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BIOCHEMICAL AND CHARACTERISTICS OF GLUCOSE METABOLISM IN TYPE 2 DIABETES MELLITUS

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Relevance. Diabetes mellitus is a metabolic disorder characterised by chronic disturbances in glucose homeostasis resulting from impaired insulin secretion, reduced insulin action, or a combination of both. Persistent hyperglycaemia may lead to serious complications affecting the cardiovascular system, kidneys, eyes, and nervous system. Therefore, effective regulation of glucose metabolism is one of the principal objectives of pharmacological management of diabetes mellitus.

Modern pharmacotherapy involves the widespread use of insulin preparations, metformin, sulfonylureas, glucagon-like peptide-1 (GLP-1) receptor agonists, dipeptidyl peptidase-4 (DPP-4) inhibitors, and sodium–glucose cotransporter 2 (SGLT2) inhibitors. These pharmacological agents act on different stages of glucose metabolism and target specific molecular pathways. Accordingly, investigating the mechanisms of action of antidiabetic drugs in relation to the biochemical processes underlying glucose homeostasis is essential for understanding contemporary therapeutic approaches to diabetes mellitus.

Objective. To provide a biochemical and hygienic rationale for glucose metabolism in type 2 diabetes mellitus.

Results. This study is theoretical and analytical in nature and is based on a review of the scientific literature addressing the pathogenesis of diabetes mellitus, the biochemical foundations of glucose metabolism, and contemporary approaches to pharmacotherapy. The literature reviewed includes original research articles, systematic reviews, meta-analyses, clinical trials, and current international clinical practice guidelines on diabetes management published in recent years. PubMed, ScienceDirect, Google Scholar, and other scientific databases are used to identify and select relevant publications. The literature review initially focuses on the principal disturbances in glucose metabolism associated with the development of diabetes mellitus. Particular attention is given to reduced insulin secretion, the development of insulin resistance, increased hepatic glucose production, and impaired glucose uptake by peripheral tissues. In addition, the metabolic regulation of glucose through glycolysis, glycogenesis, glycogenolysis, and gluconeogenesis is examined, together with the roles of the liver, skeletal muscles, adipose tissue, pancreas, and kidneys in these processes. The subsequent stage involves examining the pharmacological and molecular mechanisms of action of the principal drug classes used in the treatment of diabetes mellitus. In particular, the suppression of hepatic gluconeogenesis and the effects of metformin on insulin sensitivity are analysed, along with the activation of intracellular signalling pathways through insulin receptors by insulin preparations and the stimulation of insulin secretion from pancreatic β-cells by sulfonylureas. The analysis also covers the ability of GLP-1 receptor agonists to enhance glucose-dependent insulin secretion and suppress glucagon secretion, the role of DPP-4 inhibitors in prolonging the activity of endogenous incretin hormones, and the mechanism by which SGLT2 inhibitors reduce renal glucose reabsorption and promote glucosuria. To provide a more comprehensive understanding of the mechanisms underlying pharmacological action, the principal molecular targets of these agents are also examined. These include the insulin receptor and its intracellular signalling pathways, AMP-activated protein kinase (AMPK), glucose transporter type 4 (GLUT4), SGLT2, DPP-4, and GLP-1 receptors. The roles of these molecular targets in regulating glucose transport, insulin sensitivity, gluconeogenesis, and other

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metabolic processes are evaluated comparatively. Furthermore, the study examines findings from clinical trials assessing the effects of different pharmacological classes on glycaemic control. The principal evaluation parameters include fasting blood glucose levels, glycated haemoglobin (HbA1c), and postprandial glucose levels. Body weight and other metabolic indicators are also considered where relevant. In addition to therapeutic efficacy, the safety profiles of the medications, their major adverse effects, and relevant limitations of use are reviewed. The collected evidence is systematically organised and subjected to comparative analysis according to the mechanisms of pharmacological action, molecular targets, and effects on specific stages of glucose metabolism. Descriptive, comparative, and analytical methods are employed to synthesise the findings. This approach enables an integrated assessment of the biochemical foundations of diabetes pharmacotherapy and a systematic characterisation of the effects of different drug classes on glycaemic control.

Expected Results. The principal biochemical disturbances in glucose metabolism associated with diabetes mellitus and the pharmacological mechanisms targeting these abnormalities are expected to be systematically classified. The major molecular targets, mechanisms of action, and clinical significance of different antidiabetic drug classes in glycaemic control are also expected to be identified and characterised.

Conclusion. The effectiveness of pharmacotherapy for diabetes mellitus is closely associated with the targeted modulation of the biochemical processes disrupted in glucose metabolism. An integrated investigation of pharmacological and biochemical mechanisms provides an important scientific foundation for a deeper understanding of contemporary therapeutic approaches to diabetes mellitus and the development of individualised treatment strategies.

References

1. Ortiqov B. B. Ishchilarda uchraydigan kasallanishlarning gigiyenik tahlili //Медицинский журнал молодых ученых. – 2025. – №. 16 (12). – С. 155-159.
2. Beck-Nielsen H. et al. Metabolic and genetic influence on glucose metabolism in type 2 diabetic subjects—experiences from relatives and twin studies //Best Practice & Research Clinical Endocrinology & Metabolism. – 2003. – Т. 17. – №. 3. – С. 445-467.
3. Wile D., Wilding J. Glucose metabolism and the pathophysiology of diabetes mellitus //Clinical biochemistry: metabolic and clinical aspects. – 2014. – С. 273-304.
4. Abdullayeva A. R., Quranboyev S. B. QANDLI DIABETNING OLDINI OLISHDA SOG ‘LOM TURMUSH TARZINING O ‘RNI //E-Conference platform. – 2025. – Т. 1. – №. 1. – С. 34-34.
5. Kuvandikov G. B. QANDLI DIABET BILAN KECHUVCHI METABOLIK SINDROM: PATOGENETIK MEXANIZMLAR VA KLINIK OQIBATLAR //Вестник Ассоциации Пульмонологов Центральной Азии. – 2025. – Т. 10. – №. 5. – С. 90-94.