

SCIENTIFIC ACHIEVEMENTS OF MODERN SOCIETY

Abstracts of IX International Scientific and Practical Conference

Liverpool, United Kingdom

28-30 April 2020

**Liverpool, United Kingdom
2020**

UDC 001.1

BBK 83

The 9th International scientific and practical conference “Scientific achievements of modern society” (April 28-30, 2020) Cognum Publishing House, Liverpool, United Kingdom. 2020. 1175 p.

ISBN 978-92-9472-193-8

The recommended citation for this publication is:

Ivanov I. Analysis of the phaunistic composition of Ukraine // Scientific achievements of modern society. Abstracts of the 9th International scientific and practical conference. Cognum Publishing House. Liverpool, United Kingdom. 2020. Pp. 21-27. URL: <http://sci-conf.com.ua>.

Editor

Komarytskyy M.L.

Ph.D. in Economics, Associate Professor

Editorial board

prof. Jan Kuchar, CSc.

doc. PhDr. David Novotny, Ph.D.

doc. PhDr. Zdenek Salac, Ph.D.

prof. Ing. Karel Marsalek, M.A., Ph.D.

prof. Ing. Jiri Smolik, M.A., Ph.D.

prof. Karel Hajek, CSc.

prof. Alena Svarcova, CSc.

prof. Marek Jerabek, CSc.

prof. Vaclav Grygar, CSc.

prof. Vaclav Helus, CSc.

prof. Vera Winterova, CSc.

prof. Jiri Cisar, CSc.

prof. Zuzana Syllova, CSc.

prof. Pavel Suchanek, CSc.

prof. Katarzyna Hofmannova, CSc.

prof. Alena Sanderova, CSc.

Collection of scientific articles published is the scientific and practical publication, which contains scientific articles of students, graduate students, Candidates and Doctors of Sciences, research workers and practitioners from Europe, Ukraine, Russia and from neighbouring countries and beyond. The articles contain the study, reflecting the processes and changes in the structure of modern science. The collection of scientific articles is for students, postgraduate students, doctoral candidates, teachers, researchers, practitioners and people interested in the trends of modern science development.

e-mail: liverpool@sci-conf.com.ua

homepage: <http://sci-conf.com.ua>

©2020 Scientific Publishing Center “Sci-conf.com.ua” ®

©2020 Cognum Publishing House ®

©2020 Authors of the articles

POTASSIUM AND ITS EFFECTS ON HUMAN HEALTH

Eliseeva Tatyana

M.S., Research Scientist, edaplus.info

Zemlianyi Olexandr

Ph.D., Senior Lecturer

State Institution "Dnipropetrovsk Medical Academy of the Ministry
of Health of Ukraine"

Resume: This paper presents the results of meta-analysis of recent scientific findings on the role of potassium (K) in human health and well-being, its health benefits and unhealthy effects.

Keywords: Nutrition, Physiology, Potassium, Low-Potassium Diet, High-Potassium Diet, Health Benefits, Unhealthy Effects, Cardio-Vascular Disease, Prevention, Dietary Supplements

Recently, researches pay great and close attention to the study of various micro- and nanoelements. Their quantity is being investigated in various components of the environment, in plants, animals, and humans [1]. The question of the accumulation, transmission and influence of the elements upon the health of living organisms is intensively studied, primarily, of course, in humans. This is due to both the catastrophic pollution of the environment, and the intensive penetration of these elements into all components of ecosystems, as well as to the emergence of new pollutants, often unsafe for humans [2]. Many toxic elements can enter edible crops [3] and subsequently spread across food chains in ecosystems.

Against this background, interest in the study of macroelements, which importance for living organisms is difficult to overestimate, is undeservedly decreasing. Potassium is one of the most important macroelements for the normal functioning of the human body.

This article presents a meta-analysis of recent relevant works on the role of potassium as an essential nutrition product for human health and well-being. The meta-analysis was performed with the use of Medline, Web of Science and Scopus scientific databases.

Potassium (K) takes the 2nd place among metals (after calcium) and is the eighth or ninth most common element by mass (0.2%) in the human body. An adult weighing 60 kg contains in average about 120 g of potassium in total (about 1.5 g/kg of body weight in a men and 1.4 g/kg of body weight in women) [4].

