

Hematology

Iron Deficiency Anemia (IDA)

LEC 7

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- **Iron deficiency anemia** is the **most common form** of anemia. **Iron** is a key part of red blood cells. Without iron, the blood cannot carry oxygen effectively. The body normally gets iron through **diet** and by **reusing** iron from old red blood cells.

- ☐ **Iron :**

- The total body iron in a 70-kg man is about (**4 g.**) This is maintained by a balance between absorption and body losses. Although the **body** only absorbs (**1 mg**) **every day** to maintain balance, the internal requirement for iron is greater (**20 - 25 mg.**). An erythrocyte has a lifespan of 120 days so that 0.8% of red blood cells are destroyed and replaced each day.
- A man with 5 L of blood volume has **2.5 g** of **iron incorporated** into the **hemoglobin**, with every day turnover of **20 mg** for **hemoglobin synthesis** and degradation and another 5 mg for other requirements.

- **Iron** is absorbed mainly by the small intestine, especially the **Duodenum**, and **Jejunum** , iron has to be present in the ferrous (Fe^{2+}) rather than the ferric (Fe^{3+}) form. Ferrous ions then have to bind with ***apotransferrin***, a protein secreted by the liver into the intestines via bile. The combination of apotransferrin with iron is now called ***transferrin***.

- Most of the iron in the body is utilized in **hemoglobin synthesis**, about 65% of the body's iron is in hemoglobin, about 15 to 30% is in the storage form. Iron in excess of these requirements is deposited in body stores as ferritin or hemosiderin. Excess **iron** is mainly stored in hepatocytes or **liver cells**, and **Reticuloendothelial cells** and to a smaller amount in **bone marrow cells**.

- In these cells, iron is taken up by a large protein molecule called *apoferritin* to form *ferritin*. ***Ferritin*** is the storage form of **iron** and may contain either small or large quantities of iron.

Iron in excess of this is stored as ***hemosiderin***, another (insoluble protein – iron complex) storage form.

- Mainly iron obtained from Reticuloendothelial cells (macrophages), only a small amount of plasma iron comes from **dietary**. Iron is also present in muscles as myoglobin, and most cells of the body.

- **The development of IDA is a three stages process:**

- **Stage 1: Iron Stores Depleted.**

- - Absence of bone marrow iron
- - Decreased serum ferritin level

- **Stage 2: Iron-Deficient Erythropoiesis.**

- - Slight microcytosis
- - Slight decreased hemoglobin
- - Decreased transferrin saturation

- **Stage 3: Iron Deficiency Anemia.**
- - Decreased serum iron
- - Decreased serum ferritin
- - Decreased transferrin saturation

- ☐ **Causes of Iron Deficiency Anemia:**

- **1. Blood Loss**

- - Gastrointestinal Tract
- - Menstrual Blood Loss
- - Urinary Blood Loss (Rare) Blood in Sputum (Rare)

- **2. Increased Iron Utilization**

- - Pregnancy
- - Infancy
- - Adolescence
- - Polycythemia Vera

- **3. Malabsorption**
 - - Tropical Sprue
 - - Gastrectomy
 - - Chronic atrophic gastritis
- **4. Dietary inadequacy** (almost never sole cause)

- ☐ **Symptoms :**

- 1. Fatigue
- 2. Pica: is the persistent eating of substances such as **dirt** or **paint** that have **no nutritional value**
- 3. Koilonychia (Nail spooning)
- 4. Esophageal Web
- 5. Cold intolerance
- 6. Lethargy

