

Ferro Fort[®]
Ferrous Glycine Sulphate



Dr.

IRON DEFICIENCY ANEMIA

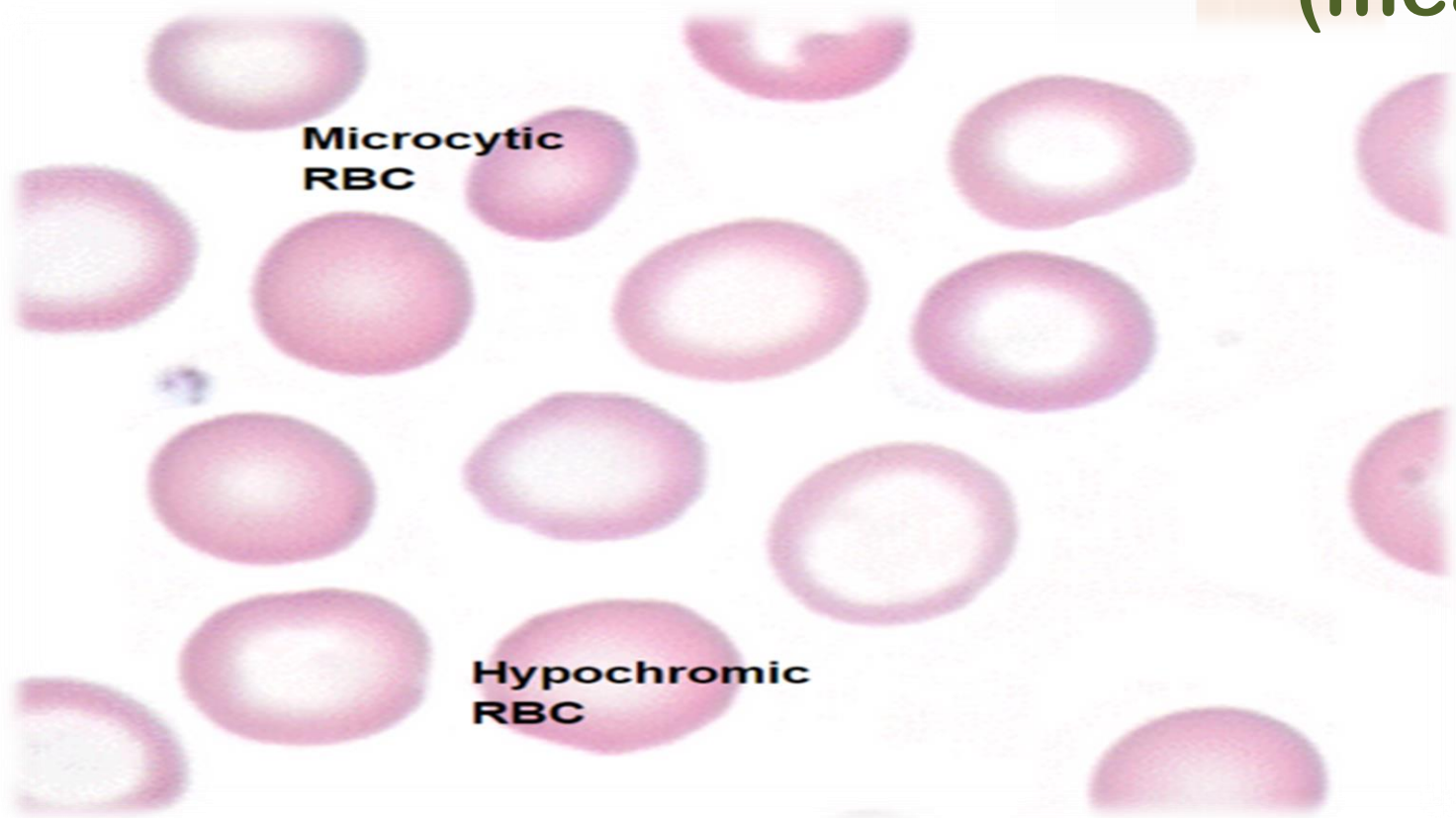


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Microcytosis/ Microcytic anemia

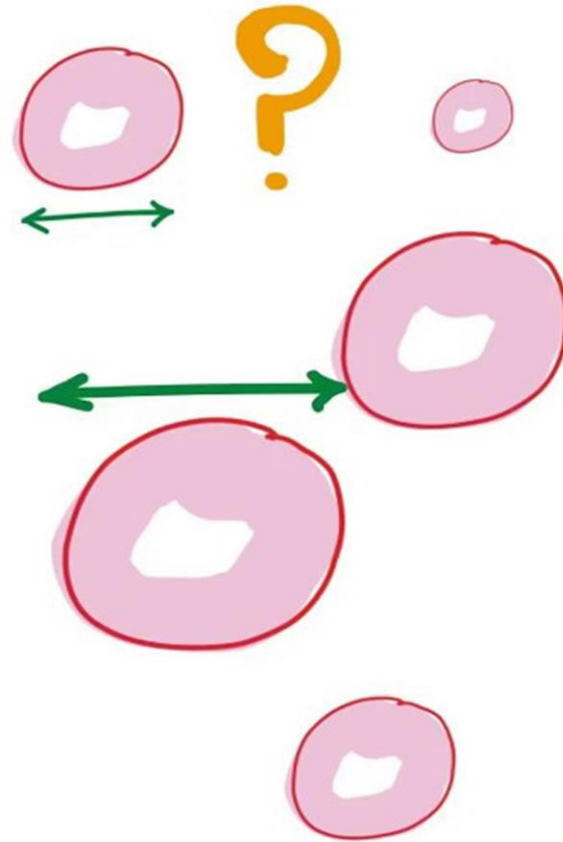
Adults: 80 to 96 fL
(mean \pm SD = 88 \pm 4 fL)



