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REVIEW

Dr. Samokhotskiy's method of healing inflammation by the analysis and regulation of blood electrolyte balance

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An overview of a little-known method, which was discovered by Dr. Alexander S. Samokhotskiy, for treatment of gangrenous, traumatic, and postoperative inflammation, sepsis and some other diseases, was represented. Dr. A. S. Samokhotskiy carried out numerous animal experiments and clinical trials and found that application of wet bandages and/or intravenous injection of solution containing trivalent chromium ions (Cr^{3+}), alum, resorcinol, sodium salicylate, lactate buffer, colloidal sulphur, thioglycolic acid and glutathione with adding KCl, $MgCl_2$, $CaCl_2$ or NaCl solutions can heal inflammation of various etiology. Intravenous injections of particular therapeutic solution containing Na^+, K^+, Ca^{2+} or Mg^{2+} ions were administered in dependence on concentration of these ions in patient's blood plasma. Thousands of patients, many of them with fatal afflictions, where other methods were helpless, were healed by Dr. A. S. Samokhotskiy with the help of his method. Purpose of this publication is to inform the international medical community with the Dr. A. S. Samokhotskiy's discovery and initiate further research in this area.

Key words: Trauma, Sepsis, Gangrene, Inflammatory Disease, Non-antibiotic Treatment, Blood Electrolyte Regulation, Electrolyte Balance, Trivalent Chromium

INTRODUCTION

During the first half of the 20th century Alexander Samokhotskiy, who studied effect of chromium astringents on healing various types of inflammations and sepsis, discovered several efficient complex solutions containing ions of biometals along with some additives for healing of these diseases. Unfortunately, because of many historical collisions including World War II and wide application of antibiotics in medicinal practice, Alexander Samokhotskiy was not able to provide the medical community with his science results. He only reported about discovery in his MD dissertation, but generally says his remarkable results were forgotten.

However, due to growing antibiotic resistance of pathogens, (1,2) an important task is to search for new drugs and new approaches for healing inflammation and infection diseases. Thus, the purposes of this article were to familiarize the medical community with the Samokhotskiy's discovery and initiation of further research in this area.

RESULTS AND DISCUSSION

Methods

In our previous brief retrospect of Dr. A. S. Samokhotskiy's research (3) we have considered the use of his solutions for the treatment of external inflammatory processes. In further research Dr. A. S. Samokhotskiy found that his solutions were not effective against the deep pockets of inflammation. Positive results of numeral animal experiments and clinical external applications of

solutions led A. S. Samokhotskiy to the idea of applying his method to the treatment of inflammatory diseases, which were inaccessible for surface treatment and investigating the possibility of intravenous injections.

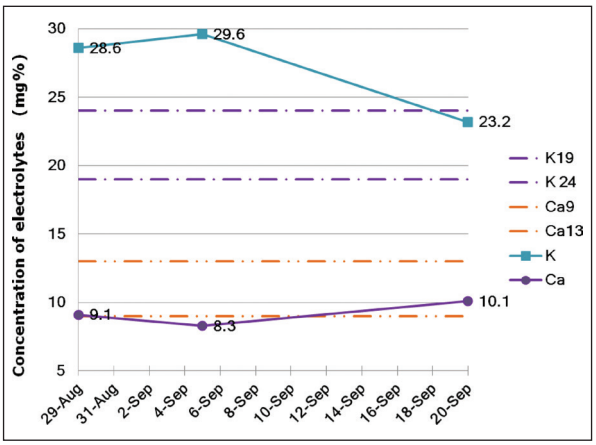
The intravenous use of Samokhotskiy's solutions for healing showed that the development of pathological phenomena in the experimental animals was slowed down compared to the controls. After positive results of intravenous injections in animal experiments, Dr. A. S. Samokhotskiy began testing intravenous injection of his solutions on humans.

Investigation of the electrolyte concentration in the blood of patients with internal inflammation showed concentration mismatch of main electrolytes such as Sodium (Na^+), Potassium (K^+), Calcium (Ca^{2+}) and Magnesium (Mg^{2+}) (Fig. 1).

