



AL-MUSTAQBAL UNIVERSITY COLLE

Department of Medical laboratory Techniques Department

### *Clinical Biochemistry*

**(Estimation of Blood Glucose)**



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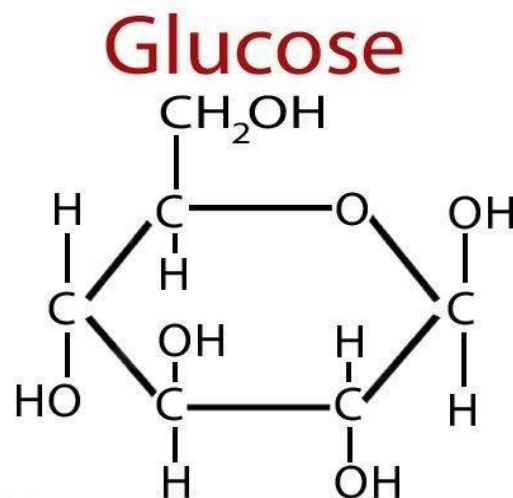
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## Carbohydrates

Is a biomolecule consisting of carbon (C), hydrogen (H) and oxygen (O) atoms, carbohydrates are found in a wide array of both healthy and unhealthy foods, the major food source and energy supply for the body and are stored primarily as liver and muscle glycogen.

## Glucose

Glucose is a 6-carbon structure with the chemical formula  $C_6H_{12}O_6$ . Glucose is our body's main source of energy, with some tissues like the brain requiring a constant supply. Glucose is referred to as –blood sugar because it circulates in our bloodstream as a source of readily available energy. It is also stored in the body as glycogen for energy reserves during times when sufficient glucose may not be available in the blood. Very little glucose is found in the diet as glucose; most is found in more complex carbohydrates that are broken down to monosaccharides through the digestive process. About half of the total carbohydrates in the diet are in the form of polysaccharides and the remainder as simpler sugars.



## **blood sugar regulation**

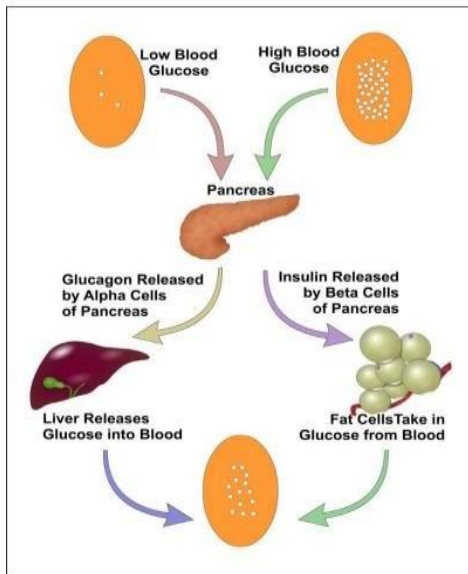
When a person consumes carbohydrates through foods, their body converts them into glucose, a simple sugar that serves as energy source. The body does not use all of this glucose at once. Instead, it converts some into storage molecules called glycogen and stores them in the liver and muscles. When the body needs energy, glucagon in the liver converts glycogen back into glucose. From the liver, it enters the bloodstream. There, insulin enables it to enter cells and provide energy for all of the body's functions. In the pancreas, different types of islet cells release insulin and glucagon.

### **Insulin**

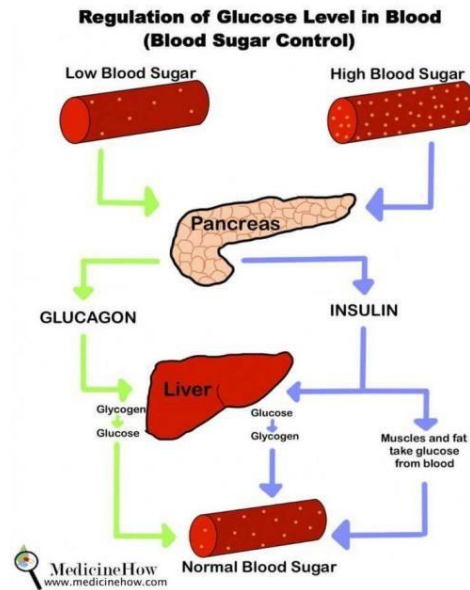
Is the primary hormone responsible for the entry of glucose into the cell. It is synthesized by the cells of islets of Langerhans in the pancreas. When these cells detect an increase in body glucose. The release of insulin causes an increased movement of glucose into the cells and increased glucose metabolism. Insulin is normally released when glucose levels are high and is not released when glucose levels are decreased glucose levels and can be referred to as a hypoglycemic.

### **Glucagon**

Is the primary hormone responsible for increasing glucose levels. It is synthesized by the cells of islets of Langerhans in the pancreas and released during stress and fasting states. When these cells detect a decrease in body glucose, they release glucagon. Glucagon acts by increasing plasma glucose levels by glycogenolysis in the liver and an increase in gluconeogenesis. It can be referred to as a hyperglycemic.



Homeostasis of Blood Glucose



| Laboratory Test                                  | Value         |
|--------------------------------------------------|---------------|
| Fasting Blood Glucose (FBG) (8h)                 | 4 – 6 mmol/L  |
| Random Blood Glucose (RBG)                       | 4 – 11 mmol/L |
| Glucose Tolerance Test (GTT) (2 h)               | > 7 mmol/L    |
| Hemoglobin A <sub>1</sub> C (HbA <sub>1</sub> c) | 4.8% - 6.0%   |

## Disease states involving carbohydrates are split into two groups

### Hyperglycemia

Hyperglycemia is an increase in plasma glucose levels. In healthy patients, during a hyperglycemia state, insulin is secreted by the beta cells of the pancreatic islets of Langerhans. Insulin enhances membrane permeability to cells in the liver and muscle. It also alters the glucose metabolic pathways. Hyperglycemia is caused by an imbalance of hormones.

### Diabetes mellitus

Is a metabolic disease that causes high blood sugar. Your body either doesn't make enough insulin or can't effectively use the insulin it makes.

**Type 1** diabetes is an autoimmune disease. The immune system attacks and destroys cells in the pancreas, where insulin is made.

**Type 2** diabetes occurs when the body becomes resistant to insulin. It's the most common type about (90% \_95%) of people living with diabetes have type 2.

### Symptoms include

- Fruity-smelling breath.
- Dry mouth.
- Abdominal pain.
- Nausea and vomiting.
- Shortness of breath.
- Confusion.
- Loss of consciousness.

### Hypoglycemia

Hypoglycemia involves decreased plasma glucose levels and can have many causes—some are transient and relatively insignificant, but others can be life threatening. The plasma glucose concentration at which glucagon and other glycemic factors are released is between 65 and 70 mg/dL (3.6–3.9 mmol/L); at about 50 to 55 mg/dL (2.8–3.0 mmol/L), observable symptoms of hypoglycemia appear.

### Symptoms hypoglycemia

- sweating.
- feeling tired.
- dizziness.
- feeling hungry.
- tingling lips.
- feeling shaky or trembling.
- a fast or pounding heartbeat (palpitations)