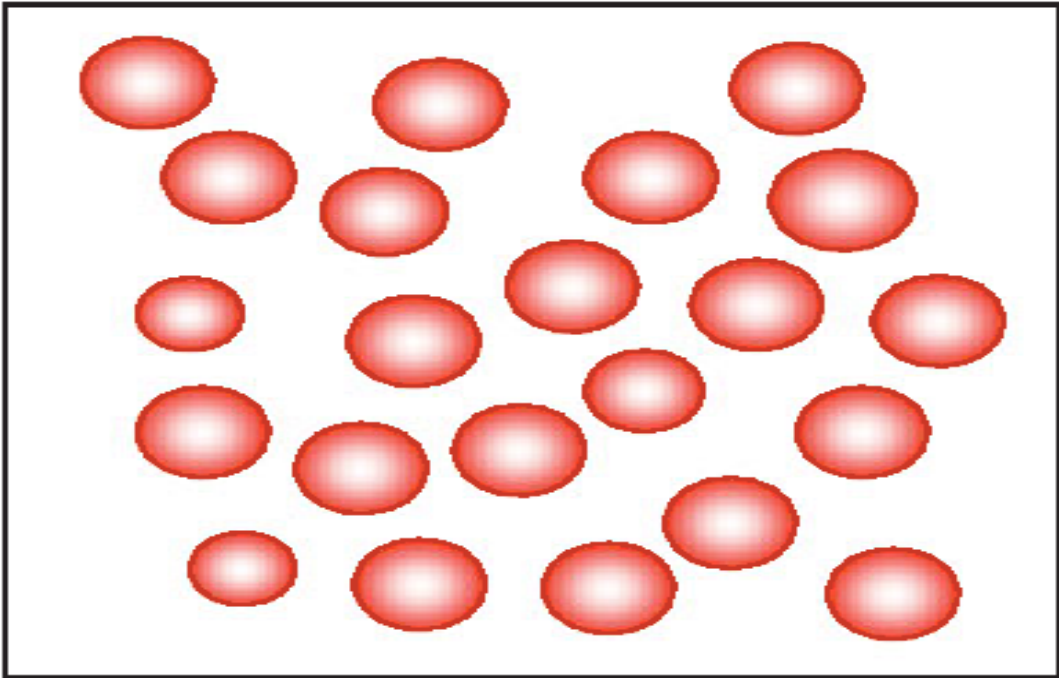
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Red cell
Distribution
width
(RDW)

