

Alexander S. Samokhotskiy.¹

About nervism² and associated therapeutic problem.

I. Introduction.

In the latter half of last century³ the medicine went up to cell level. L. Pasteur, who generalized previous observations and his own research, create background of modern theory of infection and immunity, and R. Virchow working in area of pathologic anatomy developed the methods of study the tiny structural alterations in the cells of affected organs and tissues.

The theory of cell pathology admitted the essence of all disease were the pathologic disfunctions in the cells, but an idea of independence of these processes let to separate the diseases according to distinction. Such method of classification of diseases became a provider of huge analytical data. Modern nomenclature of diseases includes 10 thousands of names, and describes more then 100 thousands their symptoms.

New diseases required new drugs. But only in area of immunology, mechanical therapy and partially in endocrinology a medical procedure is consecutive conclusion derived from analysis data. All other mass of many thousands of diseases appeared in different conditions. Every disease became special, particular unit, and required a selection of necessary drugs exactly for this illness. To satisfy these particular demands pharmacology turned the development directing to each particular case.

It was impossible to make generalized conclusions based on these particular cases, and drug development was doomed by accidental finding, recommendation of folk medicine, screening etc.

The medicine could not to remain on old positions and to overcome challenges. Assistance was rendered by physiology. Physiologists N. I. Vvedenskiy, A. A. Ukhtomski, I. M. Sechenov, I. P. Pavlov, A. D. Speranskiy created new interpretation the role of neural system in body life and formed new direction in physiology and medicine, the doctrine which was referred to as *nervism*.

Let I briefly outline several basic principles of nervism. When only bases of modern scientific medicine were underbuilt, so called fabulous unity of organism was rejected. Nervism admits integrity of the body.

A. D. Speranskiy wrote: "There are not needs to prove for acknowledgment that on the pathway from the particular to the particular the medicine will be faraway from the aims. Until the nature of all pathologic processes and without exclusion will not be united with general indication, until in addition to the segregation method according to distinction we will not include method of distinguish according to differences, we will not have theory of medicine, notably there will not be the hope be done with spontaneous movement of medicine progress and to proceed to planning and systematic work."

What is the principle, involved into the nature of all processes, is able to consolidate them?

Unlimited network of neural receptors, permeating all organs and tissues, takes upon the action of exogenous and endogenous excitators, transforms them in the process of neural excitation, which is conveyed to working organs by reflectory apparatus, changes their morphologic and functional states, i. e. forms health or illness in dependence from organic or inorganic excitator. Therefore, from the attitude toward nervism, caverns in the lungs, increased body temperature or other disease

¹ Translation from Dr. A. S. Samokhotskiy's article published in popular soviet magazine "Chemistry and Life", 1989, No. 11, pp. 75-85, after his death in 1986. ("Химия и жизнь" No. 11, 1989 г. Стр.75-85) (Translator annotation)

² Nervism is the theory that the nervous system plays the dominant role in the regulation of the physiological functions and processes that occur in animals and human. See Appendix I for details.

The modern conception of homeostasis maintenance is representing in Neurohumoral Regulation theory. See Appendix II for details. (Translator annotation)

³ The article was written by Dr. A. S. Samokhotskiy probably in the late forties or in the early fifties of 20th century. (Translator annotation)

manifestation are not produced by Koch's bacilli, sepsis does not cause by staphylococci, but body does it self.

II. Wet bandages.

During the study of inflammation processes and employing medications as wet bandages, after ascertaining their powerlessness at many severe cases, I started search of new treatment methods with revision of the original attitudes.

Detailed investigations of pathologic pattern of inflammation, observation of process of injury healing and experimental tests were shown:

1. If there are not changing in the organism, then, regardless microbe presence, there is not disease.
2. At the point of contact an irritator with organism such new factor as the time is appearing.
3. The microbe and disease are separated in time scale by infinity of processes.

I considered the initiation of these processes as immediate cause of illness. Thereby causes were included in disease manifestations and microbes came out from my medical aims. This in turn had influence on the design of the medical remedies.

