УДК 616.153.857

Хабибуллина С.Р.

ПАТОГЕНЕТИЧЕСКИЕ МЕХАНИЗМЫ ГИПЕРУРИКЕМИИ

Научные руководители— д.м.н., профессор Викторова Т.В., д.м.н., профессор Галимов Ш. Н.,к.филол.н., доцент Майорова О.А.

Башкирский Государственный Медицинский Университет, Уфа

В статье рассмотрено состояние гиперурикемии как фактора проявления заболеваний различных систем органов. Проведен анализ литературных источников, где описаны причины возникновения гиперурикемии.

Ключевые слова: гиперурикемия, подагра, метаболический синдром, сердечно-сосудистые заболевания (ССЗ), хроническая болезнь почек (ХБП), нейродегенеративные заболевания (НДЗ).

Khabibullina S. R.

PATHOGENETIC MECHANISMS OF HYPERURICEMIA

Scientific supervisors — MD, Professor, Viktorova T.V., MD, Professor Galimov Sh.N., Ph.D. in Philology, Associate Professor Mayorova O.A.

Bashkir State Medical University, Ufa

The article considers the state of hyperuricemia as a factor in the manifestation of diseases of various organ systems. The analysis of literary sources describing the causes of hyperuricemia has been carried out.

Key words: hyperuricemia, gout, metabolic syndrome, cardiovascular diseases (CVD), chronic kidney disease (CKD), neurodegenerative diseases (NDH).

An increase in the level of uric acid (MC) in the blood serum provokes the risk and occurrence of diseases of the musculoskeletal system, heart and kidneys. In Russia, one in five people, mostly men, has elevated MC indicators.

The aim

To analyze the effect of uric acid on the development of pathologies in the human body.

Material and methods

The research material was scientific articles by foreign and domestic scientists. The analysis of literary data with subsequent generalization and systematization of the information received was used as a research method.

Results and discussions

Normally, uric acid (MC) is an antioxidant in the blood and maintains blood pressure stability [1, 3]. In addition, it prevents the oxidation of low-density lipoproteins, which serves as a prevention of atherosclerotic plaques [3, 5]. However, elevated MC levels, lasting for a long time, cause a number of pathological changes: gout, metabolic syndrome, diseases of the cardiovascular system and kidneys [3].

Hyperuricemia comes in two forms: primary and secondary. The primary occurs as a result of increased biosynthesis of urates in the liver or a decrease in their excretion by the kidneys and organs of the gastrointestinal tract. In the body, these compounds are formed as a result of the cleavage of purine nucleotides, which are involved in a variety of biochemical processes [2]. Uric acid

homeostasis is regulated by a number of major SLC and ABC transporters, as well as several multispecific transporters (Fig. 1). Carrier proteins encoded by SLC group genes (OAT1, OAT3 and URAT1) perform antagonistic functions. Being located on the basolateral membrane of the proximal tubules, the first two transporters are involved in the excretion of urates by the kidneys, when URAT1, on the contrary, regulates their reabsorption. On the apical membrane in intestinal and kidney tissues, there is a multispecific ABCG2 transporter responsible for the excretion of MK [3]. Recessive mutations associated with the hereditary manifestation of deficiency in the enzymatic activity of hypoxanthinguanine phosphoribosyltransferase (GFRT) and responsible for the biological transformation of purines can directly act as independent risk factors for hyperuricemia [8].

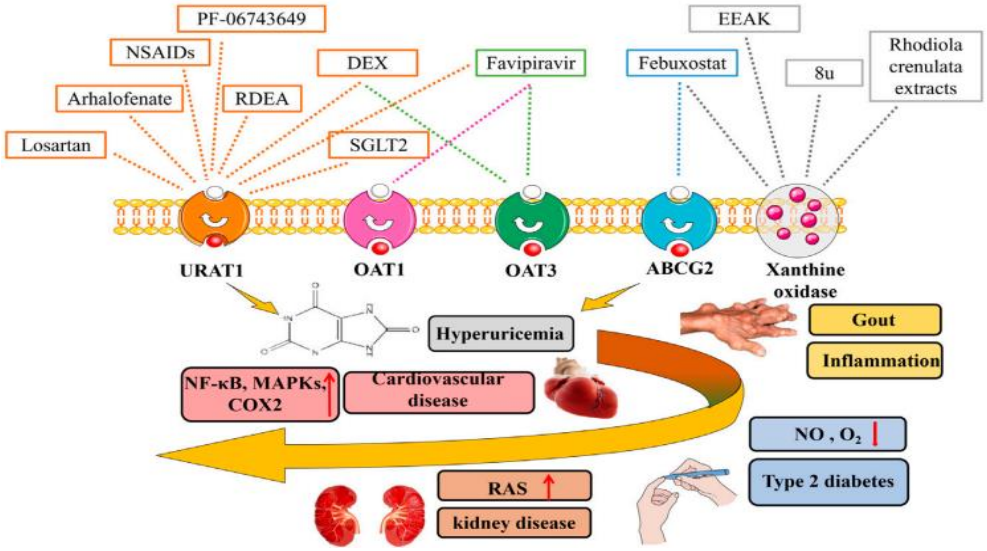

Fig. 1. Maintenance of uric acid homeostasis by a number of specific carrier proteins [3].