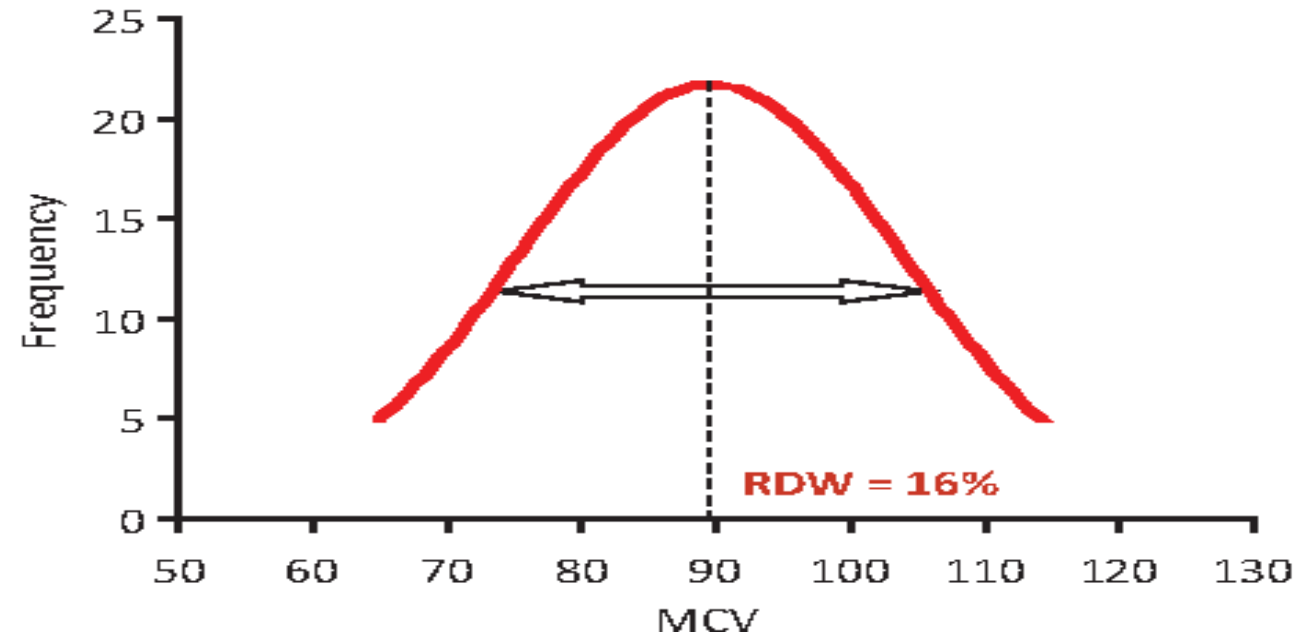
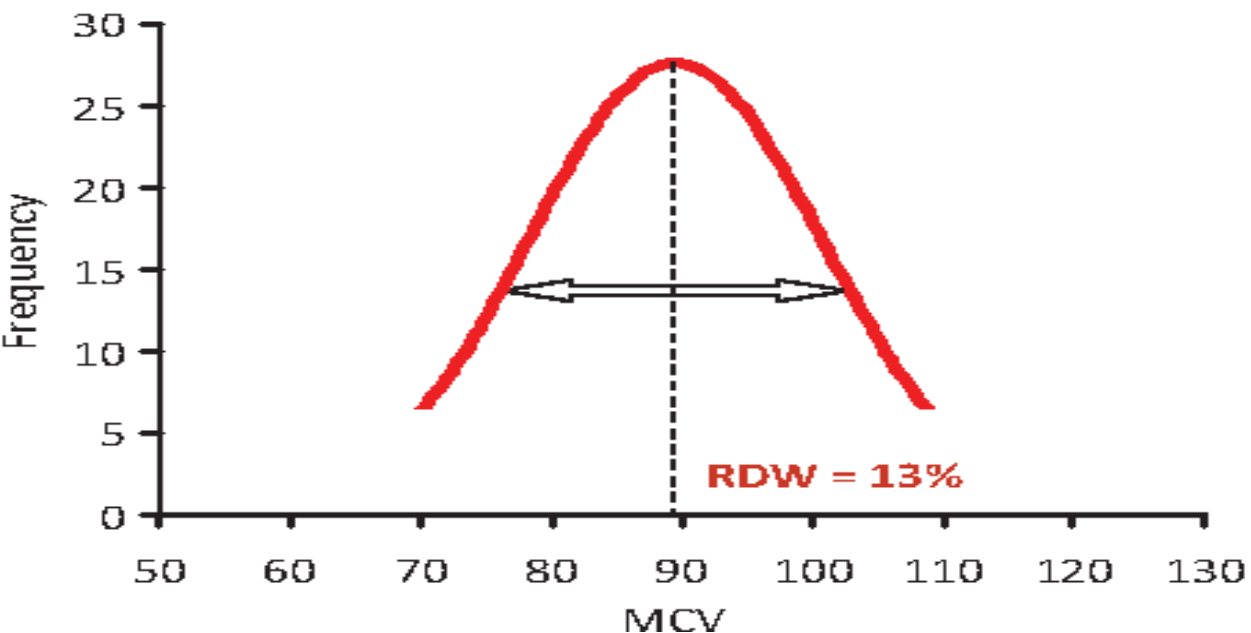
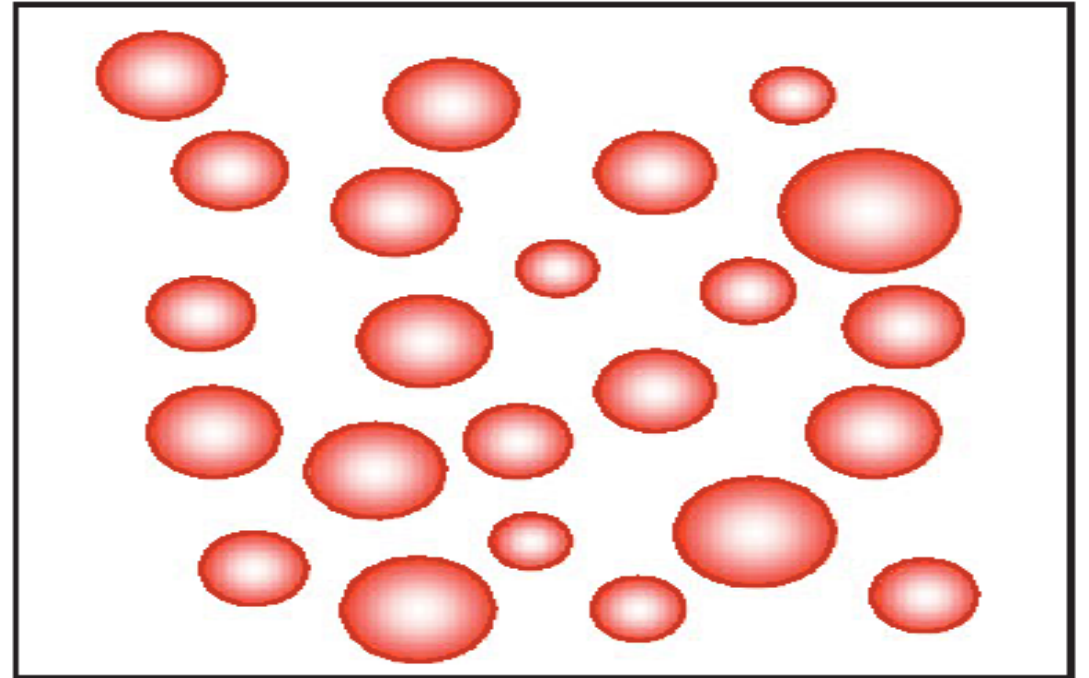