Potassium is a macroelement, the main cation in the intracellular fluid of muscles and other cells. Presence of optimal concentration of K is pivotal for the normal and stable functioning of heart, liver, blood vessels, kidneys, muscles, brain cells and other organs. In order to avoid cardiac problems, it is necessary to include into the diet foods with high potassium content [5].

The highest potassium content is found in plant foods such as potatoes, fresh and fermented cabbage, legumes (peas, beans and soy), bananas, citrus fruits, melons, avocados, tomatoes, watermelons and berries of some *Viburnum* sp. Rye bread, buckwheat, rice, wheat are also rich in K. Quite a lot of potassium is found in animal products, for example, in fish, salmon, flounder, cod, as well as in chicken and other types of meat [6-8].

The daily norm of potassium for an adult is approximately 2 g, but for those who actively work physically or play sports, it is necessary to increase this amount to 2.5-5 g per day [9]. Recommended daily doses of K in Europe are about 3.1–3.5 g per day for adults [8, 17].

One of the most important functions of potassium in a body is the participation in the transmission of nerve impulses. Via this element, muscle contractions, including those in the myocardium, are controlled. That is why potassium is so useful for the cardiovascular system and indispensable for the normal functioning of muscle tissue, so its deficiency can extremely negatively affect the functioning of the heart muscle [10].

Potassium reduces intravascular volume, partially due to a decrease in sodium reabsorption, i.e., an increase in urinary sodium excretion. These effects may be important in lowering blood pressure in addition to the natriuretic effects of potassium [11].

The effect of potassium on the state of bone tissue and its calcium content is essential. It was established that increased consumption of potassium-rich fruits and vegetables reduces the acidity of the diet and helps maintain calcium in the bones, preventing its leaching and, therefore, osteoporosis [12]. Moreover, the addition of potassium chloride in a dose of 4.5g/day reduces salt-induced disturbances in homeostasis associated with the risk of cardiovascular disease and stroke [13].

Low-potassium diets can lead to hypertension and hypokalemia [14]. Most often, deficiency of this macroelement is evidenced by persistent fatigue, muscle weakness and cramping, poor sleep and distracted attention, bloating, constipation and abdominal pain [15]. Potassium deficiency can be manifested as metabolic disorders, malfunctioning heart rate rhythms, heart attacks, malfunctioning of the kidneys and adrenal glands, impaired functioning of the nervous system, development of convulsive phenomena. If the potassium deficiency is not compensated for a long time, a number of serious diseases can develop, including problems with the cardiovascular system, dysregulation of blood pressure, kidney and gastrointestinal tract disorders [16-19].

A number of resources are presented on the Internet, on which information on the beneficial and harmful effects of food elements, including potassium, is systematized using authoritative sources, such as www.edaplus.info [20]. In particular, the indicated resource presents the results of a comprehensive meta-analysis of randomized clinical trials of the role of K in heart function [21].

Thus, potassium is one of the key components for maintaining the health and normal homeostasis of the human body, and its regular intake in the amount of at least 2-3 g per day is a necessary condition for the normal functioning of almost all organ systems in human body [22-23]. However, excessive K uptake could result in toxic condition called hyperkalemia [24].

REFERENCES:

