

# MAGLUMI Ferritin (CLIA)



130201001M



100



**Shenzhen New Industries  
Biomedical Engineering Co., Ltd**  
4F, Wearnes Tech Bldg,  
Science & Industry Park,  
Nanshan, Shenzhen, 518057 CHINA  
Tel. + 86-755-86028224  
Fax. + 86-755-26654850



**Lotus Global Co., Ltd**  
15 Alexandra Road  
London  
NW8 0DP  
UK  
Tel. + 44-20-75868010  
Fax. + 44-20-79006187



## FOR PROFESSIONAL USE ONLY

Store at 2-8 °C



COMPLETELY READ THE INSTRUCTIONS BEFORE  
PROCEEDING



## SYMBOLS EXPLANATIONS



Authorized Representative in Europe



Manufacturer



Attention. See Instructions For Use



Contents of kit



In vitro diagnostic medical device  
(In vitro diagnostic use)



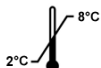
Lot number



Catalogue Code



Expiry date (Use by...)



Temperature limitation  
(store at 2...8 °C)



Number of tests



Keep away from direct sunlight



Keep upright for storage

## INTENDED USE

The kit has been designed for the quantitative determination of Ferritin in human serum.

The method can be used for samples over the range of 0-3,000ng/ml.

The test has to be performed on the MAGLUMI chemiluminescence immunoassay (CLIA) fully auto analyzer (Including MAGLUMI 1000, MAGLUMI 2000, MAGLUMI 2000 Plus and new developed models).

## SUMMARY AND EXPLANATION OF THE TEST

Ferritin is a high-molecular iron storage protein (MW approx. 450,000) which can incorporate varying amounts of iron in the form of iron. The Iron represents approximately 25% of the total molecular weight.

Ferritin can mainly be found in the cytoplasm of the reticubendothelial 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 mobilisable form. Thus, it gives a measure of the amount of iron available for haeroglobin 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 haemachromatosis are associated with elevated ferritin serum concentrations.

Elevated ferritin levels have also been found In a variety of malignancies, especially in Hodgkin- or Non-Hodgkin lymphoma, acute or chronic leukaemia as well as in breast or bronchial carcinoma

## PRINCIPLE OF THE TEST

Sandwich immunoluminometric assay:

Use an anti-ferritin monoclonal antibody to label ABEI, and use another monoclonal antibody to label FITC. Sample, Calibrator or Control are mixed thoroughly with FITC Label and nano magnetic microbeads in a cuvette incubated at 37°C, then cycle washing for 1 time. Then add ABEI Label, incubation and form a sandwich, then washing for the 2<sup>nd</sup> time. Subsequently, the starter reagents are added and a flash chemiluminescent reaction is initiated. The light signal is measured by a photomultiplier as RLU within 3 seconds and is proportional to the concentration of ferritin present in controls or samples.



## KIT COMPONENTS

### Material Supplies

| Reagent Integral for 100 determinations  |        |
|--|--------|
| <b>Nano magnetic microbeads:</b> TRIS buffer, 1.2% (W/V), 0.2%NaN <sub>3</sub> , coated with sheep anti- FITC polyclonal antibody. | 2.5ml  |
| <b>Calibrator Low:</b> bovine serum, 0.2%NaN <sub>3</sub>  | 2.5ml  |
| <b>Calibrator High:</b> bovine serum, 0.2%NaN <sub>3</sub>   | 2.5ml  |
| <b>FITC Label:</b> anti-Ferritin monoclonal antibody labeled FITC, containing BSA, 0.2%NaN <sub>3</sub> .                          | 22.5ml |
| <b>ABEI Label:</b> anti-Ferritin monoclonal antibody labeled ABEI, containing BSA, 0.2%NaN <sub>3</sub> .                          | 12.5ml |
| <b>Diluent:</b> 0.9% NaCl  | 25ml   |
| All reagents are provided ready-to-use.  |        |

| Reagent Vials in kit box   |       |
|--|-------|
| <b>Internal Quality Control:</b> containing BSA, 0.2%NaN <sub>3</sub> . (target value refer to Quality Control Information date sheet) | 2.0ml |

### Accessories Required But Not Provided

|                          |                 |
|--------------------------|-----------------|
| MAGLUMI Reaction Module  | REF: 630003     |
| MAGLUMI Starter 1+2      | REF: 130299004M |
| MAGLUMI Wash Concentrate | REF: 130299005M |
| MAGLUMI Light Check      | REF: 130299006M |




### Preparation of the Reagent Integral


Before the sealing is removed, gentle and careful horizontal shaking of the Reagent Integral is essential (avoid foam formation!) Remove the sealing and turn the small wheel of the magnetic microbeads compartment to and fro, until the colour of the suspension has changed into brown. Place the Integral into the reagent area and let it stand there for 30 min. During this time, the magnetic microbeads are automatically agitated and completely resuspended.