Low Anysocytosis

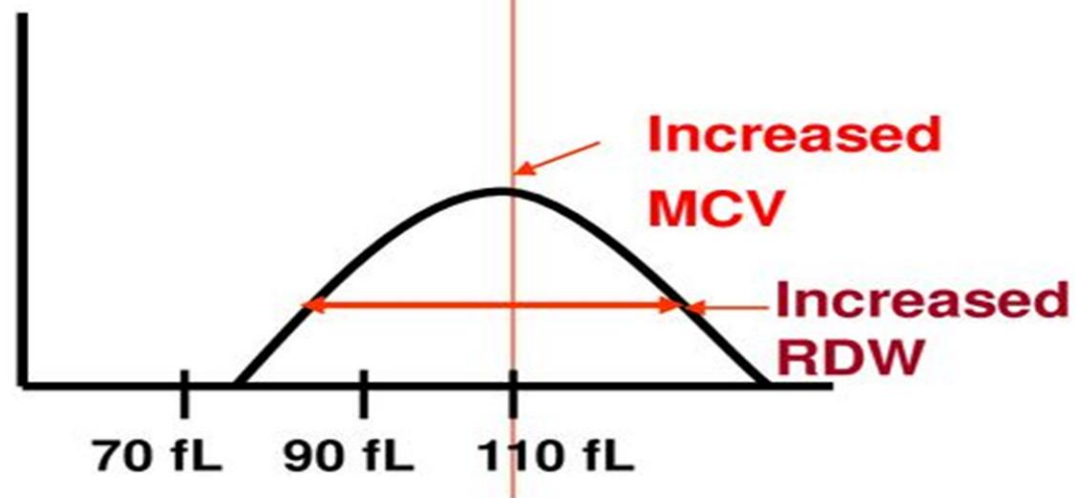
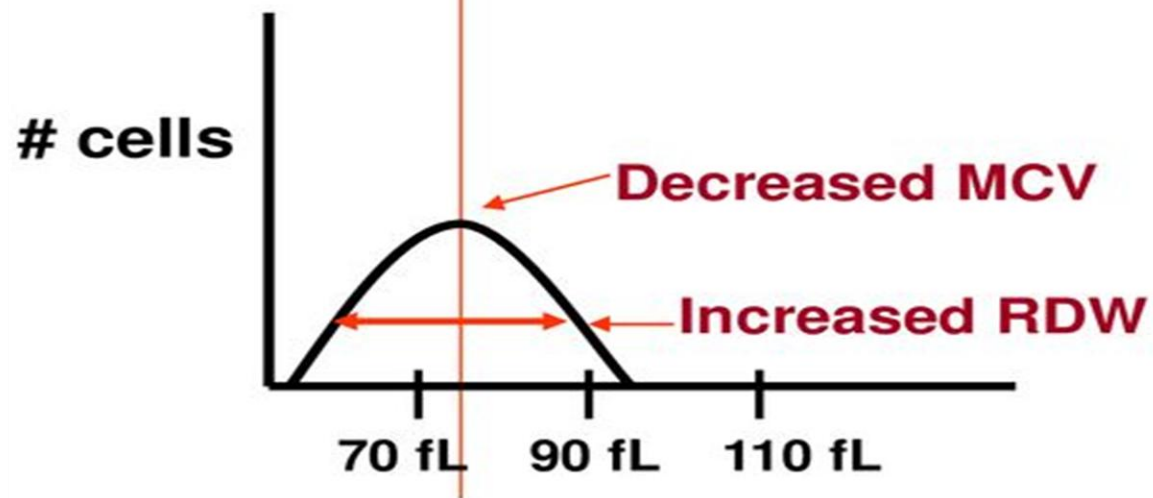
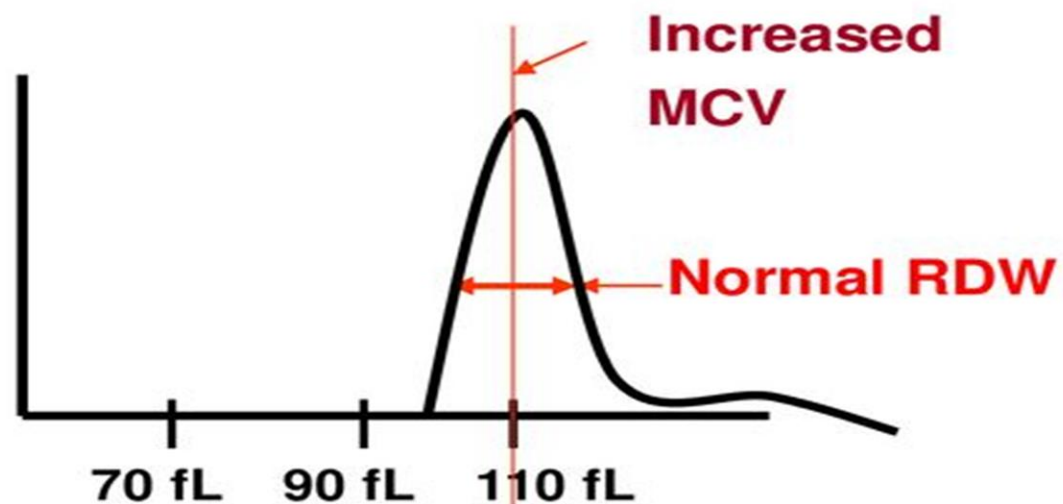
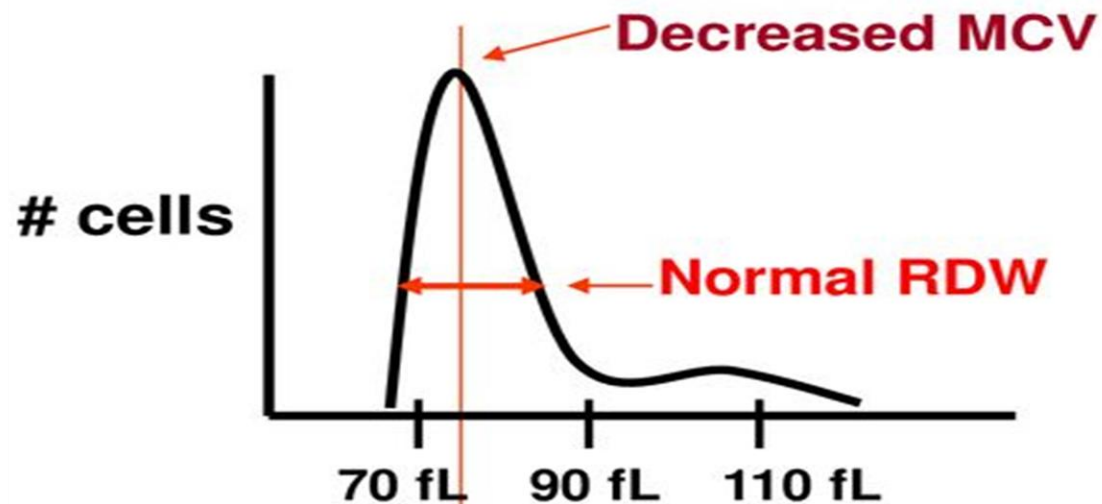