The causes of the secondary state of elevated MC include the consumption of a large number of products with a high purine content: red meat, fructose, alcohol [2]. Ethanol catalyzes the breakdown of ATP in the liver, which provokes an increase in the concentration of nucleic bases in the blood, then due to a delay in renal excretion, an accumulation of urates occurs [4]. Recent studies indicate a link between hyperuricemia and umami taste, since food rich in purines often has this taste. This relationship was carried out with the dietary supplement E621- sodium glutamate, which is one of the products of umami and affects the occurrence of metabolic syndrome by increasing the level of MC in plasma [6]. In addition, the treatment of malignant neoplasms by radioactive irradiation also contributes to an increase in the concentration of free purines [2, 6].

Hyperuricemia promotes the deposition of sodium monaurate crystals in various organs, accompanied by a long inflammatory process [10]. MK causes neutrophils to produce a large number of mediators, including interleukin-6 (IL-6), tumor necrosis factor-α (TNF-α), interleukin-1β (IL-1β), underlying the occurrence of gout and osteoarthritis [9, 10].Inflammation causes high oxidative stress,

provokes a decrease in the level of nitric oxide, which regulates cardiovascular metabolism, which contributes to damage to the vascular endothelium and the progression of CVD [1, 3, 6]. Elevated MC values also exacerbate the course of chronic kidney disease (CKD), and are also the cause of its occurrence. This occurs by inducing the penetration of macrophages into the transitional epithelium of the renal tubules into the mesenchyma and the deposition of urate crystals in it [3, 9].

The effect of MC levels on the manifestation of neurodegenerative diseases (NDZ) such as Alzheimer's and Parkinson's disease is still being studied. Higher serum MC levels are associated with improved cognitive functions and neuroprotective effects [3, 6]. However, research by scientists is contradictory and does not reliably confirm the relationship of hyperuricemia with a decrease in the incidence of NDH [6, 7].

Conclusion

High values of uric acid in the blood serum are directly related to the development of pathologies in the human body. Hyperuricemia, in addition to hereditary factors, also depends on a person's lifestyle, so it is necessary to follow a diet to prevent this condition.

REFERENCES

1. Сафарян А.С., Лишута А.С., Небиеридзе Д.В./ Мочевая кислота как фактор риска сердечно-сосудистых заболеваний // РФК. 2022. №4.
2. Eckenstaler R, Benndorf RA. The Role of ABCG2 in the Pathogenesis of Primary Hyperuricemia and Gout-An Update. Int J Mol Sci. 2021 p.2-6.
3. Hao-lu Sun,Yi-wan Wu,He-ge Bian,Hui Yang,Heng Wang ,Xiao-ming Meng,Juan Jin/ Function of Uric Acid Transporters and Their Inhibitors in Hyperuricaemia// Front. Pharmacol., Vol. 12 – 2021 p.2-7.
4. Hernández-Rubio A, Sanvisens A, Bolao F, Pérez-Mañá C, García-Marchena N, Fernández-Prendes C, Muñoz A, Muga R./Association of hyperuricemia and gamma glutamyl transferase as a marker of metabolic risk in alcohol use disorder// Sci Rep. 2020 p.1-2,6.
5. Jebari-Benslaiman S, Galicia-García U, Larrea-Sebal A, Olaetxea JR, Alloza I, Vandenbroeck K, Benito-Vicente A, Martín C./ Pathophysiology of Atherosclerosis// Int J Mol Sci. 2022 Mar 20 p.5-7.
6. Kuwabara M, Fukuuchi T, Aoki Y, Mizuta E, Ouchi M, Kurajoh M, Maruhashi T, Tanaka A, Morikawa N, Nishimiya K, Akashi N, Tanaka Y, Otani N, Morita M, Miyata H, Takada T, Tsutani H, Ogino K, Ichida K, Hisatome I, Abe K./Exploring the Multifaceted Nexus of Uric Acid and Health: A Review of Recent Studies on Diverse Diseases// Biomolecules. 2023 Oct 13 p.2-7,9 – 15.
7. Qiao M, Chen C, Liang Y, Luo Y, Wu W/The Influence of Serum Uric Acid Level on Alzheimer's Disease: A Narrative Review//Biomed Res Int. 2021 p. 6.
8. Rosa J Torres & Juan G Puig/Hypoxanthine-guanine phosophoribosyltransferase (HPRT) deficiency: Lesch-Nyhan syndrome//Orphanet Journal of Rare Diseases , Vol.2, 2007 .
9. Wu X, You C./ The biomarkers discovery of hyperuricemia and gout: proteomics and metabolomics//PeerJ. 2023 p.3-6, 14-16.

10. Zhu Y, Li J, Zhang Y, Zhang W, Doherty M, Yang Z, Cui Y, Zeng C, Lei G, Yang T, Wei J./ Association between hyperuricaemia and hand osteoarthritis: data from the Xiangya Osteoarthritis Study//RMD Open. 2023 p.6.

Сведения об авторе статьи:

Khabibullina Safiya Rustemovna - 2nd year student of the Faculty of Medicine of the Bashkir State Medical University, Ufa, Lenin St.3 e-mail:habibullina2804@gmail.com