Estimation of Insulin

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Insulin is a protein hormone, secreted by β-cells of islets of Langerhans of pancreas. It plays an important role in metabolism causing increased carbohydrate metabolism, glycogenesis and glycogen storage; FA synthesis/TG storage and amino acid uptake/protein synthesis. Thus, insulin is an important anabolic hormone which act on variety of tissues. Major target tissues of .insulin are the muscles, liver, adipose tissue and heart

Regulation of insulin secretion:

About 40-50 units of insulin is secreted daily by human pancreas. The normal insulin concentration in plasma is 20-30 μU/ml. The important factors that influence the release of insulin from the β-cells of pancreas.

1-Factors stimulating insulin secretion: These include glucose, amino acids and gastrointestinal hormones

2-Factors inhibiting insulin secretion: Epinephrine is the most potent inhibitor of insulin release. In emergency situations like stress, extreme exercise and trauma, the nervous system stimulates adrenal medulla to release epinephrine. Epinephrine suppresses insulin release and promotes energy metabolism by mobilizing energy-yielding compounds—glucose from liver and fatty acids from adipose tissue.

Degradation of insulin

In the plasma, insulin has a normal half-life of 4-5 minutes. This short half-life permits rapid metabolic changes in accordance to the alterations in the circulating levels of insulin. This is advantageous for the therapeutic purposes. A protease enzyme, namely insulinase .(mainly found in liver and kidney), degrades insulin

Metabolic effects of insulin

Insulin plays a key role in the regulation of carbohydrate, lipid and .protein metabolisms

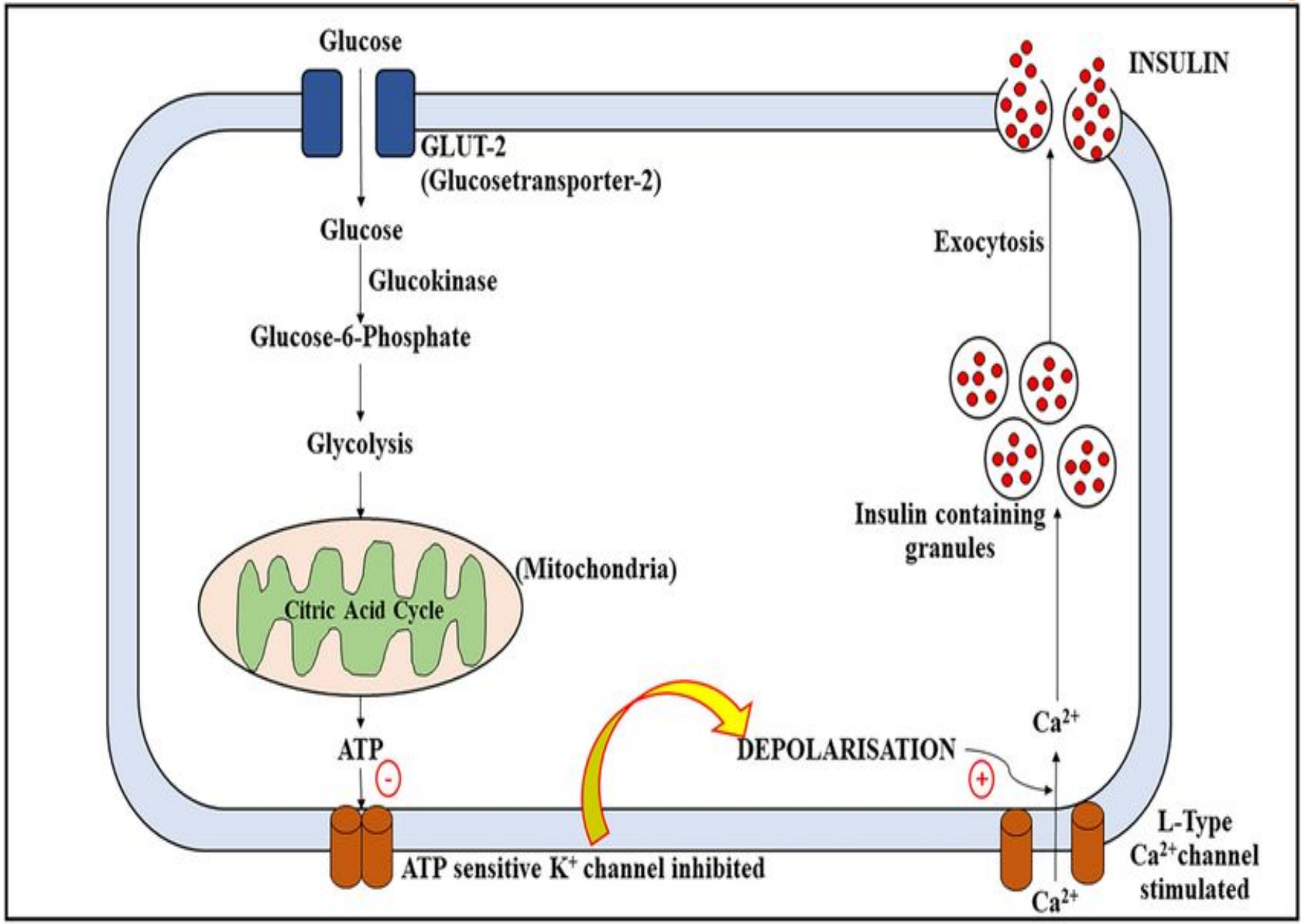
Effects on carbohydrate metabolism: In a normal individual, about . half of the ingested glucose is utilized to meet the energy demands of the body (mainly through glycolysis). The other half is converted to fat (~ 40%) and glycogen (~ 10%). This relation is severely impaired in insulin deficiency. Insulin influences glucose metabolism in many ways. The net effect is that insulin lowers blood glucose level (hypoglycemic effect) by promoting its .utilization and storage and by inhibiting its production

Effects on lipid metabolism: The net effect of insulin on lipid . metabolism is to reduce the release of fatty acids from the stored fat and decrease the production of ketone bodies. Among the tissues, .adipose tissue is the most sensitive to the action of insulin

Effects on protein metabolism: Insulin is an anabolic hormone. It . stimulates the entry of amino acids into the cells, enhances protein synthesis and reduces protein degradation. Besides the metabolic effects described above, insulin promotes cell growth and .replication

Mechanism of action of insulin

It is now recognized that insulin binds to specific plasma membrane receptors present on the target tissues, such as muscle and adipose. This results in a series of reactions ultimately leading to the biological action. Three distinct mechanisms of insulin action are known. One concerned with the induction of transmembrane signals (signal transduction), second with the glucose transport across the .membrane and the third with induction of enzyme synthesis


Glucose
GLUT-2
(Glucosetransporter-2)
Glucose
Glucokinase
Glucose-6-Phosphate
Glycolysis
Citric Acid Cycle
(Mitochondria)
ATP
ATP sensitive K+ channel inhibited
DEPOLARISATION
Ca2+
Ca2+
L-Type
Ca2+channel
stimulated
Exocytosis
INSULIN
Insulin containing
granules

CLASSIFICATION OF DIABETES MELLITUS

Diabetes mellitus is a metabolic disease, more appropriately a disorder of fuel metabolism. It is mainly characterized by hyperglycemia that leads to several long term complications.

:Diabetes mellitus is broadly divided into 2 groups

.insulin-dependent diabetes mellitus (IDDM) -

.non-insulin dependent diabetes mellitus (NIDDM) -

This classification is mainly based on the requirement of insulin for .treatment

Thank you for listening