For the treatment of internal inflammatory processes Dr. A. S. Samokhotskiy suggested to use intravenous injection of solution composed depending on the lack of an appropriate electrolyte in the blood. Chemical compositions of new medical solutions denominated as StK or StCa are outlined in Table 1.

Dr. A. S. Samokhotskiy described in his dissertation (4) nine thematic examples of successful intravenous treatment of severe traumatic or postoperative sepsis. The use of an intravenous method while treating diseases of general forms of tuberculosis, acute and chronic cases of dysentery, and surgical diseases produced good results.

To monitor the effectiveness of the treatment Dr. A. S. Samokhotskiy determined the content of K^+ and Ca^{2+} ions in plasma before treatment, then again at the intervals during and after the treatment. (4) Data of analysis of concentration K^+ and Ca^{2+} ions during the treatment of patient, who had acute pain in the upper abdomen after removal of the gallbladder are shown in Fig. 1.



[a]K19 and K24 lines are limits of normal concentration of Potassium ions in human blood plasma (19–24 mg%), K line represents measured concentrations of K^+ ions in blood plasma (in mg%).
[b]Ca9 and Ca13 lines are limits of normal concentration of Calcium ions in human blood plasma (19–24 mg%), Ca line represents measured concentrations of Ca^{2+} ions in blood plasma (in mg%).
[c]The concentrations of potassium ions and calcium ions in plasma were determined by Kramer-Tisdall's method (10) and de Waard's method (11) respectively on Aug 29, Sept 5, and Sept 20.

Figure 1. Changes in concentration of K^{+a} and Ca^{2+b} ions in blood plasma[c] during the illness with treatment by Samokhotskiy's solutions.

CASE REPORT

Patient K-n, man, 50 years old. In the past, he suffered from bouts of renal colic. Removal of the gallbladder was made in the 1935. After surgery, pain attacks resumed. Patient began to lose weight, felt tired all the time. Pain in upper abdomen became permanent. *09.01.*[*] Intravenous injections of 1 cm^3 StK was made. *09.06* and *09.07.* Intravenous injections of 1 cm^3 StCa were made. *09.12* and *09.15.* Intravenous injections of 1 cm^3 StCa were made. *09.30.* The patient's condition was good; he had not pain, sometimes just a slight feeling of heaviness. The efficiency of the patient was restored.

StK or StCa solutions were administered intravenously depending on the data of analysis in order to bring K^+ and Ca^{2+} concentrations in the blood to normal. How it is shown in Fig. 1, a patient's convalescence was in concert with the normalization of electrolyte concentration in blood plasma.

Dr. A. Samokhotskiy hypothesized that because of significant effects of other cations such as sodium (Na) and magnesium (Mg) in the organism homeostasis, these electrolytes should be added into the therapeutic formulations. Removal of $CaCl_2$ from StCa solution gave a standard solution of sodium (denominated as StNa). For preparation of other compositions 1N aqueous solutions of KCl, $MgCl_2$, $CaCl_2$ and 2N solution of NaCl were used, which were added to the StNa or StK standard solutions and then used for healing according to the analytical data of electrolyte concentration in the blood plasma.

Dr. A. S. Samokhotskiy employed the following method: in cases of low concentration of Na^+, Mg^{2+} and Ca^{2+} in the plasma, then to 10 cm^3 StNa he added a solution of the next items in the following amounts: 2N NaCl 0.5 cm^3; 1N $MgCl_2$ 0.05 cm^3; 1N $CaCl_2$ 0.5 cm^3, and in cases of low values of K^+ in the plasma to 10 cm^3 StK 0.05 cm^3 1N KCl solution was added. (4)

During the therapy, simultaneously with the quantification of K^+ and Ca^{2+}, the concentrations of Na^+ and Mg^{2+} in the plasma were determined.

