

class: Three  
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## **Red blood cell indices**

Measurements needed to calculate RBC indices are the red blood cell count, hemoglobin, and hematocrit. The hematocrit is the percentage of blood by volume that is occupied by the red cells. The three main RBC indices are:

### **Mean corpuscular volume (MCV):**

The average size of red blood cells expressed in femtoliters (fL). MCV is calculated by dividing the hematocrit (as percent) by the RBC count in millions per microliter of blood, then multiplying by 10. The MCV is elevated when your RBCs are larger than normal (macrocytic), for example in anemia caused by vitamin B12 deficiency. When the MCV is decrease, your RBCs are smaller than normal (microcytosis) as is seen in iron deficiency anemia or thalassemia's.

$$\text{MCV} = \frac{\text{Hct \%} \times 10}{\text{RBC count}} = \text{fL (femtoliter)}$$

### **NORMAL**

- Adult = 80 to 95 fL.
- Newborn = 96 to 108 fL

### **Mean corpuscular hemoglobin (MCH):**

The average amount of hemoglobin inside an RBC expressed in pictogram (pg) .The MCV is calculated by dividing the hemoglobin concentration in grams per deciliter by the RBC

count in millions per microliter, then multiplying by 10. Macrocytic RBCs are large so tend to have a higher MCV, while microcytic red cells would have a lower value.

$$\text{MCH} = \frac{\text{Hb g/dL} \times 10}{\text{RBC count}} = \text{pg (picogram)}$$

### **NORMAL**

Adult = 27 to 31 pg

Newborn = 32 to 34 pg

### **Mean corpuscular hemoglobin concentration (MCHC):**

The average concentration of hemoglobin in the RBCs expressed as a percent. It is calculated by dividing the hemoglobin in grams per deciliter by the hematocrite ,then multiplying by 100. Decrease MCHC values (hypochromia) are seen in conditions where the hemoglobin is abnormally diluted inside the red cells, such as in iron deficiency anemia and in thalassemia .Increased in MCHC values (hyperchromia) are seen in conditions where the hemoglobin is abnormally concentrated inside the red cells, such as in burn patients and hereditary spherocytosis a relatively rare congenital disorder.

$$\text{MCHC} = \frac{\text{hemoglobin(g / 100ml)} \times 100}{\text{hematocrit(\%)}}$$

### **Normal**

- Adult = 32 to 36 g/dL or 32 to 36 %
- Newborn = 32 to 33 g/dL or 32 to 33 %.