RDW :
11.5 to
14.5
percent

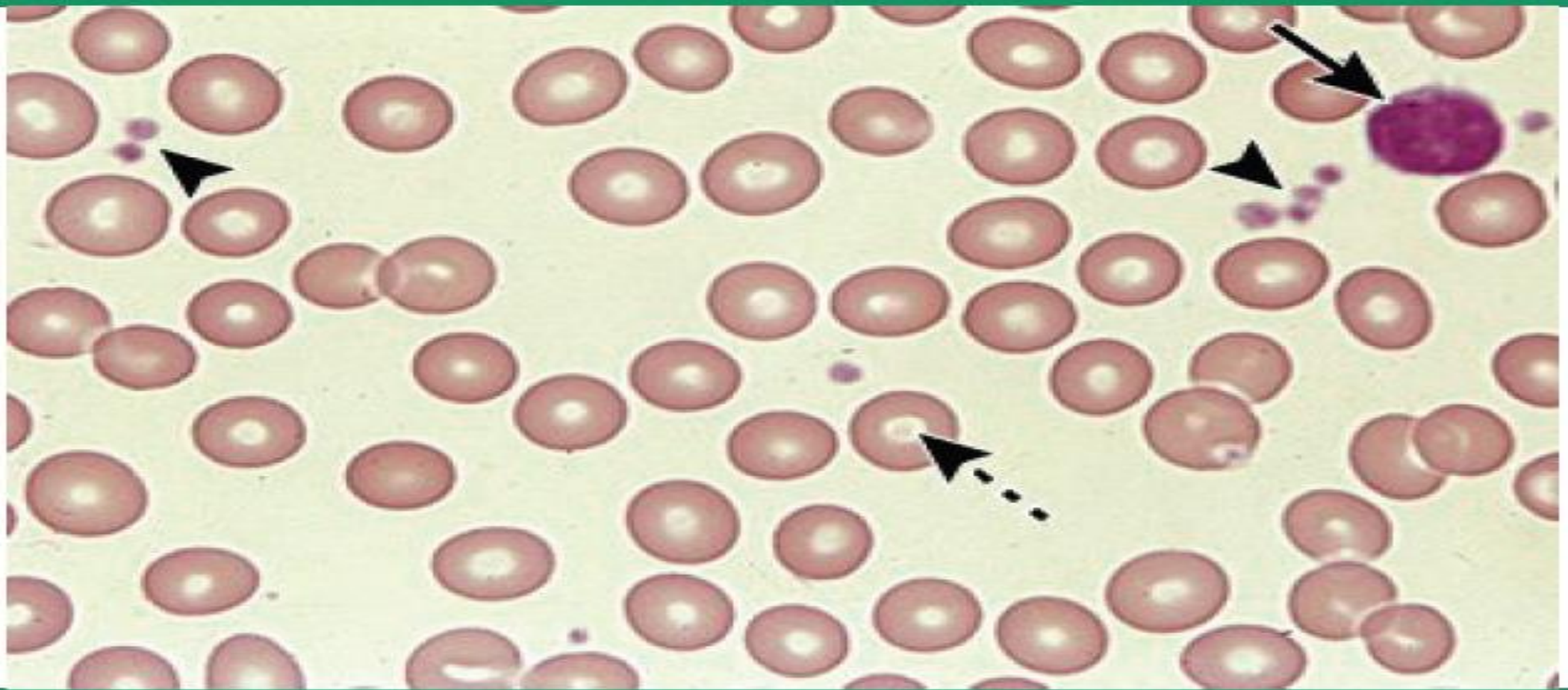
High Anysocytosis



RDW and RBC Histogram



Normal peripheral blood smear



High-power view of a normal peripheral blood smear. Several platelets (arrowheads) and a normal lymphocyte (arrow) can also be seen. The red cells are of relatively uniform size and shape. The diameter of the normal red cell should approximate that of the nucleus of the small lymphocyte; central pallor (dashed arrow) should equal one-third of its diameter.



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causes of microcytosis

Hereditary disorders

Defects of globin synthesis

Thalassemia syndromes

Thalassemic hemoglobinopathies (eg, hemoglobin [Hb]E, Hb Lepore)

Defects of iron metabolism

Iron refractory iron deficiency anemia (IRIDA)*

Divalent metal transporter (DMT)1 mutations*

Atransferrinemia*

Sideroblastic anemia

Acquired disorders

Iron deficiency anemia

Anemia of chronic disease (also called anemia of chronic inflammation)*

Myelodysplastic syndrome (MDS) with acquired thalassemia[¶]

Sideroblastic anemias due to drugs or toxins (lead poisoning, alcohol, drugs)

Copper deficiency (some cases)

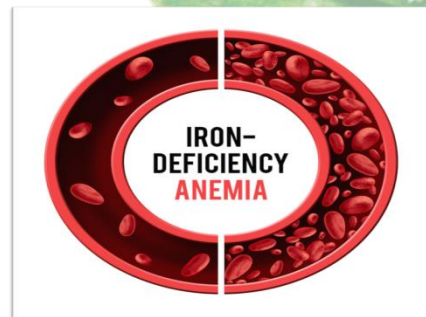
Zinc toxicity



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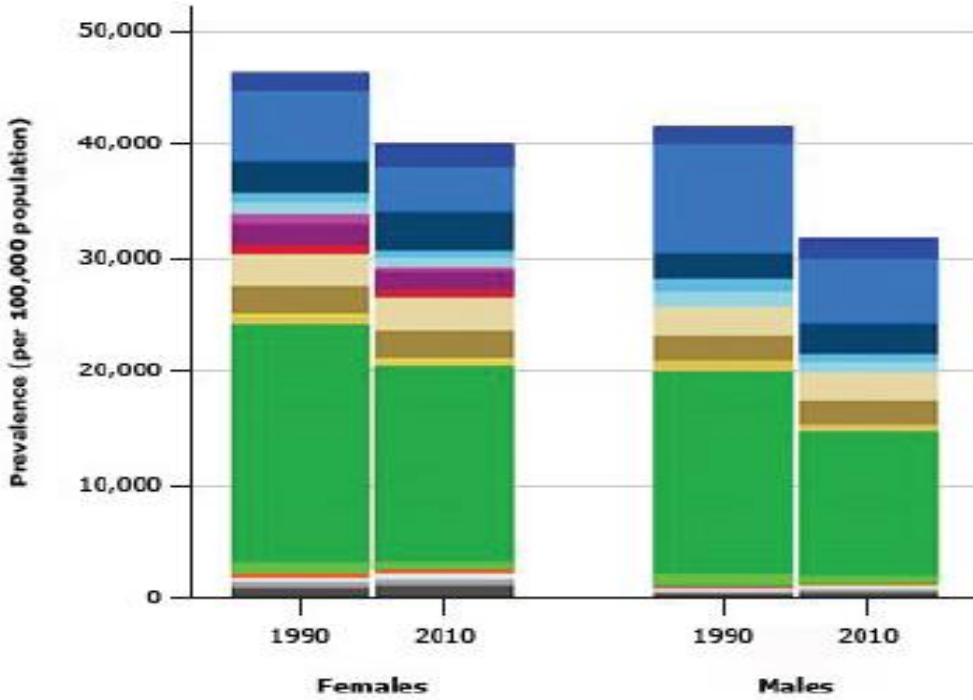
iron deficiency and iron deficiency anemia in adults