**Do not interchange integral component from different reagents or lots!**

### Storage and Stability

- Sealed: Stored at 2-8°C until the expiry date.
- Opened: Stable for 4 weeks. To ensure the best kit performance, it is recommended to place opened kits in the refrigerator if it's not going to be used on board during the next 12 hours.

-  Keep upright for storage.

-  Keep away from direct sunlight.

## TRACEABILITY AND CALIBRATION

### 1) Traceability

To perform an accurate calibration, we have provided the test calibrators standardized against the W.H.O.3rd International Standard Recombinant Human Ferritin (IS94/572)

### 2) 2-Point Recalibration

Via the measurement of calibrators, the predefined master curve is adjusted (recalibrated) to a new, instrument-specific measurement level with each calibration.

### 3) Frequency of Recalibration

- After each exchange of lots (Reagent Integral or Starter Reagents).
- Every 4 weeks and/or each time a new Integral is used (recommendation).
- After each servicing of the MAGLUMI Fully Auto analyzer.
- If controls are beyond the expected range.

## SPECIMEN COLLECTION AND PREPARATION

Sample material: serum

Collect samples using standard procedures.

Store at 2-8  
below -20 °C

Avoid repeated freezing and thawing cycles, stored samples should be thoroughly mixed prior to use (Vortex mixer).

Please ask local representative of SNIBE for more details if you have any doubt.

### Vacuum Tubes

- (a) Blank tubes are recommended type for collecting samples.
- (b) Please ask SNIBE for advice if special additive must be used in sample collecting.

## Specimen Conditions

- Do not use specimens with the following conditions:
  - (a) heat-inactivated specimens;
  - (b) Cadaver specimens or body fluids other than human serum;
  - (c) Obvious microbial contamination.
- Use caution when handling patient specimens to prevent cross contamination. Use of disposable pipettes or pipette tips is recommended.
- Inspect all samples for bubbles. Remove bubbles with an applicator stick prior to analysis. Use a new applicator stick for each sample to prevent cross contamination.
- Serum specimens should be free of fibrin, red blood cells or other particulate matter.
- Ensure that complete clot formation in serum specimens has taken place prior to centrifugation. Some specimens, especially those from patients receiving anticoagulant or thrombolytic therapy, may exhibit increased clotting time. If the specimen is centrifuged before a complete clot forms, the presence of fibrin may cause erroneous results.

## Preparation for Analysis

- Patient specimens with a cloudy or turbid appearance must be centrifuged prior to testing. Following centrifugation, avoid the lipid layer (if present) when pipetting the specimen into a sample cup or secondary tube.
- Specimens must be mixed **thoroughly** after thawing by **low** speed vortexing or by gently inverting, and centrifuged prior to use to remove red blood cells or particulate matter to ensure consistency in the results. Multiple freeze-thaw cycles of specimens should be avoided.
- All samples (patient specimens or controls) should be tested within 3 hours of being placed on board the MAGLUMI System. Refer to the SNIBE service for a more detailed discussion of onboard sample storage constraints.

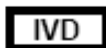
## Storage

- If testing will be delayed for more than 8 hours, remove serum or plasma from the serum or plasma separator, red blood cells or clot. Specimens removed from the separator gel, cells or clot may be stored up to 24 hours at 2-8°C.
- Specimens can be stored up to 30 days frozen at -20°C or colder.

## Shipping

Before shipping specimens, it is recommended that specimens be removed from the serum or plasma separator, red blood cells or clot. When shipped, specimens must be packaged and labeled in compliance with applicable state, federal and international regulations covering the transport of clinical specimens and infectious substances. Specimens must be shipped frozen (dry ice). Do not exceed the storage time limitations identified in this section of the package insert.

## WARNING AND PRECAUTIONS FOR USERS



°C: 24 hours for use in **IVD** diagnostic procedure only.

- Package insert instructions must be carefully followed. Reliability of assay results cannot be guaranteed if there are any deviations from the instructions in this package insert.

## Safety Precautions

**CAUTION:** This product requires the handling of human specimens.

- The calibrators in this kit are prepared from bovine serum products. However, because no test method can offer complete assurance that HIV, Hepatitis B Virus or other infectious agents are absent; these reagents should be

considered a potential biohazard and handled with the same precautions as applied to any serum or plasma specimen.