From infinite number of factors, which are made up inflammation process, most significant factors had to be isolated. Experimental tests induced me to acknowledge such those abnormalities which appeared as in inflammation focal as outside of it. For such processes I attributed Eppinger's⁴ serous inflammation,⁵ drop of oxidative-reduction potential (Eh) and elevation of number of colloidal particles bearing positive charge.

For struggle against serous inflammation group of astringents was applied namely chromium sulfate, prepared from potassium dichromate, alum for mitigating chromium action, sodium salicylate and resorcinol. For giving of buffered stability mixture the lactic acid and KOH was used. Thioglycolic acid was used as Eh stimulator. Colloidal sulphur was applied for precipitation of electropositive colloidal particles.

This targeted direction of medication design was kepted for years and was transferred for cure of infections which were unavailable for immediate impact. It purported switching over from wet bandages to intravenous injections, from outpatients to clinical patients.

Transfer to using intravenous injections impelled me apply astringent properties of calcium ions. Addition of CaCl_2 to previous solutions, where chromium sulphate prepared from potassium bichromate, is impossible, because K and Ca are antagonists in their action onto organism. Therefore new solution of chromium sulphate was obtained starting from sodium dichromate. To this solution calcium chloride was added.

Thereby it was obtained two solutions. General composition of them was identical except of these elements. One solution contains sodium, and another solution contains calcium. First composition was named *de bene esse* Standard potassium⁶ StK, and second composition was named Standard calcium StCa.

Experimental period was continued for seven years. Thousands and thousands patients were treated by me with these procedures. Hundreds variations of prescriptions were replaced each other. Rapid improvement of patient condition, healing large and deep wounds without scars, reduction of cure terms let to assess positively the practical results.

⁴ Hans Eppinger June. (5 January 1879 in Prague - 25 September 1946 in Vienna), Professor Dr. med., Austrian physician, internist, university professor in Freiburg in mash gau, Cologne and Vienna, son of Hans Eppinger sen. (Translator annotation)

⁵ Eppinger, Hans: The serous inflammation. Vienna: Springer, 1935

⁶ See Appendix III.

III. Intravenous injections.

Wet bandages could be removed in any time. Intravenous injections can not be withdrawn. Wet bandages contact with the surface of body, but intravenous injections intrude into major thoroughfare of metabolic processes. The latter required testing of method safety.

Tests were started with determination of antiseptic properties of solutions. Studies of typhoid, paratyphoid A and B, staphylococcus, streptococci and *Escherichia coli* in culture did not reveal antibacterial killing properties and even inhibition of bacteria growing with these solutions. Seeding with breeding ground gave diplococcus and hay bacillus growing. However, after injection of evaluated solutions into abdominal cavity of experimental animals and intravenously negative phenomenons were not observed. Healing of infected animals by studied solutions was positive, especially polluted wounds were healing by first intention.

Indication for using was broadened as we attested with safety and usability these unsterile solutions. The presence of thermally unstable thioglycolic acid does not allowed thermal sterilization, but microbes were beyond of our field of interest in this system of conceptions. Thrombophlebitis, obliterating endarteritis, septic processes, and suppurative inflammation of wounds were healed by this method.

However during the cure new peculiar facts were found: some patients were healed with treatment by StK, others patients with the same diagnosis antagonistic StCa was adjuvant. Usefull at beginning of cure standard solution deteriorated the patient condition later, and and vice versa, the harmful at start of treatment became therapeutically healthy, even in cases when the proesseses had nothing related to inflammation. This implied diagnosis not reflects in full the body conditions and precense of potassium or calcium in our compositions determined usefulness or harmfulness of this medical method in each particular case.

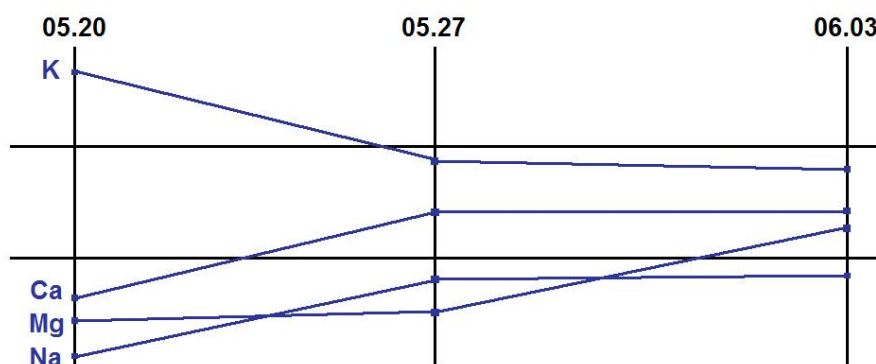
Naturally the question appeared about behavior of these electrolytes in blood plasma. For answer it was nessesary to determine potassium and calcium concentrations in blood plasma before a start of cure and some days after intrusion.

