https://www.scirp.org/journal/ns Natural Science, 2022, Vol. 14, (No. 11), pp: 497-502

Relative Deficiency of Intracellular Potassium in Relation to the Functional Changes and Diseases in Non-Nervous System

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Keywords: Potassium Ion, Relative Deficiency of Potassium Ions, Na^+, K^+-ATPase, Non-Nervous Diseases, Quantum Biology

Received: September 28, 2022 **Accepted:** November 7, 2022 **Published:** November 10, 2022

ABSTRACT

Because of the huge differences in cellular structures and functions in non-nervous system and interaction between the nervous and non-nervous systems in potassium ion absorption, storage and effective utilization, the organs, tissues and tissue cells in non-nervous system have different functional dependence on potassium ion and its characteristics in competitive distribution differences. Therefore, I propose that the relative deficiency of potassium in cells in non-nervous organs and tissues may show very different functional changes and disease characteristics. Some are susceptible to pathogenic microorganisms, some may result in decrease of cell functions, and other may have comprehensive changes such as chronic inflammation. Therefore, the core causes for the functional changes and lesions of these non-nervous organs and tissues are closely related to the relative deficiency of potassium ions in their cells, which provides important ideas for the prevention and treatment of these functional changes and diseases.

1. INTRODUCTION

In other recent papers, the importance of the potassium/sodium (K^+/Na^+) ion system in realizing the functions of organs, tissues and tissue cells, as well as its important role in the natural non-specific immune mechanism have been clarified [1]. The relationship between the relative deficiency of potassium in nerve cells and the functional changes in nervous system and the occurrence of neurological and mental diseases has also been analyzed [2]. Additionally, the core mechanism for the occurrence and metastasis of tumor cancer cells in relation to the continuous relative deficiency of intracellular potassium was addressed [3]. In this paper, the relative deficiency of potassium in relation to the functional changes and the occurrence of diseases in non-nervous system will be discussed.

2. CHARACTERISTICS IN THE ABSORPTION, STORAGE AND USE OF POTASSIUM IN NON-NERVOUS TISSUES

First of all, based on the development characteristics of systems, organs and tissues, if the body has a relative deficiency of potassium ions in cells in non-nervous system, it may show different functional changes.

Like other animals, the development of human embryo also originates from the three germ layers [4], among which the ectoderm develops nervous system and sensory organs, skin and skin appendages; the mesoderm mainly develops circulatory system, muscle, bone tissue, external membrane of internal organs, urinary excretion system and reproductive system; the endoderm mainly develops epithelial tissues of digestive and respiratory tract, liver and pancreas. Since most of tissue cells in the skin and nervous system are derived from the ectoderm [4]. Therefore, the regulation of nerve functions mediated by different somatosensory signals has important relationship with the skin tissue.

The functions of other organs are also regulated by the nervous system, in which autonomic nervous system including the sympathetic and parasympathetic systems play an important role in the functional regulation of the non-nervous system [5]. The sensory nerve endings are densely distributed in the skin, therefore, unlike the relationship between the nervous system and the skin, the sympathetic and parasympathetic regulation of non-nervous system functions is often selective because they are mainly distributed in the envelope of organs and blood vessels, and less presentation in the parenchymal parts of organs and tissues [6, 7]. The brain can regulate the functions of non-nervous organs and tissues through the neuroendocrine system [8]. In addition, the endogenous neural networks (enteric nervous system) in the gastrointestinal tract of the digestive system play an important role in digestive functions, including the process of absorbing potassium ions from digested food [9]. The mutual regulation between the sympathetic and parasympathetic system and enteric nervous system is also an important guarantee for the functional synergy between the nervous system and non-nervous organs [10].

Understanding the relationship between nervous system and non-nervous tissues is very useful and important for clarifying the storage and utilization of potassium in non-nervous tissues, and also provides a basic framework for analyzing the relative deficiency of potassium in non-nerve tissue cells because the interaction between nervous system and non-nervous system plays a very important role in the absorption, storage and effective utilization of potassium ions in the body.

The digestive system is responsible for absorption of potassium ions [11-23]. Unlike other herbivores, such as cattle and sheep, human beings only carry out simple digestion of food in the stomach. Therefore, the potassium ions in intake food cannot be effectively released in the stomach, and only be absorbed into the blood circulation by the intestinal mucosa of the lower digestive tract during the digestion of food. Then these absorbed potassium ions are distributed into various organs and tissues, and finally enters the body's cells for storages or functions. Although the digestive tract mucosa can absorb potassium ions, however, the use of potassium ions by most tissue cells of digestive tract also needs to be completed through blood circulation, just like other tissue cells.

