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THE IMPORTANCE OF GLUCOSE IN THE BODY. ORIGIN, TREATMENT AND PREVENTION METHODS OF DIABETES MELLITUS.

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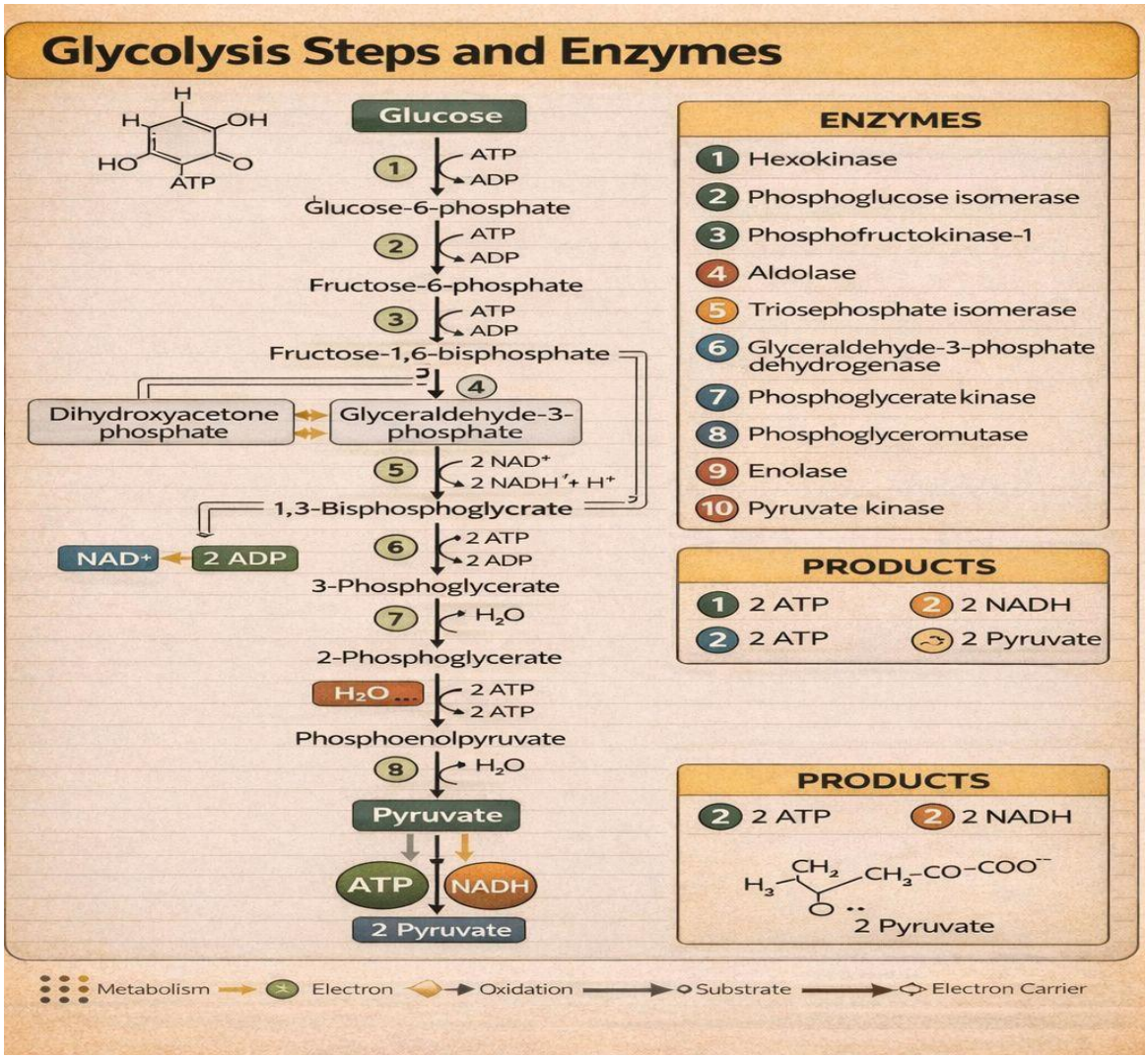
Keywords: Insulin resistance, oxidative stress, glucooneogenesis, glycolysis, metformin, neuropathy, ketoacidosis, retinapathy

Annotation: Although glucose is a simple carbohydrate, it is a key choke of complex energetic and regulatory mechanisms in biological systems. A special role is played by the activity of insulin and other hormones as an important regulator of glucose metabolism. When these complex control mechanisms are disrupted, diabetes mellitus in particular develops, which leads to a serious imbalance in the uptake of glucose by cells. This article describes the mechanisms of glucose in the body, pathological changes that occur in the body when the amount is changed, and the reactions related to glucose in the body are explained through biochemical mechanisms.