This phase of research concur with period of general growth of interest to study electrolytes in organism media. Investigations of H. Schade, B. Zondek and K. Gebler were proving great relevance of electrolytes and impelled me include in aria of my research all macro elements of blood plasma, i. e. K, Ca, Na and Mg.

Data of blood plasma analysis can be representing as a diagram. Two horizontal lines are drawn on page of graph paper with distance 20 mm from each other. The lines limit the concentration amplitude of physiologic fluctuations of studied elements. For example potassium concentration limits enclose between 19 mg% and 24 mg%, therefore the low horizontal corresponds to 19 mg% and upper line correspond to 24 mg%. Physiologic variations of concentrations lie in limits $24 - 19 = 5$ mg%, therefore, alteration of potassium concentration in 1 mg% correspond to 4 mm of the Chart.

Similarly, graphic parameters for other elements were established: for calcium 9 – 13 mg%, for magnesium 1.5 – 3.5 mg%, for sodium 210 – 350 mg%. Change in concentration in 1 mg% for calcium related 5 mm of chart, for sodium – 0.5 mm, and for magnesium – 10 mm. Results of each analysis are outlined on ordinate. Values displaying concentration of particular elements after analysis were connected with straight line.

Demonstration chart is outlined on Fig. 1. In accordance with displayed date of analysis the following scheme of cure was applied: 05.20 to StNa salts of sodium and calcium were added; 05.27 - magnesium salt was added to StNa; 06.03 - the treatment was stopped.



The large number of observation was allowed to conclude:

1. Concentrations of electrolytes (sodium, potassium, calcium and magnesium) in blood plasma alter with various diseases, but ratio of electrolytes may be similar with diverse illness and different at the same diseases of various persons, and also at the same patient at various phase of disease.
2. Administration of medical composition containing electrolytes, the concentrations of which relatively diminished appropriately increased their contents and improved patient states.
3. Administration of medical composition containing electrolytes, the concentrations of which in blood plasma relatively increased appropriately increased their contents (amplified disparity of correlation) and impaired patient state. Generally the impairment was significant.
4. For normalization of sodium, potassium, calcium and magnesium ions correlation in blood plasma and patient mending the low doses of mentioned elements are very effective.

To combine the dynamic of indicator chart data with diagnostic static of nomenclature names of diseases and making from this eclecticism medical conclusions is hopeless matter. It is the chart became the form reflecting organism conditions, although the chart did not display symptoms of disease, but disturbance in macroelement concentrations. The method deprived us traditional and visual conceptions about disease but let to express the patient conditions in the digital form.

IV. Discussion.

The neural system which is mostly labile and differentiated, having infinite number of receptors, transpiercing all organs and tissues, assumes the action of medical excitators and transforms it in the process of neural stimulation, which conveyed by reflex system to the acting organs.

The facts of our medical research let to affirm that medical compositions of electrolytes are excitators of neural receptors and the quality of neural excitation does not distorted further. Following analysis demonstrated growth of electrolyte concentration which was injected with medical purpose. This also explains the effects of doses, which were minor in concentration and short-term in action. We do not discuss about correlation of volumes of reactive mass and time of their action, but only about irritation moment triggering neural system variate in specified direction according to intrinsic objective laws.

During the research the some new questions were appeared:

1. Why the small doses of the electrolytes considerably increase their concentrations in the blood plasma?
2. Why anti-inflammation drugs heal of many illnesses, which have nothing related to inflammation?
3. Why microbes were innocuous in these conditions?

Let we discuss about arised questions.

Why the small doses of the electrolytes considerably increase their concentrations in the blood plasma.

