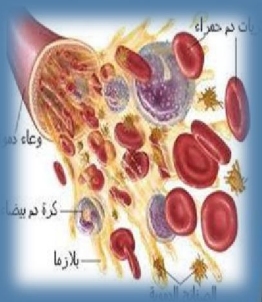
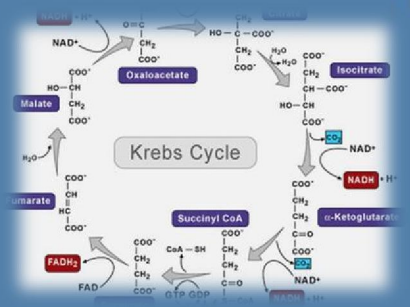
Al-Rasheed University College
Medical Analysis Department
Clinical Chemistry Lab.
Third Stage

كليـــــة الرشيد الجامعـــــــة
قســـــم التحليلات المرضيـــة
مختبر الكيميـــاء السريريـــة
المرحلـــــة الثالثـــــة





Lecture (10)

Glycated hemoglobin (HbA1c)

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Glycated hemoglobin (HbA1c)

The normal adult hemoglobin contains 90% hemoglobin A (HbA), which is a tetramer of two α- and two ß-globin chains. Both subunits contain one hem group. A minor form among the hemoglobins is the glycohemoglobin (HbA1), the glycosilated form of HbA. The most common form is the HbA1c, where one unit of glucose is coupled to the N terminal valine of the ß globin chain. The glycosilation of HbA1 occurs non enzymatically during the whole lifespan of the erythrocytes.

Normally 4.5-6.5 % of the hemoglobin is glycosilated, but in diabetes this value can be 2-3 times higher. Although the exact clinical significance of glycosilated hemoglobins is still not clear, the measurement of the HbA1 level is important because its amount is rational to the long-term average glucose concentration, and especially because its amount is not influenced by the patient's meal, physical activity, and/or the antidiabetic drugs taken before drawing the blood sample.

The normal and abnormal value of Glycated hemoglobin:

1- In people with diabetes, diabetic hemoglobin ranges from 4.5 to 6%, and in the case of 5.7 to 6.4%, the person is at high risk for diabetes.
2- Diabetic hemoglobin, in patients with diabetes, who have a specific glucose control system, is 7%.
3- Diabetic hemoglobin, which does not maintain long-term glycemic control, is 9%, which increases the risk of diabetes complications such as cardiovascular disease, eye diseases, kidney disease, nerve damage and ulcers.

Factors affecting on test results:

1- Incidence of acute bleeding before the examination, which affects loss hemoglobin stocks in blood, and thus lead to a decrease as a result of the test, and give an inaccurate results.

2- Anemia, or the percentage of iron in the blood is low, will rise as a result of the results.

3- Most diabetics, they have a common hemoglobin A, and in the case when the patient was another type, will affect the on the results (increase or decrease).

A1c and Blood Sugar

A1c (%)	Average Blood Sugar (mg/dL)
4	68
5	97
6	126
7	152
8	183
9	212
10	240
11	269
12	298
13	326
14	355

Direct Enzymatic HbA1c Methods

There are 3 major HbA1c testing methods currently available to clinical laboratories. They are:

1. Chromatography based HPLC assay.
2. Antibody based immunoassay.
3. Enzyme based enzymatic assay.