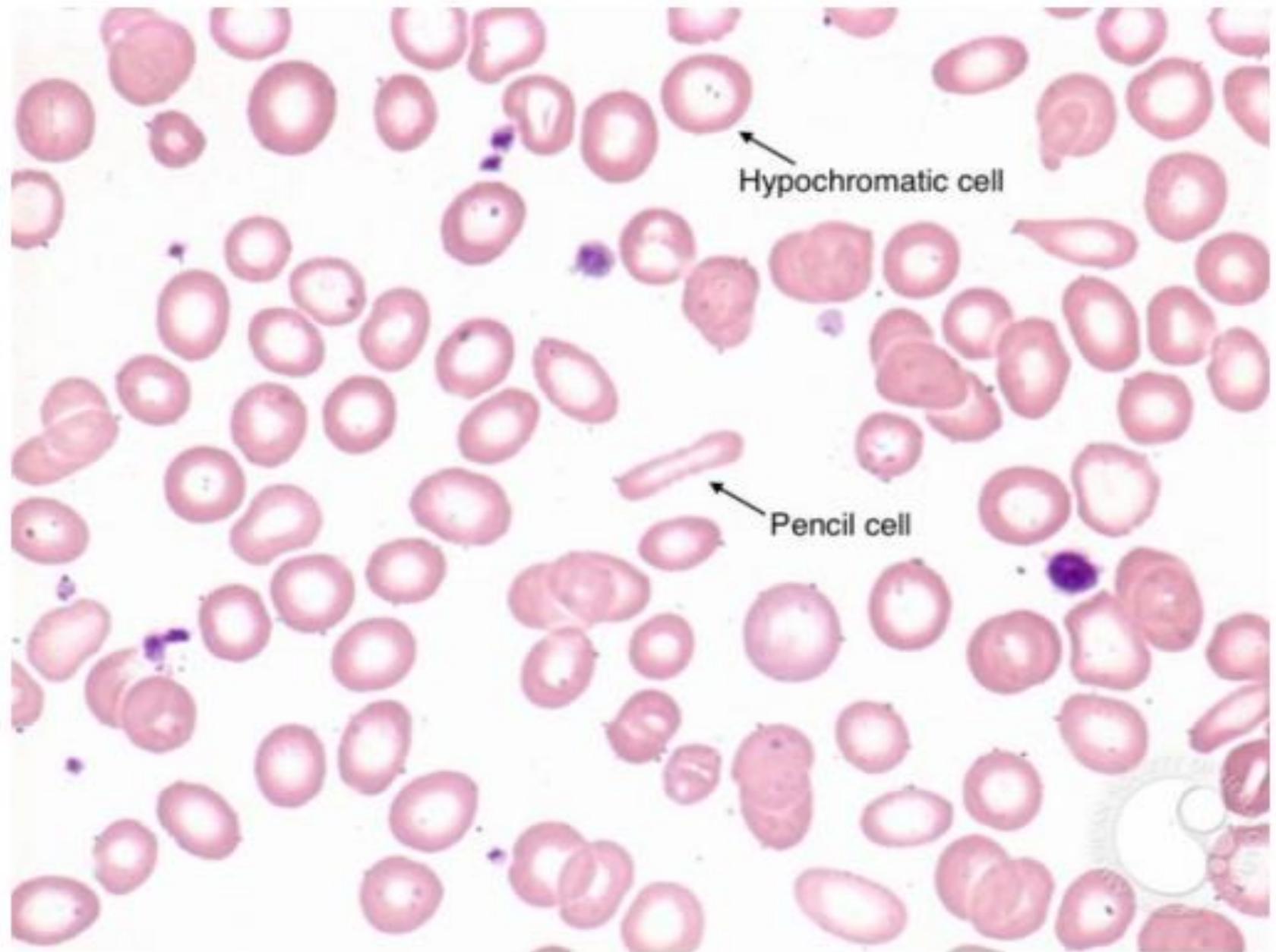
- ☐ **Laboratory finding**

- **1. Red cell indices and blood film:**

- Decrease Hb, PCV, RBCs, MCV, MCH, MCHC.

- **2. Blood film will show:**

- - Hypochromic microcytic anemia.
- - Anisocytosis (i.e. differences in size of cells)
- - Poikilocytosis (i.e. differences in shape of cells)
- - Target cells and pencil shaped cells.
- - WBC is variable.
- - Platelets usually increase



- **3. Chemical tests in serum**

- - **Ferritin** is decreased, because it measures iron stores.
- - **Total iron binding capacity (TIBC)** increase because TIBC measures transferrin.
- - **Serum transferrin receptor**

Transferrin receptor is shed from cells **into plasma**. The level of serum transferrin receptor (STAR) is increased in IDA but not in the anemia of chronic disease or thalassemia trait.

- **4. Bone marrow examination (biopsy)**
- - Is rarely needed, but when done it reveals depleted iron stores with erythroid hyperplasia.

- ☐ **Treatment :**
- Taking **iron supplements** and eating **iron-rich foods** are important parts of treating iron deficiency anemia. Iron supplements (most often ferrous sulfate) are needed to build up the iron stores in the body.
- **Pregnant** and **breastfeeding** women will need to take **extra iron** because their **normal diet** usually will not provide the amount they need.

- **Iron-rich foods include:**
- 1. Chicken .
- 2. Dried lentils, peas, and beans.
- 3. Eggs (yolk).
- 4. Fish.
- 5. Peanut butter.
- 6. Soybeans.
- 7. Whole- grain bread.
- 8. Meats (liver is the highest source)
- Raisins, Spinach, and other greens.

**Thank You
For
Listening**