Some potassium ions in the blood are excreted through the urine production process of the urinary system [24], and other secretions and sweat also contain a small amount of potassium ions. One possible reason why the kidney secretes a certain amount of potassium ions every day is that the kidney can selectively expel some potassium ions with low quantum energy levels from the body [25-28], which is only a speculative suggestion and may involve the scope of quantum biology because the kidney has selective filtration and reabsorption of some ions, such as potassium and sodium ions, etc., during the process of forming urine. Whether such a process is related to the quantum energy level of potassium ions needs to be studied. Of course, this is a very interesting question and provides an in-depth understanding and analysis of the relative deficiency of potassium ions in human body, indicating that some potassium ions in the body may reduce their quantum energy levels in the process of functional actions, and cannot recover its quantum energy in the body's cells, as a result, these potassium ions should be discharged from the body through the urinary system. That is part of the connotation about the use efficiency of potassium

ions in the body mentioned in another paper [29].

Heart, muscle and nerve tissues are important organs for the body to store potassium ions for functions, while other tissues such as skin may have relatively less storage. The role of adipocytes in the accumulation of potassium ions is not clear.

3. THE CHARACTERISTICS RELATED TO THE RELATIVE DEFICIENCY OF POTASSIUM IN NON-NERVOUS SYSTEM

Based on these discussions mentioned above, if the relative deficiency of potassium ions is existed in non-nervous tissues, it may present the characteristics as follows:

1) Only when the intake of potassium by the body is less than the discharge of potassium for a long time, and then results in an obvious reduction of potassium in the body as a whole, the relative deficiency of potassium may occur;

2) A deficiency of potassium in the whole body could lead to the competition for the utilization of potassium ions between the different organs, tissues or tissue cells, which could result in the relative deficiency of potassium in the specific tissues or cells;

3) The degree of relative deficiency of potassium in tissues and tissue cells determines the difference in their functional changes. Some of them may only present the functional decline. If the decline is obvious, it will lead to the occurrence of disease. Such a competition for the use of potassium between the different cells could lead to the obvious deficiency of potassium in certain tissues and finally cause the diseases;

4) The degree of functional changes or diseases due to the relative deficiency of potassium may be age-dependent, and slight in young people, but more severe in aged ones.

4. RELATIVE DEFICIENCY OF POTASSIUM IONS RELATED TO THE FUNCTIONAL CHANGES AND DISEASES IN NON-NERVOUS SYSTEM

In addition to the damage of organs or tissues caused by external forces, the functional changes in non-nervous system and the emergence of various acute and chronic diseases in the body are mostly related to the relative deficiency of potassium ions. As discussion above, it is undeniable that such a relative deficiency is also closely related to the advantages of tissues and cells in the competitive utilization of potassium ions, and risk factors associated with functional changes and diseases may play an important role. To a certain extent, these risk factors may weaken the ability of tissues and cells to make competitive use of potassium ions, resulting in insufficient or lack of potassium ions in some tissues and cells, thus leading to the functional changes or diseases.

Therefore, the core cause of functional changes or diseases in organs and tissues in non-nervous system is the relative insufficient of potassium ions, however, inducible factors or risk factors also play an important role. If the core problem is solved, the occurrence and development of diseases can be significantly reduced. If the risk factors are associated with heredity, these risk factors cannot be completely removed, and such diseases cannot be eliminated, therefore, the relative deficiency of potassium ions in organs or tissues may persist or recur.

Now I will discuss the functional changes, disorders and diseases caused by the relative deficiency of intracellular potassium in organs and tissues in non-nervous system as follows:

1) Functional changes and diseases in circulatory system

The functional changes in circulatory system caused by the relative deficiency of intracellular potassium ions can exist in vascular endothelium and smooth muscle cells, myocardial contraction cells and pacing cells, heart and vascular valve tissue cells. Sympathetic and parasympathetic functional changes caused by the relative deficiency of potassium in sympathetic and parasympathetic nerve cells may also affect cardiovascular functions. These functional changes may result in instability of blood pressure (high and low blood pressure), arrhythmia, weak myocardial contraction, formation of arteriosclerosis and vascular plaque, etc. The myocarditis, valvulitis and vasculitis in the circulatory system may also be related to

the relative deficiency of potassium ions in the affected cells.