Introduction: The total amount of glucose in the blood is 3.8-6.3mmol/l. Its excess of this amount will cause diabetes in the body. Diabetes mellitus is now a common, but not contagious, disease. The level of glucose in the body is controlled by the hormone insulin. Impaired insulin secretion is one of the main causes of diabetes. Over the past 30-40 years, diabetes has reached the level of a non-infectious global pandemic. If in 1990 there were 200 million patients, in 2022 this figure reached 830 million. As of now, as of 2026, 589 million people are living with diabetes, that is, one out of every 9 people in the world is living with diabetes. More than 250 million people do not know that they have diabetes. This leads to a late diagnosis of the disease.

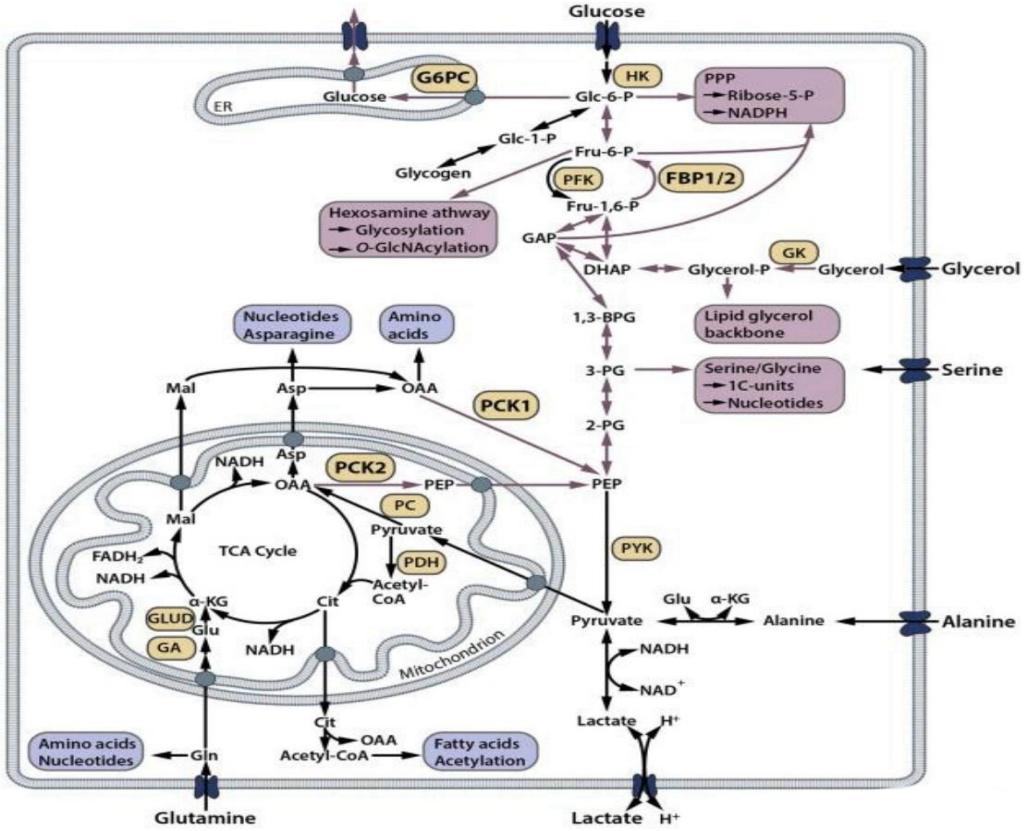
The main part: Various glucose-related reactions occur in the body. One of them is glycolysis. In this, glucose is initially phosphorylated and glucose is converted to 6-phosphate. Then it isomerizes to fructose 6-phosphate and phosphorylates again to form fructose 1,6-bisphosphate. This process is the main control stage. This substance is then broken down into 2 3carbon compounds, which enter sequential oxidation reactions. In this process, NAD+ is returned to form NADH and ATF is synthesized at the substrate level. Finally, pyruvate acid is formed from phosphoenolpyruvate, which in total energy ATF is produced.

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When the body does not have enough glucose (for example, at hunger), it is again formed from non-glucose substances (lactate, amino acids). This process is called glucooneogenesis and occurs mainly in liver cells. In this case, initially pyruvate is corboxylated in mitochondria and converted to oxaloacetate. In later steps, this substance changes upwards through reverse reactions and glucose 6-phosphate is formed. At the last stage, glucose is formed from 6-phosphate and released into the bloodstream. This process requires a lot of energy and is controlled by the hormones glucogon as well as cortisol.

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1.Biochemical mechanism of diabetes.

a)Insulin and glucose metabolism.

Insulin is a hormone produced by betta cells of the pancreas, which allows glucose to enter cells. In diabetes, however, insulin is deficient or its effect decreases, and hyperglycemia occurs when blood glucose levels are exceeded.

b)1-type qandli diabetes mexanism.