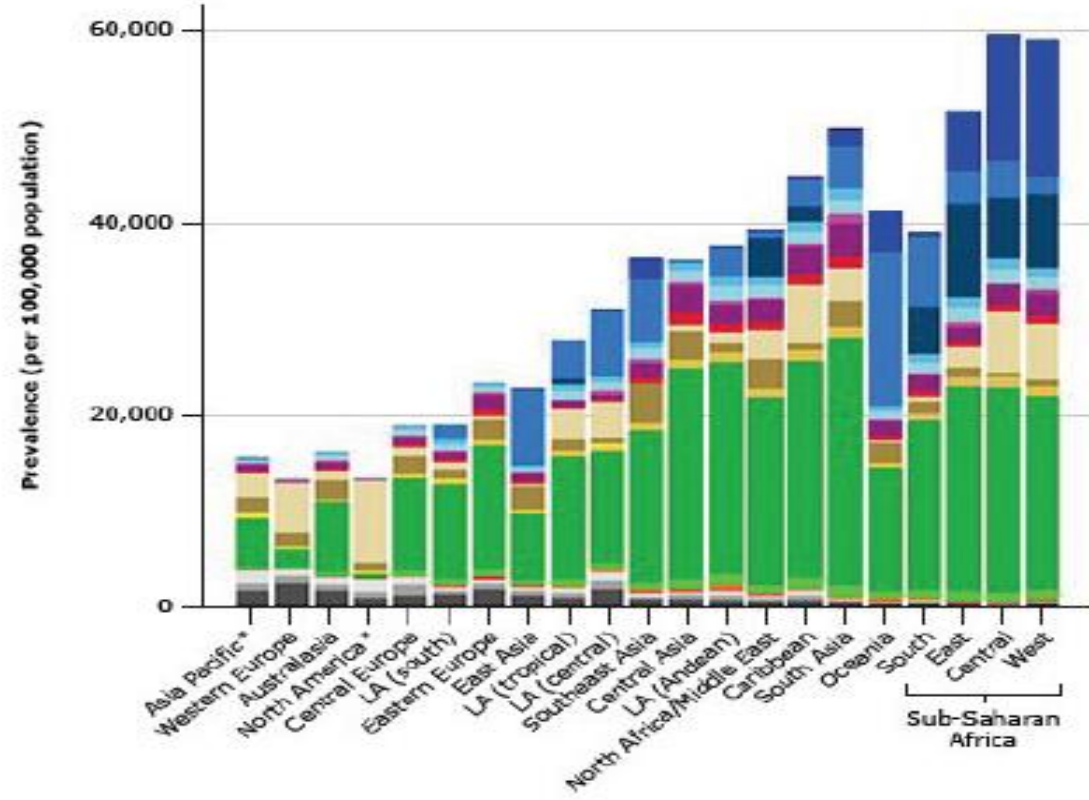
EPIDEMIOLOGY

Graphs showing the prevalence of anemia according to sex, year, and geographic region, classified by underlying cause

Prevalence of anemia by sex and time period



Prevalence of anemia by geographic region (2010)



Malaria	Maternal hemorrhage	Sickle cell	Iron-deficiency anemia	Diabetic CKD
Hookworm	Fibroids	Thalassemias	Other endocrine	Hypertensive CKD
Schistosomiasis	Other gynecological disorders	G6PD deficiency	Gastritis and duodenitis	Other CKD
Other infectious diseases	Other hemoglobinopathy	Peptic ulcer		
Other neglected tropical diseases				

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	Normal	Iron deficiency without anemia	Iron deficiency with mild anemia	Severe iron deficiency with severe anemia
Hemoglobin	Normal range*	Normal range*	9 to 12 g/dL (90 to 120 g/L)	6 to 7 g/dL (60 to 70 g/L)
Red blood cell size and appearance	Normal	Normal	Normal or slight hypochromia (slight decrease in MCHC)	Microcytosis (decrease in MCV) and hypochromia (decrease in MCHC)
Serum ferritin	40 to 200 ng/mL (40 to 200 mcg/L; 89.9 to 449 picoM/L)	< 40 ng/mL [†] (< 40 mcg/L; < 89.9 picoM/L)	< 20 ng/mL (< 20 mcg/L; < 45 picoM/L)	< 10 ng/mL (< 10 mcg/L; < 22.5 picoM/L)
Serum iron	60 to 150 mcg/dL (10.7 to 26.7 microM/L)	60 to 150 mcg/dL (10.7 to 26.7 microM/L)	< 60 mcg/dL (< 10.7 microM/L)	< 40 mcg/dL (< 7.1 microM/L)
Total iron-binding capacity (TIBC; transferrin)	300 to 360 mcg/dL (53.7 to 64.4 microM/L)	300 to 390 mcg/dL (53.7 to 69.8 microM/L)	350 to 400 mcg/dL (62.6 to 71.6 microM/L)	> 410 mcg/dL (> 73.4 microM/L)
Transferrin saturation (serum iron/TIBC)	20 to 50%	20%	< 15%	< 10%
Bone marrow iron stain	Adequate iron present	Iron absent	Iron absent	Iron absent
Erythrocyte zinc protoporphyrin, ng/mL RBC	30 to 70	30 to 70	> 100	100 to 200





BLOOD LOSS

stool tested for blood, gastrointestinal evaluation for adults >50 years of age with new onset IDA regardless of the results of stool occult blood testing, because gastrointestinal lesions can bleed intermittently

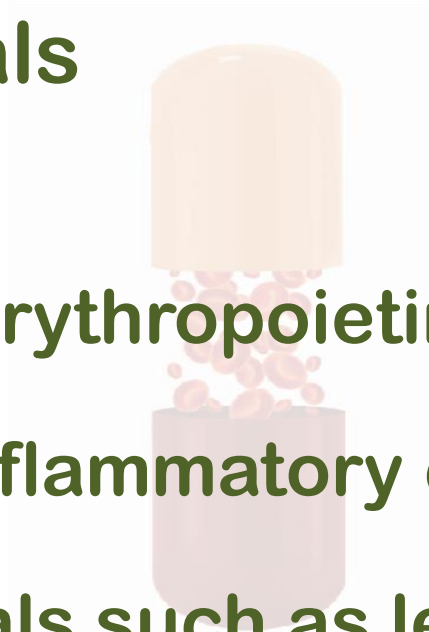
- gastrointestinal telangiectasias
- exercise-induced hemolysis
- Urinary blood loss
- surgical treatment for obesity





iron-replete individuals

- decreased levels of erythropoietin
- increased levels of inflammatory cytokines
- toxicity of heavy metals such as lead





Typical findings in iron deficiency

Medical history may show:

- Symptoms of anemia, pica, restless legs syndrome
- Conditions that could interfere with iron intake (eg, positive FH for celiac disease; GI symptoms)
- Potential sources of blood loss (eg, heavy menses, pregnancies, GI bleeding, frequent blood donation)

Examination may show:

