MAYO CLINIC LABORATORIES

# Test Definition: FERR1

Ferritin, Serum

## Overview

### Useful For
Aiding in the diagnosis of iron deficiency and iron overload conditions

Differentiating iron deficiency anemia and anemia of chronic disease

### Testing Algorithm
For more information see Hereditary Hemochromatosis Algorithm.

### Special Instructions
- Hereditary Hemochromatosis Algorithm

### Method Name
Electrochemiluminescence Immunoassay

### NY State Available
Yes

## Specimen

### Specimen Type
Serum

### Specimen Required
**Patient Preparation:** For 12 hours before specimen collection, patient **should not** take multivitamins or dietary supplements (eg, hair, skin, and nail supplements) containing biotin (vitamin B7).
**Collection Container/Tube:**
**Preferred:** Serum gel
**Acceptable:** Red top
**Submission Container Tube:** Plastic vial
**Specimen Volume:** 0.6 mL
**Collection Instructions:** Within 2 hours of collection, centrifuge and aliquot serum into a plastic vial.

### Forms
If not ordering electronically, complete, print, and send a Kidney Transplant Test Request with the specimen.

### Specimen Minimum Volume
0.5 mL

### Reject Due To

| | |
|---|---|
| Gross hemolysis | Reject |
| Gross lipemia | OK |
| Gross icterus | Reject |

### Specimen Stability Information

| Specimen Type | Temperature | Time | Special Container |
|---|---|---|---|
| Serum | Refrigerated (preferred) | 7 days | |
| | Ambient | 24 hours | |
| | Frozen | 365 days | |

## Clinical & Interpretive

### Clinical Information

Ferritin is a large spherical protein consisting of 24 noncovalently linked subunits with a molecular weight of approximately 450,000 Da. The subunits form a shell surrounding a central core containing variable amounts of ferric hydroxyphosphate. One molecule of ferritin is capable of binding between 4000 and 5000 atoms of iron, making ferritin the major iron storage protein for the body.

Ferritin is found mainly in the cytoplasm of cells of the reticuloendothelial system and is a constituent of normal human serum. The concentration of ferritin is directly proportional to the total iron stores in the body, resulting in serum ferritin concentrations becoming a common diagnostic tool in the evaluation of iron status.

In most normal adults, serum ferritin concentrations vary with age and sex. There is a sharp rise in serum ferritin concentrations in the first month of life, coinciding with the depression of bone marrow erythropoiesis. Within 2 or 3 months, erythropoiesis becomes reactivated and there is a drop in the concentration of serum ferritin. By 6 months, the concentration is reduced to fairly low levels, where they remain throughout childhood. There is no sex difference until the onset of puberty, at which time ferritin concentrations rise, particularly in male patients. There is a significant positive correlation between age and serum ferritin concentrations in female patients but not in male patients.

Patients with iron deficiency anemia have serum ferritin concentrations approximately one-tenth of normal subjects, while patients with iron overload conditions (hemochromatosis, hemosiderosis) have serum ferritin concentrations much higher than normal. Studies also suggest that serum ferritin provides a sensitive means of detecting iron deficiency at an early stage. Serum ferritin concentrations may serve as a tool to monitor the effects of iron therapy, but results should be interpreted with caution as these cases may not always reflect the true state of iron stores. Ferritin is a positive acute phase reactant in both adults and children, whereby chronic inflammation results in a disproportionate increase in ferritin in relation to iron reserves. Elevated ferritin is also observed in acute and chronic liver disease, chronic kidney failure, and in some types of neoplastic disease.

Evaluating body iron stores may include serum iron determination, total iron binding capacity, and percent saturation of transferrin, however, these are subject to diurnal variations and may be less precise. Additionally, they do not discriminate between depleted iron stores (iron deficiency) and conditions associated with defective iron release (eg,

anemia of chronic disease).