It is an autoimmune disease in which betta cells are broken down by macrophages. As a result, insulin production stops. In this disease, fats are broken down, ketone cells are formed and ketoacidosis develops. There is a unique variant of type 1 diabetes called Idiopathic Diabetes . It causes more severe symptoms of the disease than autoimmune type 1 diabetes. People with this disease may experience episodic ketoacidosis, as well as insulin deficiency. This type of diabetes is more common in people of Asian and African races.(7)

c)2-type qandli diabetes mexanism.

This form of diabetes mellitus is the most common disease, in which insulin resistance occurs, cells do not respond to insulin signals, and glucose transport is disrupted. From a biochemical point of view, there is a decrease in GLUT-4 transporter activity, the occurrence of chronic inflammatory processes.

d)Diabetes in pregnancy.

As a result of increased need in the body during pregnancy, the level of glucose in the blood may increase and insulin may not be produced in sufficient quantities. Usually this condition disappears after childbirth, but later on, it increases the risk of developing type 2 diabetes. Diabetes in pregnancy accounts for 4% of all common diabetes mellitus

e) Harmful effects of hyperglycemia.

Prolonged hyperglycemia causes glycation of proteins,increased oxidative stress and damage to blood vessels. As a result, retinopathy (inflammation of the retina of the eye), nephropathy (inflammation of the kidneys), neuropathy (inflammation of the nerve cells) occurs.

g)Endocrinopatiya.

Excess amounts of certain hormones can interfere with insulin action and lead to diabetes. Conditions such as acromegaly, glucogonoma, pheochromatsitoma (excess epinephrine), and Cushing's syndrome (excess cortisol) can lead to diabetes. Diabetes is more common in people with pre-existing defects in insulin secretion, compared to healthy people.(7)

2.Treatment of diabetes.

a)Medicines.

1-type diabetes:

Insulin therapy (compulsory)

Insulin therapy plays a fundamental role in the treatment of diabetes and is regarded as a vital replacement therapy, especially in type 1 diabetes. Modern approaches emphasize the need to tailor insulin administration to the individual metabolic profile of the patient, rather than rigid standards. Imitation of physiological insulin secretion is achieved through the basal-bolus regimen: basal insulin controls baseline production of hepatic glucose, while bolius insulin controls postprandial glucose after meals. New generation insulin analogues have become more advanced in terms of pharmacokinetic properties, significantly reducing the risk of hypoglycemia. The concept of "Smart insulin" - that is, the prospects for creating insulin drugs sensitive to glucose levels is also actively studied in scientific research. (9)

2-type diabetes:

Metformin – reduces glucose production.

Sulfonylurea drugs - increases insulin secretion.

SGLT-2 inhibitors – release glucose through the urine.

b) Modern approaches.

GLP-1 Agonists

Insulin pompasi

Artificial pancreas systems

c) Therapeutic potential of antidiabetic phytochemicals.

Many clinical studies have investigated the efficacy of plant-derived phytochemicals that have historically been used to treat diabetes in a variety of cultures. Among such plants, Curcuma longa has also shown the ability to increase glycemic control and insulin sensitivity and has been shown to lower glucose levels in people with diabetes. Include Marordica charantia (bitter melon). The amygdala, also known as the bitter leaf, has been found to effectively lower blood glucose levels. Azadirachta indica, commonly known as Nam, and many of its natural parts have been proven in animal experiments to be highly effective against diabetes.(8)

d) Combination therapy: a synergistic pharmacodynamic approach.

In recent years, the superiority of combination therapy over monotherapy in the treatment of diabetes has been scientifically substantiated. Notably, the combination of GPLP-1 receptor agonists and basal insulin has synergistic mechanisms of action, allowing for a high degree of stabilization of glycemic control.

Thanks to this combination, on the one hand, insulin resistance is partially relieved, and on the other hand, the functional reserve of pancreatic betta cells is preserved. According to the study, this approach can help reduce insulin doses and prevent body weight gain, while significantly reducing HbA1c levels.(10)

3.Prevention of diabetes.
a)Primary prevention.
Healthy eating
Prevention of obesity
Physical activity
b)Secondary prophylaxis.
Erta diagnostics
Control of sugar content

Conclusion:This article discusses the role of glucose in the body, how it is formed, how its amount is controlled by insulin, and the diseases associated with it. An increase in glucose levels causes hyperglycemia, in which various organs become inflamed. Thanks to this, diabetes mellitus develops. There are 2 forms of this disease, and the data on their pathogenesis in the body, ways of their treatment, modern approaches and prevention are presented. In addition, among the methods of treating diabetes, the use of antidiabetic phytochemicals, from which plants such substances are extracted, how they affect the body are shown. Treatment options also include areas of synergistic influence. The differences, the pros and differences of such treatment methods from monotherapy are presented on their basis.

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