**09.01.* – Date – Day and month of treatment, observation or note.

Table 1. Compositions of StCa/StNa and StK therapeutic solutions

Components of solution	Volume (mL)	Components of solution	Volume (mL)
Chromium sulfate, Standard solution[a]	30	Sodium salicylate	1.0[d]
Alum[b] aq. solution 5%	20	Resorcinol	0.4[d]
Sodium hydroxide 1N aq. solution	40	Methylene blue 0.5% aq. solution	4
Lactic acid 38% aq. solution	4	Thioglycolic acid	1[d]
Sulphur, colloidal aq. suspension	50	Distilled water	to 1000
Calcium chloride 1N aq. solution	20[c]		

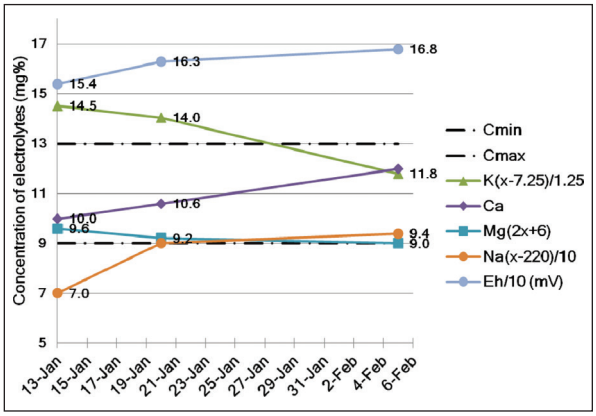
[a]Chromium sulfate standard solution was prepared from sodium dichromate for preparation of StCa/StNa solutions, and was prepared from potassium dichromate for preparation of StK solution as described in (3,4).
[b]Sodium-based and potassium based alums were used for preparation of StCa/StNa and for StK solutions respectively.
[c]Calcium chloride was not added for preparations of StNa and StK solutions.
[d]Mass in grams.

To find out the effectiveness of these new solutions, Dr. A. S. Samokhotskiy preliminarily conducted 25 clinical trials on the basis of which he deduced the following conclusions: (4)

1. Adding salts of the monovalent ions to our standards was indicated when the concentrations of the corresponding elements in the blood plasma were relatively less than the concentrations of divalent ions. When the concentrations of monovalent ions in the blood plasma were relatively larger than the concentrations of divalent ions, the addition of salts of the monovalent ions was contraindicated.
2. Adding salts of the divalent ions to our standards was indicated when the concentrations of the corresponding elements in the blood plasma were relatively less than the concentrations of monovalent ions. When the concentrations of divalent ions in the blood plasma were relatively larger than the concentrations of monovalent ions, the addition of the divalent ion salts was contraindicated.

In addition, Dr. A. S. Samokhotskiy checked the necessity of the astringents, sulfhydryl- group containing derivatives, and other components of his formulations. Samokhotskiy had conducted a series of experiments on rabbits and proved that the standard components produced a positive therapeutic effect only if all of them were included into therapeutic composition at the same time. He concluded that under these conditions very small amounts of mono- and divalent ions normalized concentration of the corresponding elements in blood plasma. Similarly, a very small amount of sulfhydryl derivatives normalized the E_h; as a consequence of these improvements a therapeutic effect occurred. Thus, the effect of components of standard solutions was interdependent.

In clinical testing glutathione (0.001 g to 10 cm^3 of therapeutic solution) was also added to enhance the reductive properties of therapeutic solutions. Analysis of concentration of Na^+, K^+, Ca^{2+}, Mg^{2+} electrolytes and E_h values during the treatment of spontaneous gangrene by intravenous injection of Samokhotskiy's solutions are outlined in Fig. 2 (4).



[a]Cmin and Cmax lines are limits of normal concentration of Na^+, K^+, Ca^{2+}, Mg^{2+} in blood.
Na(x-220)/10, K(x-7.25)/1.25, Ca, Mg(2x + 6) lines represent measured concentrations of Na^+, K^+, Ca^{2+}, Mg^{2+} ions in blood plasma (in mg%) respectively.
[b]E_h represents measured values of redox potential E_h (mV).
[c]The concentrations of potassium ions and calcium ions in plasma were determined as before, the concentrations of sodium and magnesium ions were determine by Muller's and Gadient's methods respectively (12) on Jan 13, Jan 20, and Feb 5.

