5) The Fifth Experiment:

SERUM IRON AND TIBC

Serum iron concentration connotes the Fe^{+3} bound to the serum transferrin and does not include the iron contained in serum as free hemoglobin. It's the element to which oxygen binds on a hemoglobin molecule within an erythrocyte .Small amount of iron are lost from the body via :

- The urine .
- Feces .
- Sweat .
- Cells sloughed from the skin .
- Menstrual blood (in women) .

Source:

In foods : meat , liver , shellfish , egg yolk , beans nuts and cereals .

Function:

1. As a constituent of Hb molecule for O_2 transport from lung to tissue.
2. Stimulation of many enzyme of respiratory chain (cytochrome oxidase , peroxidase and catalase).

☒ The total quantity of iron in the body average (4-5 grams) about 65 % of which is in the form of hemoglobin.

Clinical significance :

Increased Iron

1. Increase RBCs destruction "hemolytic anemia ".
2. Decrease utilization of Fe^{+3} " Iron poisoning ".
3. Hepatitis " due to increase release of iron from body stores.
4. Hemochromatosis " increased rate of absorption of iron"

Decrease iron

1. Iron deficiency anemia .
2. Chronic blood loss.

3. Nephrosis " due to loss of protein ".
4. Pregnancy.
5. Malignancies.

Biochemical assessment of iron stores in the body :

1) Serum ferritin :

The range of normal in most laboratory is 30 – 300 ng/ml , low levels (< 12 ng/ml) are specific for iron deficiency , and levels increase in inflammatory , neoplastic disorders , in case of liver injury (e.g Hepatitis) and in some tumors (e.g : acute leukemia).

2) Serum Iron Concentration :

Refers to iron bound to serum transferrin , and does not include any iron contained in serum as free Hb.

3) Serum transferrin :

Transferrin transports circulating iron molecules , it is increased in iron deficiency anemia.

4) Total Iron – Binding capacity :

The serum iron which is bound to a B- globulin called transferrin . However, only approximately 1/3rd of the transferrin in serum normally is in combination with iron . the additional amount of iron that can potentially be bound to transferrin constitute the unsaturated iron-binding capacity (UIBC) of plasma.

TIBC = Plasma iron + UIBC

5) Saturation of transferrin:

It represent the amount of iron binding sites that are occupied .

= [serum iron conc. / TIBC] $_x$ 100

The Procedures :

Prepare working reagent as in the following :

Mix R1 (4 volumes) + R2 (1 volume) stable 6monthe at 2-8c

Manual procedure :

Blank - Tubes	Reagent Blank	Sample blank	Sample	CAL Standard
D.W	200µl			
Sample	--	200µl	200µl	
CAL Standard			--	200µl
R1		1.0ml	--	
Working reagent	1.0ml		1.0ml	1.0ml

- Bring reagents and samples to room temperature
- Pipette into labelled test tubes
- Mix and let the tubes stand 5minutes at room temperature
- Read the absorbance (A) of the sample blank at 560nm against D.W
- Read the absorbance (A) of the samples and the standard at 560 nm against the reagent blank

Calculation:

$$\frac{\mathbf{A}\text{ sample} - \mathbf{A}\text{ sample Blank}}{\mathbf{A}\text{ standard}} \times \mathbf{C}\text{ standard} = \mu\text{g/dl iron}$$

Normal values:

Age	Iron µg/Dl
New born	100 – 250
Infant	40 – 100
Children	50 -120
Men	60 -175
Women	50 -170