

# The Continuous Relative Deficiency of Intracellular Potassium Is a Core Mechanism for the Occurrence and Metastasis of Tumor Cancer Cells

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## ABSTRACT

The core mechanism for occurrence of tumor cancer cells is related to the continuous relative deficiency of potassium ions in the cells of organs and tissues, which results in embryonic like proliferation and differentiation in the affected cells. The purpose of the metastasis of cancer cells is to obtain and utilize the potassium resources in other organs in body. However, if the overall potassium storage in body is obviously insufficient, the metastatic cancer cells still fail to achieve the purpose of obtaining enough potassium and turn into normal cells, further proliferation and differentiation of cancer cells will continue, and finally will lead to functional decline in the organs and tissues affected or death. Therefore, the key means to prevent and treat tumors and cancers is to ensure the normal and balanced potassium ions in cells in various organs and tissues, so as to avoid the formation of tumors and cancer cells caused by obvious deficiency of potassium ions.

## 1. INTRODUCTION

In other recent papers, I have clarified the importance of the potassium/sodium (K<sup>+</sup>/Na<sup>+</sup>) 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 [1], and I also analyzed the relationship between the relative deficiency of intracellular potassium and the functional changes and diseases in nervous and non-nervous systems [2, 3]. This article will discuss how the relative deficiency of intracellular potassium leads to the occurrence of tumor cancer cells and the mechanism for metastasis of cancer cells.

## 2. THE RELATIVE DEFICIENCY OF INTRACELLULAR POTASSIUM IONS IS RELATED TO CELL EXCESSIVE PROLIFERATION, TUMOR AND CARCINOGENESIS

Based on the discussion in the previous papers, I propose here that the core mechanism for the oc-

currence and formation of tumor cancer cell is caused by the continuous relative deficiency of potassium ions in organs and tissues.

There are many reasons for the relative deficiency of potassium ions, among which inadequate potassium obtained from diet may be the key one, which may be closely related to the reduction of potassium content in agricultural products and processed foods. The disordered or selected eating habits and inappropriate spread of so-called “healthy scientific knowledge” as well as the reduction of the absorption and utilization of potassium ions in the process of food digestion due to the functional changes in digestive system may also play a role. In addition, various endogenous and exogenous tumorigenic risk factors may accelerate the relative deficiency of intracellular potassium ions. The proliferating tumor cancer cells may compete to obtain potassium ions from extracellular fluid by increasing the number and activity of  $\text{Na}^+$ ,  $\text{K}^+$ -ATPase on their cell membrane [4-14], and if such a process can supplement the deficiency of potassium, then the cells will stop proliferating and turn into normal state. However, if the potassium storage is insufficient overall in body, while the competitive process still cannot obtain enough potassium ions for the normal functions of cells, consequently, the cells will be accelerated to form cancer cells. In addition, some risk factors, such as the abnormal oxidative stress that can increase the production of reactive oxygen species (ROS) [15-18], may cause partial damage to the cell membrane, resulting in the weakening of the ability of cells to store potassium ions. Therefore, controlling the growth rate of tumor cancer cells and striving to transform them into normal cells is related to whether they can establish the same amount of intracellular potassium ions as the normal cells. However, such a transformation may be difficult in the aging process of organs and tissues. A series of physiological functions in body are reduced, leading to the inability to establish adequate storage of potassium ions in body, as a result, the insufficient potassium ions in organs and tissues will continue to present, and tumor cancer cells will occur irreversibly.

### 3. RELATIVE DEFICIENCY OF INTRACELLULAR POTASSIUM AND METASTASIS OF CANCER CELLS

The metastasis of cancer cells is an important factor that affects the function of the body and ultimately leads to the death of living body. There are different explanations for the mechanism of tumor cancer cell metastasis. Here, I propose that the purpose of tumor cancer cell metastasis is to obtain other non-*in situ* potassium ions, or it is a competitive cellular behavior to obtain potassium ions owned by other normal tissues. Fast-growing tumor cancer cells accompanied by the increased expression of  $\text{Na}^+$ ,  $\text{K}^+$ -ATPase [19-33] lead to the huge consumption of potassium ions *in situ* tissues, while the potassium ions in blood circulation cannot support such a huge consumption, then it will lead to the death of fast-growing cancer cells if such a situation reaches a certain degree. The way to avoid the death of tumor cancer cells is to transfer through the blood and lymphatic system to meet the needs of tumor cancer cells for potassium ions. Tumor cancer cell metastasis usually tends to the organs and tissues, such as brain and lung, of which the potassium ion content is relatively higher. Some organs that also store relatively abundant potassium ions, such as heart and muscle tissue, are generally not conducive to tumor cancer cell metastasis because the cells in these organs and tissues have contractile function, which is not conducive to the stable growth of tumor cancer cells. The probability of tumor cancer cell metastasis is relatively low in some tissues, such as skin, which could contain a relatively less amount of potassium ions.

### 4. PREVENTION AND TREATMENT STRATEGIES FOR TUMORS AND CANCERS

Based on such discussions, the reason for tumor growth and carcinomatosis may be mainly due to the continuous relative deficiency of potassium in tissue cells, whereas other factors only strengthen the role. The core reason is the continuous shortage of the overall potassium ions in body. Therefore, to inhibit the growth and metastasis of tumor cancer cells, it is first necessary to meet the overall potassium needs in body and ensure the normal functions of various organs and tissues. Therefore, it is quite necessary to provide diary diet containing enough potassium ions, and then take appropriate measures to ensure that the digestive system can effectively absorb potassium ions, correct the persistent relative deficiency of po-

tassium in body, meet the potassium demand of tumor cancer cells that have occurred in the specific organs and tissues, and finally try to transform them into normal cells. Inhibiting of the activity of Na<sup>+</sup>, K<sup>+</sup>-ATPase may only inhibit the behavior of the tumor cancer cells with high expression of this enzyme for their huge consumption of potassium ions, and therefore, this therapeutic method may only achieve partial anti-cancer effects [19-33]. Similarly, the use of traditional medicine prescriptions can also partially correct the potassium deficiency in the body or improve the utilization efficiency of potassium ions. However, if the treatment is not at the early stage of the formation of tumor cancer cells, the therapeutic effect is limited, and may vary depending on the degree of individual potassium deficiency [34].

## 5. CONCLUSIONS AND SIGNIFICANCE

In this paper, it is proposed that the core mechanism for occurrence of tumors and cancer cells is caused by the continuous relative deficiency of potassium ions in the cells of specific organs and tissues, and the purpose of cancer cell metastasis is to obtain and utilize the potassium resources in other organs of body. However, if the overall potassium storage in body is obviously insufficient, and even the cancer cells after metastasis cannot achieve the purpose for obtaining enough potassium and turn into normal cells, then further ectopic proliferation of cancer cells will continue, and finally lead to the functional decline in key organs and tissues and the death of living body.

Therefore, the key means to prevent and treat tumors and cancers is to ensure the normal and balanced potassium storages in various organs and tissues, so as to avoid the relative deficiency of intracellular potassium in tissues and tissue cells and prevent normal cells from transforming into tumor cancer cells.

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## CONFLICTS OF INTEREST

The author declares no competing financial interests.

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