Figure 2. Concentrations[a] of Na^+, K^+, Ca^{2+}, Mg^{2+} ions in blood[c] and E_h[b] data during the treatment of the patient[d] with spontaneous gangrene by Samokhotskiy's solutions.

CASE REPORT

Patient M-v, man, 84 years old, reported the following: eight months ago, sense of fatigue began appear in the right lower extremity. After some time walking pain

and further seizures were manifested in the calf region. This state lasted for quite a while and then the pain came in 4 and 5 toes. Slowly growing, the pain became so intense that the patient slept last month only fitfully. Pain of the 5th finger was mostly disturbing, when viewed finger appears as the blue-purple, with edema. Edema extended to the rear of the foot. The pulsation of the arteries of the foot was not detectable. *01.13*, *01.20*, *02.05*. Analyses of blood were performed. Injections were in dose 1 cm^3. *01.14*. Intravenous injection of (StNa + NaCl + $CaCl_2$ + glutathione) solution was made; *21.01*. Injection of (StNa+$CaCl_2$+glutathione) solution was made. *02.10*. The condition of the patient was much better. He slept at night well; occasionally pain appeared for a short time. Edema of the fingers and the foot disappeared. Injections were discontinued. The patient was examined in two months. He had no previous complaints; went freely, slept well at night. Pulse of the back of the foot arteries was clear.

It follows from the Fig. 2, the convalescence of the patient was accompanied by normalization of the electrolyte composition of the blood and increasing E_h values.

Analytical data during more complicated treatment of a patient having high intensity headache of unclear origin is displayed in Fig. 3.

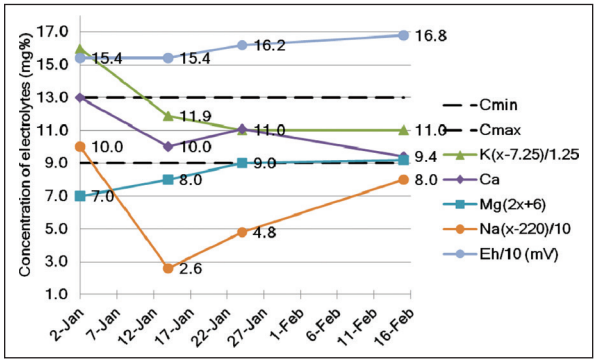
CASE REPORT

Patient T-a, a woman, 34 years old. The headaches began about ten months ago. Their intensity gradually increased, the attacks became more frequent. Dizziness began after 2–3 months. In the sequel these phenomena were so increased that the patient had left the job. She was treated at the clinic of nervous diseases within two months, but there was no improvement. The cause of pain had not been elucidated, and the diagnosis had not been established. In the last two months the disease took a step forward. Vertigo was so increased that the patient fell, and headaches were accompanied by vomiting. *01.02*, *01.14*, *01.24* and *02.15*. Analyses of blood were performed. Injections were in dose 1 cm^3. (*Solution*)/10 means diluted in 10 times solution was injected. *01.03*. Intravenous injection of (StNa + $MgCl_2$ + glutathione) solution was made. *01.10*. Intravenous injection of (StNa+$MgCl_2$+glutathione)/10 solution was made. *01.15*. Intravenous injection of (StNa + NaCl + glutathione) solution was made. *01.19*. Intravenous injection of (StNa + NaCl + glutathione)/10 solution was made. *01.21*. Intravenous injection of (StNa + NaCl + $MgCl_2$ + glutathione)/10 solution was made. *01.23*. Intravenous injection of (StNa + NaCl + glutathione)/10 solution was made. *02.02*. Intravenous injection of (StK + glutathione)/10 solution was made. *02.10*. The patient's condition was considerably better and without headaches. Vertigo was only during intense physical fatigue. Injections were discontinued. A month later, the patient felt perfectly healthy.

These treatments revealed, that consistent application of (StNa + $MgCl_2$ + glutathione) solution, (StNa + NaCl + glutathione) solution, (StNa + NaCl + $MgCl_2$ + glutathione) solution and, finally, (StK + glutathione) solution led to normalization of blood electrolyte composition and to complete recovery of a patient's health.

Using the same method, and data obtained from the analysis of electrolyte concentrations and the values of E_h, Samokhotskiy treated several other patients.

In his dissertation (4) Samokhotskiy described 15 typical examples of positive clinical treatment effects of spontaneous gangrene, eczema, osteomyelitis, epilepsy, asthma, peritonitis and other disorders with the help of the method of body electrolyte regulation and intravenous injections of his therapeutic solutions.



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[b]E_h represents measured values of redox potential E_h (mV).
[c]The concentrations of potassium, calcium, sodium and magnesium ions in plasma were determined as before (10–12) on Jan 2, Jan 14, Jan 24, and Feb 15.

Figure 3. Concentrations[a] of Na^+, K^+, Ca^{2+}, Mg^{2+} ions in blood plasma and E_h [b] data during the treatment[c] of the patient[d] with intensive headache by Samokhotskiy's solutions.

DISCUSSION

It is possible suggest a hypothesis about mechanism of action of Samokhotskiy's solutions. Clinical results indicated that the StNa composition with appropriate additives might be used for the treatment of various diseases with the indispensable condition of monitoring electrolyte concentration and the E_h values. Dr. A. Samokhotskiy elucidated that lower values of Na^+, K^+, Mg^{2+} and Ca^{2+} in the plasma became normal, if the

corresponding elements were added to the therapeutic compositions. He also noted that since mass quantities introduced electrolytes were low, it was possible only deduce about the local and temporal elevation of electrolyte concentrations in the blood, or "cationic stimulus."

In his formulations A. S. Samokhotskiy used solutions of trivalent chromium and their therapeutic effect explained by Cr^{3+} astringent action. However, in the second half of the 20th century, it was found that Chromium is an essential microelement, which appears to play a positive role in the regulation of insulin, and, as result, in metabolism of carbohydrates, proteins, lipids, and the functioning of the cardiovascular system. (5) The lack of Cr^{3+}, such as in case of artificial nutrition patients, was leading to type 2 diabetes mellitus like state and neuropathy. (6) The concentration of Chromium ions Cr^{3+} in Samokhotskiy's solutions was 1.27 mg/mL, which was about six times greater than the maximum essential daily requirement of chromium, which ranges from 50 to 200 μg (7).

The mechanism of action of Chromium ions is to enhance the binding of insulin, increasing the number of insulin receptors and facilitating receptor phosphorylation. (8) Take into consideration the significant effect of insulin on the absorption and metabolism of carbohydrates in the cells, the effect on metabolism of proteins, lipids and nucleic acids, the chromium deficiency may cause or burden insulin resistance and a wide range of health disorders.

We can suppose that the introduction of Chromium ions Cr^{3+} and other electrolyte cations with Samokhotskiy's solutions reduces insulin resistance, lowers and maintains normal levels of blood glucose, enhances cellular glucose metabolism, increases energy formation, acceleration of anabolic processes, enhances protective mechanisms of the cells, tissue and whole organism.

Reducing the concentration of extracellular glucose may also contract the nutritional base of pathogenic bacteria that had particularly positive effect in the treatment of postoperative, traumatic, and gangrenous inflammation.

In conclusion of his article (9) A. Samokhotskiy mentioned that his method of healing did not replace dietetics, mechanotherapy, endocrinology, immunology, surgery, and hygiene. He noticed that data of electrolyte analysis indicated current state of a patient's health, but the morphological disturbances and clinical manifestations of disease should be taken into consideration for comprehensive assessment. Further complex analysis can disclose requirements for medical treatment of a various order, particularly operative intervention or intensive care at acute period of chronic diseases.

The results obtained by A. Samokhotskiy suggested that the components of therapeutic solutions can initiate the processes of recovery of normal electrolyte and water metabolism, normalization of acid-base balance could start, stabilization and recovery of cell membranes to normal state and the mobilization of immune functions could occur.

Electronic Supplementary Information (ESI) available: [Selected parts of Dr. Samokhotskiy's dissertation, examples of treatments and patient histories from Dr. A. S. Samokhotskiy's medical practice, as described in his MD dissertation and translated from Russian to English by Dr. Valeriy Bacherikov, or are available from authors on request.]

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