2) Functional changes and diseases in digestive system

The relative deficiency of intracellular potassium ions related to the functional changes in digestive system may exist in gastrointestinal tissues and cells, intestinal plexus, liver tissues, bile ducts, gallbladder and pancreas. For example, the functional changes or disorders may involve normal intestinal flora, intestinal motility, absorption function, and gastric acid and insulin secretions. The relative deficiency of potassium ions in the cells of the liver and biliary system may lead to the decline of the ability of hepatocytes to resist viruses and accelerate the replication of viruses in hepatocytes, which may result in the different types of viral hepatitis, while the relative deficiency of potassium ions in the liver may lead to abnormal fat metabolism, which is involved in obesity and other metabolic changes. In addition, the relative deficiency of intracellular potassium ions in the biliary system may lead to the functional changes in bile secretion and excretion and the inflammation in the biliary system.

3) Functional changes and diseases in respiratory system

The relative deficiency of potassium ions may be related to the functional changes in the epithelial tissue of the respiratory tract, bronchial smooth muscle and alveolar cells, which could be more sensitive to bacterial and viral infections or cause respiratory diseases such as tuberculosis, influenza, allergy and asthma, etc.

4) Functional changes and diseases in urinary and reproductive system

The relative deficiency of potassium ions in urinary and reproductive system could be involved in the functional changes in kidney, bladder tissue, prostate, uterus and accessories. For example, the relative deficiency of potassium ions can lead to the inflammation in the epithelial cells of the urinary system and the abnormal functions in germ cells, which may be related to infertility.

5) Functional changes and diseases in blood system

It is mainly manifested in bone marrow tissue where the blood cells are generated. If the relative deficiency of potassium occurs in the proliferation environment of primitive blood cells, it may lead to abnormal proliferation and development of different types of blood cells in bone marrow tissue. In severe cases, myeloma and blood cancer may occur.

6) Functional changes and diseases in endocrine system

Endocrine system is another important system for body function regulation besides the nervous system. It can be divided into two categories: one is the naked eye visible organs that exist independently in morphology and structure, namely endocrine organs, such as pituitary gland, pineal gland, thyroid gland, parathyroid gland, thymus and adrenal gland. Another one is the endocrine cell clusters scattered in other organs and tissues, namely endocrine tissues, such as islets in pancreas, interstitial cells in testis and follicle cells in ovary. The relative deficiency of intracellular potassium ions in these tissues and cells can lead to the functional changes and disorders, such as the increased and decreased thyroid functions, endocrine disorders and abnormal reproductive functions.

7) Functional changes and diseases in skin and somatosensory organs

The relative deficiency of potassium ions in skin cells can not only cause the functional changes of the skin itself, but also may be related to the functional changes in the sensory nervous system. As a result, it may not only be easy to suffer from skin diseases such as vitiligo, but also may cause skin tissues to be easily infected by different microorganisms, such as bacteria, viruses and fungi. If the functional changes affect the sensory nerve, it can lead to sensory abnormalities such as itching and pain.

8) Functional changes and diseases in visual, auditory and olfactory systems

Retina is an important part of the brain, which has the same origin as nerve cells. Different diseases in retina, especially inflammation and age-related degenerative changes, may be result of the relative deficiency of potassium in retinal cells, which is similar to the mechanism of nervous system diseases described in another paper [2]. The functional changes in the accessory tissues in the eyeball are also related to the relative deficiency of potassium in their cells. For example, the deficiency of potassium ions in the crystalline body may be related to the decline of the plasticity of the lens, while the deficiency of potassium ions in the ciliary muscle that regulates the shape change of lens may lead to the decline of its function,

which is related to the formation of myopia and presbyopia.

5. CONCLUSION AND SIGNIFICANCE

The functional changes and diseases in organs, tissues and cells in non-nervous system show very obvious differences in clinical symptoms. Although the knowledge of modern medicine provides important scientific data for analyzing and clarifying the mechanisms of functional changes and diseases, however, there is a lot of variability in the prevention and treatment of these functional changes and diseases. Here, I propose that the relative deficiency of potassium in non-nervous system may be a core mechanism that can give an explanation for various clinical characteristics of functional changes and diseases, and also provide new ideas for the prevention and treatment.

ACKNOWLEDGEMENTS

This work was supported by the innovation team fund of National Ethnic Affairs Commission (MZR20002) and the research funds of South-Central Minzu University (KTZ20039 and CZP 18003).

CONFLICTS OF INTEREST

The author declares no competing financial interests.

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