Interferent	Interferent Concentration	% Interferent Bias
Bilirubin	20 mg/dL	$\leq 10\%$
Hb	500 mg/dL	$\leq 10\%$
Intralipid	1000 mg/dL	$\leq 10\%$
Total protein	10 g/dL	$\leq 10\%$
RF	1000IU/mL	$\leq 10\%$
ANA	400AU/mL	$\leq 10\%$
HAMA	600ng/mL	$\leq 10\%$

Reference

1. Jacobs A. Ferritin: an interim review[J]. Curr Top Hematol, 1985, 5:25-62.
2. Crichton R R. Ferritin: structure, synthesis and function. [J]. N Engl J Med, 1971, 284(25):1413-1422.
3. Alfrey C P, Lynch E C, Whitley C E. Characteristics of ferritin isolated from human marrow, spleen, liver, and reticulocytes[J]. J Lab Clin Med, 1967, 70(3):419-428.
4. Hann HWL, Kim CY, London T, Blumberg BS. Increased Serum Ferritin in Chronic Liver Disease: A Risk Factor for Primary Hepatocellular Carcinoma. Int J Cancer 1989; 43:376–379
5. Cazzola M, Arosio P, Belletti V, et al. Immunological Reactivity of Serum Ferritin in Patients with Malignancy[J]. Tumori, 1985, 71(6):547-554.

Symbols



Manufacturer



Date of manufacture



Use-by date





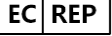








Contains sufficient for $\langle n \rangle$ tests




Consult instructions for use




Biological risks

	Temperature limit
	CE Marking
	EU Representative
	In Vitro diagnostic medical device
	Catalogue Number
	Batch code
	Reagent
	Microparticles
	Conjugate
	Calibrator
	Control

Contact Information

 Medunion S.L.
Carrer de Tapioles 33, 2-1, 08004, Barcelona,
SPAIN.

 Carbon Technologies LLC
Innovation Park Muscat (IPM), P.O. Box 92, Al
Khoudh 123, Muscat, OMAN.

24-hour service hotline: +968-97058350

After-sale Service Center: Carbon Technologies LLC



Release Date: Date of Manufacture: