Al-Mustaqbal University College

Anesthesia Techniques Department

Carbohydrates part 2

Glucose metabolism

Glycolysis

is the sequence of reactions that converts glucose into pyruvate in the presence of oxygen (aerobic) or lactate in the absence of oxygen (anaerobic) with the production of ATP.

It is a unique pathway since it can utilize oxygen if available, or it can function in the total absence of oxygen

Location

Glycolysis is the major pathway for the utilization of glucose and is found in cytosol of all cells.

- **Under aerobic condition**

pyruvate is taken up into mitochondria and after conversion to acetyl-CoA is oxidized to CO 2 and H2 O by citric acid cycle with production of ATP.

- **Anaerobic Glycolysis**

• Tissues that function under hypoxic conditions produce lactate, e.g. exercising skeletal muscle and erythrocytes.

• In erythrocytes even under aerobic conditions, glycolysis produce lactate because of absence of mitochondria.

Gluconeogenesis

The synthesis of glucose from noncarbohydrate precursors is called gluconeogenesis

Precursors for gluconeogenesis include:

- Lactate
- Glycerol
- Glucogenic amino acids

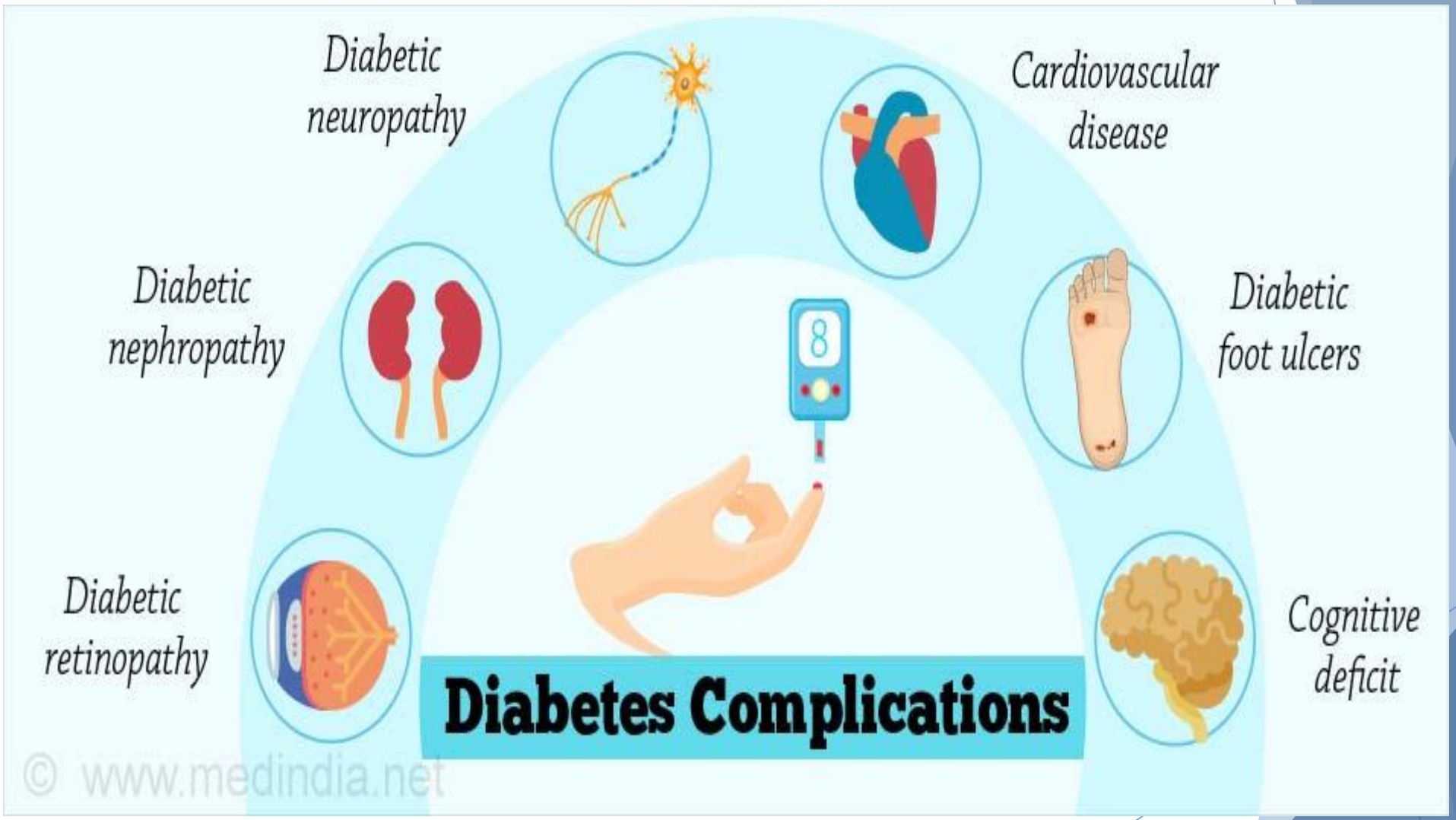
Location of Gluconeogenesis

Gluconeogenesis occurs mainly in the cytosol. Liver is the major tissue for gluconeogenesis. During starvation, the kidney is also capable of making glucose by gluconeogenesis.