## Reference Values

Males:
0 days-4 weeks: 150-973 mcg/L
5 weeks-5 months: 9-580 mcg/L
6 months-9 years: 6-111 mcg/L
10-17 years: 15-201 mcg/L
> or =18 years: 31-409 mcg/L

Females:
0 days-4 weeks: 150-973 mcg/L
5 weeks-5 months: 9-580 mcg/L
6 months-17 years: 8-115 mcg/L
18-50 years: 6-175 mcg/L
> or =51 years: 11-328 mcg/L

## Interpretation

Hypoferritinemia is associated with increased risk for developing iron deficiency where iron deficiency is sufficient to reduce erythropoiesis causing hemoglobin concentrations to fall. Latent iron deficiency occurs when serum ferritin is low without low hemoglobin.

Hyperferritinemia is associated with iron overload conditions including hereditary hemochromatosis where concentrations may exceed 1000 mcg/L. Non-iron overload hyperferritinemia may be caused by common liver disorders, neoplasms, acute or chronic inflammation, and hereditary hyperferritinemia-cataract syndrome.

For more information about hereditary hemochromatosis testing, see Hereditary Hemochromatosis Algorithm.

## Cautions

Ferritin is an acute phase reactant and may be elevated in patients with inflammation, liver disease, chronic infection, autoimmune disorders, and malignancy.

Ferritin may be elevated in excess iron storage disorders besides hemochromatosis including hemolytic anemia, sideroblastic anemia, and in those with multiple blood transfusions.

Race and ethnicity factors (especially in Africans, African Americans, and Asians) are also associated with higher mean concentrations of serum ferritin than are typical of the White population, the basis of which is not completely understood.

## Clinical Reference

1. McPherson RA, Pincus MR: Henry's Clinical Diagnosis and Management by Laboratory Methods. 21st ed. Elsevier Saunders; 2007:506
2. Burtis CA, Ashwood ER, Bruns DE: Tietz Textbook of Clinical Chemistry and Molecular Diagnostics. Elsevier Saunders; 2012:985-1030
3. Cappellinin MD, Lo SF, Swickels DW: Hemoglobin, iron, bilirubin. In: Rifai N, Horvath AR, Wittwer CT, eds. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics. 6th ed. Elsevier Saunders; 2018:719-775

## Performance

### Method Description
The Roche ferritin method employs monoclonal antibodies specifically directed against ferritin. A biotinylated monoclonal antibody and a second monoclonal antibody labeled with a ruthenium complex react to form a sandwich complex. After the addition of streptavidin-coated microparticles, the complex becomes bound to the solid phase via interaction of biotin and streptavidin. The reaction mixture is aspirated into the measuring cell where the microparticles are magnetically captured onto the surface of the electrode. Application of a voltage to the electrode then induces chemiluminescent emission, which is measured by a photo multiplier.(Package insert: Elecsys Ferritin. Roche Diagnostics; V2 10/2022)

### PDF Report
No

### Day(s) Performed
Monday through Sunday

### Report Available
Same day/1 to 2 days

### Specimen Retention Time
7 days

### Performing Laboratory Location
Mayo Clinic Laboratories - Rochester Main Campus

## Fees & Codes

### Fees
- Authorized users can sign in to Test Prices for detailed fee information.
- Clients without access to Test Prices can contact Customer Service 24 hours a day, seven days a week.
- Prospective clients should contact their account representative. For assistance, contact Customer Service.

### Test Classification
This test has been cleared, approved, or is exempt by the US Food and Drug Administration and is used per manufacturer's instructions. Performance characteristics were verified by Mayo Clinic in a manner consistent with CLIA requirements.

### CPT Code Information
82728

### LOINC® Information

# Test Definition: FERR1

Ferritin, Serum

| Test ID | Test Order Name | Order LOINC® Value |
|---|---|---|
| FERR1 | Ferritin, S | 20567-4 |

| Result ID | Test Result Name | Result LOINC® Value |
|---|---|---|
| FERR1 | Ferritin, S | 20567-4 |