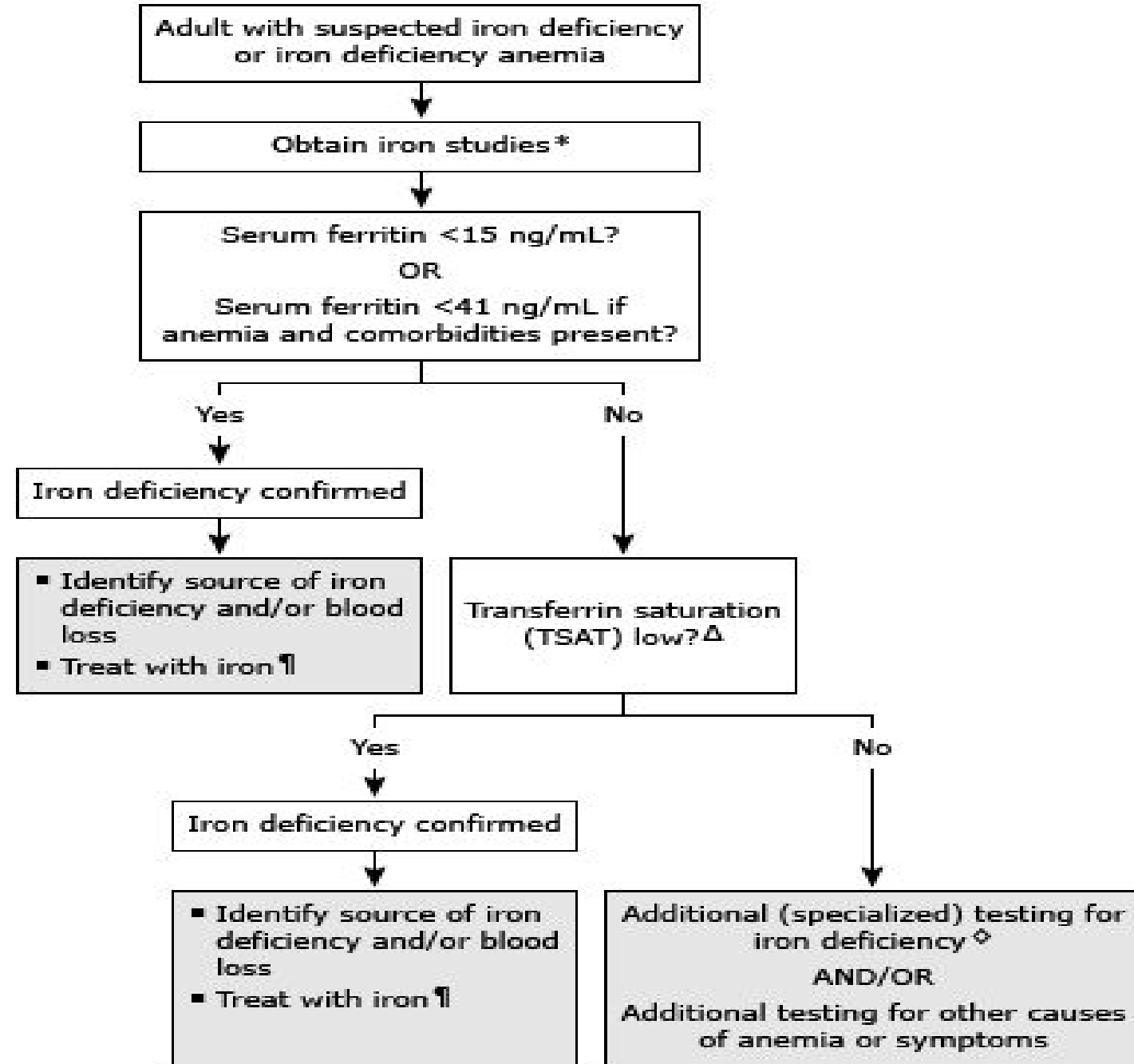
- Stigmata of iron deficiency
- Source of blood loss (eg, occult blood in stool)

CBC may show:

- Anemia
- Low RBC count
- Microcytic/hypochromic RBCs
- Low reticulocyte count
- High platelet count

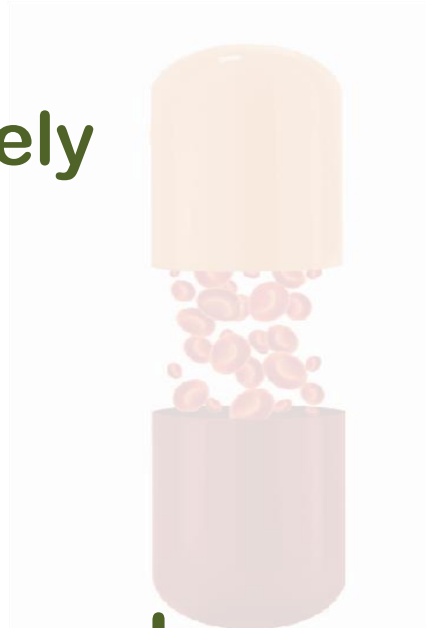
Iron studies panel includes the following:

- Iron
- Transferrin/TIBC
- Ferritin
- Percent transferrin saturation (TSAT; calculated as iron/TIBC \times 100)



ANEMIA OF CHRONIC INFLAMMATION

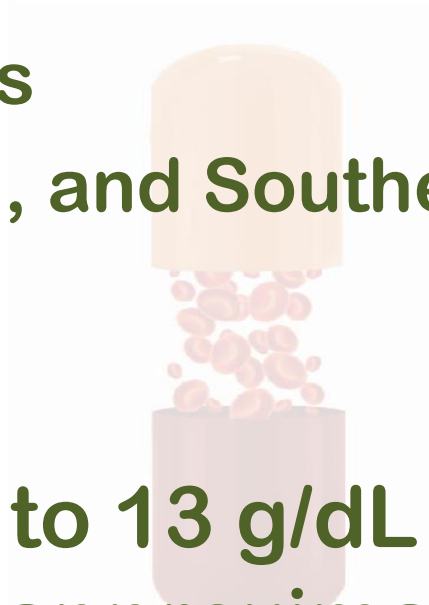
- ✓ a diagnosis of exclusion
- ✓ MCV below 70 fL is unlikely
- low serum iron
- low TIBC
- normal to increased serum ferritin
- ✓ chronic infections (eg, pulmonary tuberculosis), inflammation (eg, active rheumatoid arthritis), and malignancies