- All samples, biological reagents and materials used in the assay must be considered potentially able to transmit infectious agents. They should therefore be disposed of in accordance with the prevailing regulations and guidelines of the agencies holding jurisdiction over the laboratory, and the regulations of each country. Disposable materials must be incinerated; liquid waste must be decontaminated with sodium hypochlorite at a final concentration of 5% for at least half an hour. Any materials to be reused must be autoclaved using an overkill approach (USP 24, 2000, p.2143). A minimum of one hour at 121°C is usually considered adequate, though the users must check the effectiveness of their decontamination cycle by initially validating it and routinely using biological indicators.
- It is recommended that all human sourced materials be considered potentially infectious and handled in accordance with the OSHA Standard on Bloodborne Pathogens 13. Biosafety Level 214 or other appropriate biosafety practices should be used for materials that contain or are suspected of containing infectious agents.
- This product contains Sodium Azide; this material and its container must be disposed of in a safe way.
- Safety data sheets are available on request.

#### Handling Precautions

- Do not use reagent kits beyond the expiration date.
- Do not mix reagents from different reagent kits.
- Prior to loading the Reagent Kit on the system for the first time, the microbeads requires mixing to re-suspend microbeads that have settled during shipment.
- For microbeads mixing instructions, refer to the KIT COMPONENTS, Preparation of the Reagent Integral section of this package insert.
- To avoid contamination, wear clean gloves when operating with a reagent kit and sample.
- Over time, residual liquids may dry on the kit surface, please pay attention the silicon film still exists on the surface of the kit.
- For a detailed discussion of handling precautions during system operation, refer to the SNIBE service information.

#### TEST PROCEDURE

To ensure proper test performance, strictly adhere to the operating instructions of the MAGLUMI Fully Auto analyzer. Each test parameter is identified via a RFID tag on the Reagent Integral. For further information please refer to the MAGLUMI Chemiluminescence Analyzer Operating Instructions.

|                         |  |
|-------------------------|--|
| 40µl<br>+100µl<br>+20µl | Sample, calibrator or controls<br>FITC label<br>Nano magnetic microbeads |
| 10 min                  | Incubation   |
| 400µl<br>+200µl         | Cycle washing<br>ABEI label  |
| 10 min                  | Incubation   |
| 400µl                   | Cycle washing  |
| 3s                      | Measurement  |

#### DILUTION

Samples with concentrations above the measuring range can be diluted. After manual dilution, multiply the result by the dilution factor. After dilution by the analyzers, the analyzer software automatically takes the dilution into account when calculating the sample concentration.

Availability of sample dilution by analyzer please refers to the MAGLUMI analyzer user software program. Dilution settings please follow MALGUMI analyzer operating instructions.

#### QUALITY CONTROL

028120523-v1.0-EN

- Observe quality control guidelines for medical laboratories.
- Use suitable controls for in-house quality control. Controls should be run at least once every 24 hours when the test is in use, once per reagent kit and after every calibration. The control intervals should be adapted to each laboratory's individual requirements. Values obtained should fall within the defined ranges. Each laboratory should establish guidelines for corrective measures to be taken if values fall outside the range.

#### LIMITATIONS OF THE PROCEDURE

##### 1) Limitations

Elevated ferritin serum levels have also been found in certain hepatic disorders, acute or chronic inflammations as well as in manifest or latent infections. Therefore, ferritin serum levels may only be interpreted in context with the clinical picture and other diagnostic procedures.

##### 2) Interfering Substances

No interference with test results is seen by concentrations of bilirubin<0.06mg/ml, haemoglobin<16mg/dl or triglycerides<12.5mg/ml.

##### 3) HAMA

Patient samples containing human anti-mouse antibodies (HAMA) may give falsely elevated or decreased values. Although HAMA-neutralizing agents are added, extremely high HAMA serum concentrations may occasionally influence results.

##### 4) High-Dose Hook

High-dose hook is a phenomenon whereby very high level specimens may read within the dynamic range of the assay. For the MAGLUMI Ferritin assay, no high dose hook effect was observed when samples containing up to 100,000ng/ml.

#### RESULTS

##### 1) Calculation of Results

The analyzer automatically calculates the ferritin concentration in each sample by means of a calibration curve which is generated by a 2-point calibration master curve procedure. The results are expressed in ng/ml. For further information please refer to the Maglumi Fully Auto Operator's Manual.

##### 2) Interpretation of Results

- Reference values: male 25-350ng/ml  
Female 13-232ng/ml
- Results may differ between laboratories due to variations in population and test method. Each laboratory should establish its own reference range.