Diabetes mellitus

- Diabetes mellitus is a group of diseases in which blood glucose levels are elevated. Diabetes is the most common disorder of carbohydrate metabolism
- Diabetes is the leading cause of many **complications** as:

- end-stage renal disease
- non traumatic amputations,
- blindness.
- atherosclerotic disease.
- deaths


Diabetic neuropathy
Cardiovascular disease
Diabetic nephropathy
Diabetic foot ulcers
Diabetic retinopathy
Cognitive deficit
Diabetes Complications
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Pathophysiology

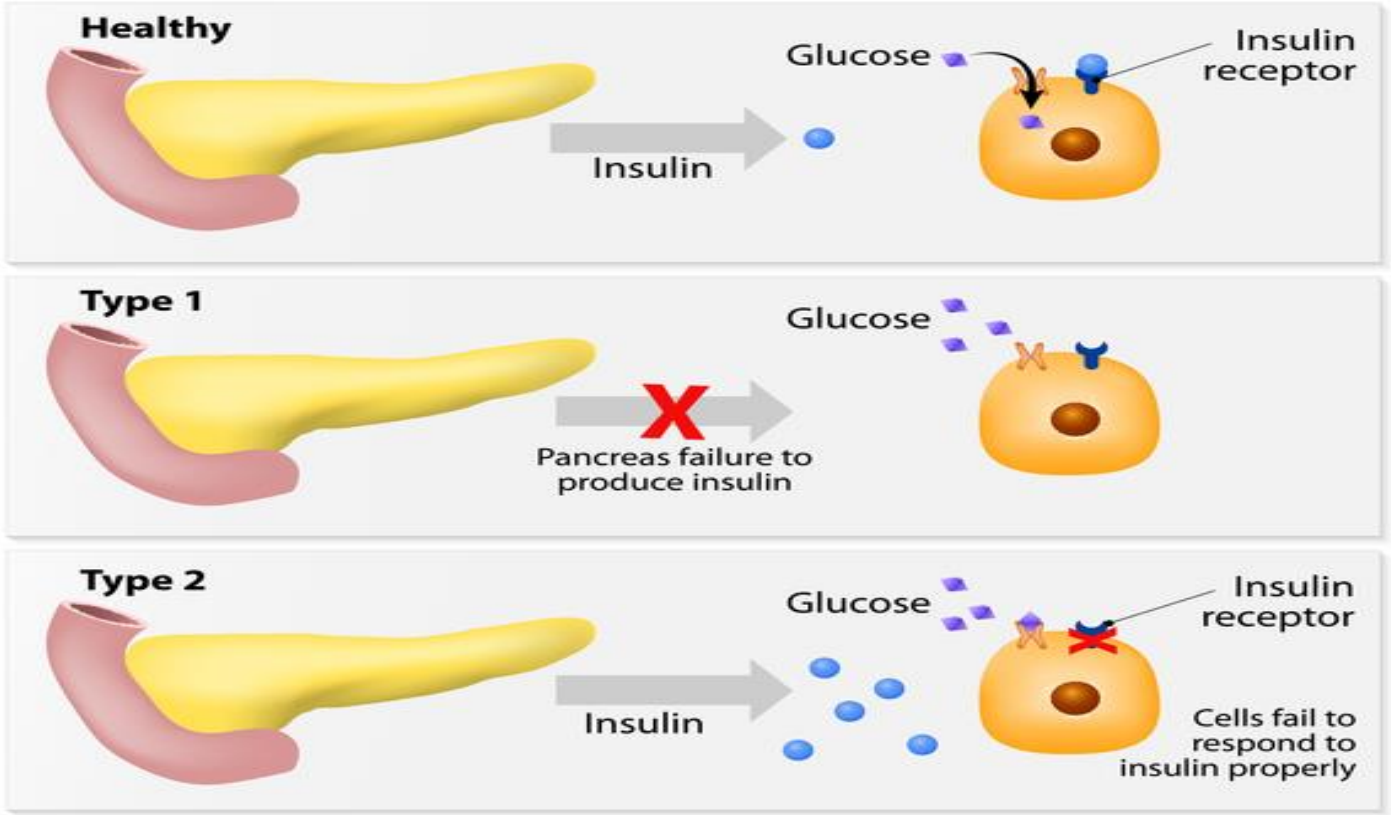
- After carbohydrates digestion and absorption the blood glucose elevated which stimulates the pancreas to release insulin that facilitate glucose inertance inside the cells to use it as source of energy or in another metabolic processes
- In diabetes mellitus, metabolism of all the main foodstuffs is altered. The basic effect on glucose metabolism is insulin deficiency or insulin resistance

Classification

- **type 1 diabetes mellitus,** which is caused by an absolute or near absolute deficiency of insulin,
- represents approximately 10% of all cases of diabetes.
- There usually is an autoimmune destruction of insulin-producing beta cells in the islets of the pancreas

- **type 2 diabetes mellitus**, which is characterized by the presence of insulin resistance with an inadequate compensatory increase in insulin secretion which usually end with relative or absolute deficiency in insulin secretion.
- Type 2 diabetes is the most common type of diabetes, affecting approximately 90% of cases. Many of them are obese

DIABETES MELLITUS



- In addition, women who develop diabetes during their pregnancy are classified as having **gestational diabetes.**

- **Other specific types of diabetes**.

Diagnosis of Diabetes

Any of the followings tests is diagnostic to DM:

- Fasting blood glucose ≥ 126
- Random blood glucose or 2 Hrs. post prandial blood glucose ≥ 200 mg/dl
- HbA1c ≥ 6.5%

To confirm the diagnosis repeat the same test in different day

Glycated hemoglobin

- **Glycated hemoglobin (**HbA1c) is the term used to describe the formation of a hemoglobin compound produced when glucose reacts with the globin part of hemoglobin.
- HbA1c testing provides an index of average blood glucose levels over the past 2 to 4 months (depending on RBC life span)
- Conditions associated with shortened red blood cell survival such as hemolysis and pregnancy will lower the HbA 1c level .

Thank you