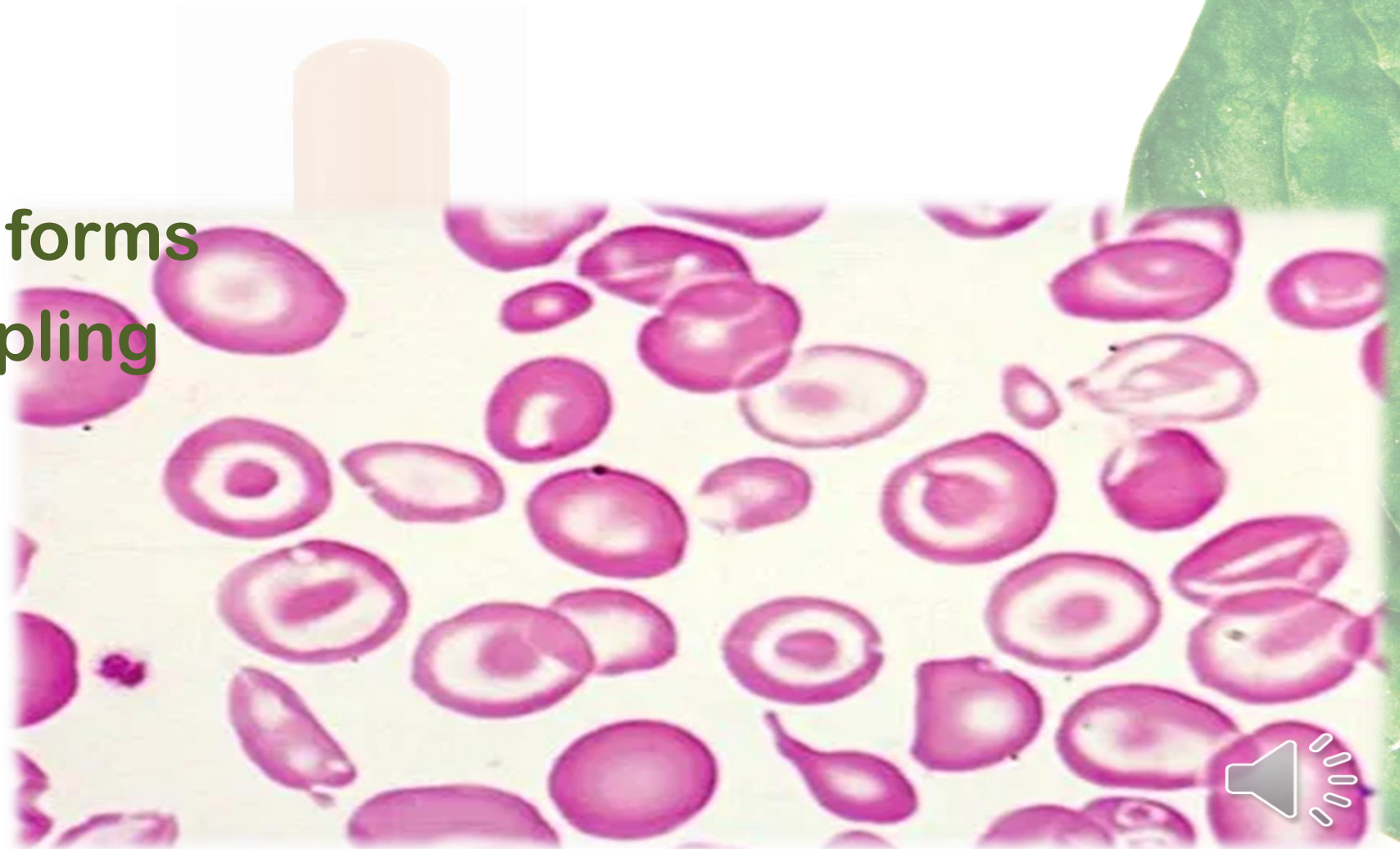
- ✓ alpha or beta globin genes
- ✓ Africa, the Mediterranean, and Southeast Asia
- ✓ mild splenomegaly

- ❑ hemoglobin level is 10 to 13 g/dL in beta thalassemia minor, with an MCV of approximately 65 to 75 fL
- ❑ RBC count normal or increased
- ❑ RDW is normal





- ❑ Hypochromia
- ❑ microcytosis
- ❑ target cells
- ❑ tear-drop RBC forms
- ❑ basophilic stippling



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APPROACH TO THE EVALUATION





CONFIRM MICROCYTOSIS/MICROCYTIC ANEMIA

- ✓ in vitro RBC fragmentation due to collection in a sample tube containing an inappropriate fluid or debris
- ✓ inadvertent heating of the sample (eg, during transport)
- ✓ especially long delay between sample collection and analysis
- ✓ extremely large platelets or white blood cell fragments may be counted as RBCs

repeating the sample and/or reviewing the peripheral blood smear





EXCLUDE IRON DEFICIENCY AND THALASSEMIA

	Iron deficiency Anemia	Thalassemia
<u>Hb</u>	Low	Low (100-115)
MCV	< 85: Consider Fe deficiency <75: Fe deficiency	Low (60's)
RBC Count	Low	High
RDW	High	Normal
Ferritin	Low (<30)	





ASSESS THE LIKELIHOOD OF ANEMIA OF CHRONIC INFLAMMATION

	Iron Deficiency Anemia	Anemia of Chronic Disease	Thalassemia
MCV	Low/normal	Low/normal	Low/normal
RDW	High	Normal	Normal
Iron	Low	Low	Normal/high
TIBC	High	Normal/low	Normal
Ferritin	Low	Normal/high	Normal
Transferrin saturation	Low	Normal	Normal
Transferrin	High	Normal	Normal

MCV = mean corpuscular volume
 RDW = red cell distribution width
 TIBC = total iron binding capacity

Diagnosing the Cause of Microcytosis

Adult with microcytosis (mean corpuscular volume < 80 μm^3 [80 fL])

Check ferritin level

Ferritin level < 15 ng per mL (15 mcg per L), or < 50 ng per mL (50 mcg per L) with chronic inflammation

Iron deficiency anemia

Serum iron level decreased
TIBC increased
Transferrin saturation decreased

Suggests iron deficiency anemia

Ferritin level normal to high

Check serum iron level, TIBC, and transferrin saturation

Serum iron level decreased
TIBC decreased
Transferrin saturation decreased

Suggests anemia of chronic disease

Serum iron level normal to increased
TIBC normal
Transferrin saturation normal to increased

Perform hemoglobin electrophoresis (consider earlier in the evaluation of children and young adults)

Normal hemoglobin A2 level

Sideroblastic anemia
Alpha-thalassemia trait

Increased hemoglobin A2 level

Beta-thalassemia trait

Diagnose other hemoglobinopathy



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Thank You