#### PERFORMANCE CHARACTERISTICS

##### 1) Precision

Intra-assay coefficient of variation was evaluated on 3 different levels of control serum repeatedly measured 20 times in the same run, calculating the coefficient of variation.

###### Intra-assay precision

| Control | Mean(ng/ml) | SD(ng/ml) | CV%   |
|---------|-------------|-----------|-------|
| Level 1 | 43.67       | 2.56      | 5.87% |
| Level 2 | 365.12      | 20.63     | 5.65% |
| Level 3 | 650.38      | 34.93     | 5.37% |

Inter-assay coefficient of variation was evaluated on three batches of kit. Repeatedly measured 3 different levels of control serum 21 times, calculating the coefficient of variation.

###### Inter-assay precision

| Control | Mean(ng/ml) | SD(ng/ml) | CV%   |
|---------|-------------|-----------|-------|
| Level 1 | 46.25       | 4.37      | 9.44% |
| Level 2 | 377.58      | 32.96     | 8.73% |
| Level 3 | 680.16      | 61.55     | 9.05% |

##### 2) Analytical Sensitivity

The sensitivity is defined as the concentration of Ferritin equivalent to the mean RLU of 20 replicates of the zero standard plus two standard deviations corresponding to the concentration from the standard curve. The sensitivity is typically less than 1ng/ml.

### 3) Specificity

The specificity of the Ferritin assay system was assessed by measuring the apparent response of the assay to various potentially cross reactive analytes.

| Compound              | Concentration | Cross reactivity |
|-----------------------|---------------|------------------|
| Human Liver Ferritin  | 850ng/ml      | 0.5%             |
| Human spleen ferritin | 450ng/ml      | 0.7%             |
| Human heart ferritin  | 500ng/ml      | 0.8%             |

### 4) Recovery

Consider calibrator high of known concentration as a sample, dilute it by 1:2 ratio with diluents, and measure its diluted concentration for 10 times. Then calculate the recovery of measured concentration and expected concentration. The recovery should be within 90% -110%.

| Expected    | Mean Measuring | Recovery |
|-------------|----------------|----------|
| 601.3 ng/ml | 615.6 ng/ml    | 102%     |

### 5) Linearity

Use Ferritin calibrator to prepare the six-point standard curve, measuring all points' RLU except point A, and then do four-parameter linear fitting in double logarithm coordinate, the absolute linear correlation coefficient(r) should be bigger than 0.9800.

| Calibrator Point | Concentration ng/ml | Absolute linear correlation coefficient (r) |
|------------------|---------------------|---|
| A                | 0                   |   |
| B                | 5.0                 | r=0.9890                                    |
| C                | 25.0                |   |
| D                | 100.0               |   |
| E                | 200.0               |   |
| F                | 500.0               |   |

### 6) Method comparison

A comparison of MAGLUMI Ferritin (y) with a commercially available Ferritin test (x) using clinical samples gave the following correlations (ng/ml):

Linear regression

$$y = 1.15x - 201.2$$

$$r = 0.964$$

$$S_{y,x} = 410.3$$

Number of samples measured: 181

The sample concentrations were between 4.2 and 10013 ng/ml.

## REFERENCES

1. Aubert E, Schmidt CG. Ferritin-A Tumor Marker in Myeloid Leukemia Cancer Detection and Prevention 1985;8:297-302.
2. Aubert E, Seffens O. Ferritin im Serum-Ein "Tumormarker" bei malignen Lymphomen? Onkologie 1990;13:102-108.
3. Cazzola M, Arosio P, Bellotti V, Bergamaschi G, Dezz L, Iacobello C, Ruggeri G, Zappone E, Albertini A, Ascari E, Immunological Reactivity of Serum Ferritin in Patients with Malignancy, Tumori 1985;71:547-554.
4. Deshpande UR, Nadkarni GD, Samuel AM. Serum Ferritin in Thyroid Cancer. Thyroid 1993; 3 (4): 301-303.
5. Drysdale JW. Ferritin as a Tumor Marker. J Clin Immunoassay 1983; 6 (3): 234-239.
6. Griffiths EK, Schapira MD, Schapira DV. Serum Ferritin and Stool Occult Blood and Colon Cancer Screening. Cancer Detection and Prevention 1991; 15 (4): 303-305.

7. Güner G, Kirkali B, Yenisey C, Tore IR. Cytosol and serum ferritin in breast carcinoma. Cancer Letters 1992; 67: 103-112.
8. 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.
9. Liappis N, Schlebusch H. Referenzwerte der Ferritin-Konzentration im Serum von Kindern. Klin Padiatr 1990; 202: 99-102.