1. Zemlianyi O. A. Some Aspects of Lead Exclusion with Excrements from Laboratory Rats in the Experimental Conditions. *Ukr Z Med Biol Sportu (Ukrainian Journal of Medical Biology and Sports)* (2019): 4(4), 255-260. <https://doi.org/10.26693/jmbs04.04.255>
2. Zemlianyi O. A. Ultrastructure of the left ventricular myocardium in rats after combined action of radiation and heavy metals / *Materials of Scientific Conf. with International participation "Theory and Practice of Modern Morphology"* (October 9-10, 2019, Dnipro). *Coll. of Scientific Papers*, pp. 91-92.
3. Fedenko, V.S., Landi M., and Shemet S.A. Detection of nickel in maize roots: A novel nondestructive approach by reflectance spectroscopy and colorimetric models. *Ecological indicators* 82 (2017): 463-469.
4. Yoo J, Young-Woo J., and K.P. Kim. Assessment of body potassium level by gender and age in Korean adult group. *Radiation protection dosimetry* 178.1 (2018): 57-62.
5. D'Elia, L., Barba, G., Cappuccio, F. P., & Strazzullo, P. Potassium intake, stroke, and cardiovascular disease: a meta-analysis of prospective studies. *Journal of the American College of Cardiology*, (2011).57(10), 1210-1219.
6. Ye P, Zhu YR, Gu Y, Zhang DM, Chen SL. Functional protection against cardiac diseases depends on ATP-sensitive potassium channels. *J Cell Mol Med.* (2018);22(12):5801–5806. doi:10.1111/jcmm.13893
7. <https://www.nutri-facts.org/content/dam/nutrifacts/pdf/Nutrients-pdf/Potassium.pdf>
8. https://www.nutri-facts.org/en_US/nutrients/minerals/potassium/health-functions.html
9. Bishop, David. Dietary supplements and team-sport performance. *Sports medicine* 40.12 (2010): 995-1017.
10. D'Elia, Lanfranco, et al. Potassium intake, stroke, and cardiovascular disease: a meta-analysis of prospective studies. *Journal of the American College of Cardiology* 57.10 (2011): 1210-1219.

11. O'Donnell, Martin, et al. Urinary sodium and potassium excretion, mortality, and cardiovascular events. *New England Journal of Medicine* 371.7 (2014): 612-623.
12. Jehle, Sigrid, Henry N. Hulter, and Reto Krapf. Effect of potassium citrate on bone density, microarchitecture, and fracture risk in healthy older adults without osteoporosis: a randomized controlled trial. *The Journal of Clinical Endocrinology & Metabolism* 98.1 (2013): 207-217.
13. Connie M. Weaver. Potassium and Health.- *Adv Nutr.* 2013 May; 4(3): 368S-377S.
14. Campanozzi, Angelo, et al. High sodium and low potassium intake among Italian children: relationship with age, body mass and blood pressure. *PLoS One* 10.4 (2015).
15. Dogan, Nurettin Ozgur, et al. Weakness in the Emergency Department: Hypokalemic Periodic Paralysis Induced By Strenuous Physical Activity. *Turkish journal of emergency medicine* 15.2 (2015): 93-95.
16. Potassium. IN: *Dietary Reference Intakes for Water, Potassium, Sodium, Chloride, and Sulfate.* National Academy Press. 2005, PP.186-268.
17. Karger, S. Energy and nutrient intake in the European Union. *Annals of Nutrition and Metabolism.* - 2004. - 48 (2 (suppl)): 1-16. doi:10.1159/000083041.
18. Zhu, Zhiming, Shiqiang Xiong, and Daoyan Liu. The gastrointestinal tract: an initial organ of metabolic hypertension? *Cellular Physiology and Biochemistry* 38.5 (2016): 1681-1694.
19. Hassan, Kamal. Association of low potassium diet and folic acid deficiency in patients with CKD. *Therapeutics and clinical risk management* 11 (2015): 821.
20. Health benefits and unhealthy effects of Potassium in human body. Accessible at: <https://edaplus.info/minerals/potassium.html>
21. Gijbers L, Mölenberg FJ, Bakker SJ, Geleijnse JM. Potassium supplementation and heart rate: A meta-analysis of randomized controlled trials. *Nutr Metab Cardiovasc Dis.* 2016;26(8):674-682. doi:10.1016/j.numecd.2016.05.003
22. *Dietary Reference Intakes for sodium and potassium.* National Academies of Sciences, Engineering, and Medicine. National Academies Press, 2019.

23. Binia, Aristeia, et al. Daily potassium intake and sodium-to-potassium ratio in the reduction of blood pressure: a meta-analysis of randomized controlled trials. *Journal of hypertension* 33.8 (2015): 1509-1520.
24. Palmer, Biff F., and Deborah J. Clegg. Achieving the benefits of a high-potassium, paleolithic diet, without the toxicity. *Mayo Clinic proceedings*. Vol. 91. No. 4. Elsevier, 2016.