First of all let us refine the facts and return to the chart. To 1 mL of medical solution for injection in dependence from chart data, that electrolyte was added, the concentration of which was decreased, notably 5.5 mg%⁷ two normal solution of NaCl; 2.66 mg% normal solution of KCl, 0.2 mg% normal solution of CaCl₂, 0.06 mg% 0.5 normal solution of MgCl₂.

Primary reaction of body is reaction of neural system on our medical act. The separate injection of the individual solutions of these electrolytes does not exhibit the effects. In the same time it was proved, that additional excitators amplify the action of specific excitator by non-specific stratum. The solutions StNa, StK, StCa served as such additional excitator in our method of treatment. We notice one more time that all complex solution only is singular catalyst, but not separate parts alone.

After detection that the patient had in the blood plasma decreased concentration of one or another electrolyte we added to the medical composition the same electrolyte in small dose. Following analysis confirmed the appropriate dependence of the growth of concentration from our medical act.

Why anti-inflammation drugs heal of many illnesses, which have nothing related to inflammation.

The cause consists in primary reaction onto medical act, which is not electrolyte reaction, but is reaction of neural system, alteration of which inevitably changes the mode of the body processes. Therefore, the influence of our medical act was not limited by normalisation of macroelement ratio and affected other organism processes, information about of which can not be obtained from analytical chart. That is why the number of positive effects of medical act was considerably increased and healed the active conditions having nothing related to inflammation.

Why microbes are not harmful in these conditions.

The power of excitatory is the degree of excitation. When we injected the our medical composition and the same time any negative influences of the infection were not observed that proved inability of infection to overcome a threshold determining by neural component of the processes. Our medical composition in these conditions reduced or even eliminated an ability of the infection to form pathology.

We know there are a number of the factors lowering the power of excitators. Probably, their abundance was accumulated during of evolution for survival of species.

More than century ago Claude Bernard⁸ wrote about neural system: "Acquaintance with the functions of this organ bringing phenomena of life into the harmony will serve necessary guidance at study of diseases, because it should be impossible to follow for coupling rows of symptoms, if do not know beforehand participation of neural system in it."

In spite of century period this medical problem still remains unsolved. Pharmacology until now is developing tending by the particular cause.

Pharmacology occupies another position in our research. The pharmacology does not exceed the limit regulation of concentration of blood electrolytes; its have to solve the aims that exactly were stated in study. Micro elements of the blood plasma also should be included in the indicator chart. For this it will be necessary find their concentration in normal state and their fluctuation at pathology, creation of new excitators, compatible with macroelements, sections of vegetative nervous system and etc. The research requires corresponding instruments, and cooperation of physiologists, pharmacologists, biochemists and clinicians.

⁷ 1 mg% equals 10 mg/L concentration. (Translator annotation)

⁸ <http://www.claude-bernard.co.uk/page2.htm> (Translator annotation)

V. Conclusions.

During first phase of our research the conception of nervism about the integrity of organism was implemented in the medical practice.

During second phase diagnostic statics was replaced with dynamics of electrolyte concentration control that was represent by indicator chart, appropriately determinating prescription of medical compositions and procedures. The method of disease discrimination according to differences was substituted by the method of their consolidation by the analogy.

During third phase of research the neural component of the processes was recognized as a primary response of the organism on the excitator action.

Medical procedures, to which we were led by logic of our research, are electrolyte form of implementation of medical objective of nervism. This approach expands scope of pathological processes and let to intervene in two inevitability of human life as the senility and homeostatic disequilibrium.

The hundred hypotheses do not contribute clarity in understanding of aging processes. At old age the number of diseases and ailments rises considerably and to diagnose and to heal this geriatric complex is hopeless matter. We see our medical aim not in healing all these illness, but in normalization of condition of neural component of these processes, determinating their development.

The normalization of aging prosesses was not stated as the direct targets of our research, but certain data were obtained as accompany results of treatment several diseases of elderly patients. After removal of pathologic prosesses, causing hospitalization, the patients often felt better then in time prior illness, more cheerfully, then before, their memory was improved, long time ago losted interest to the diverse matters was arised, and, as a rule, their life tonus was enhanced.

The ancient Greeks themselves considered that the equilibrium between external and internal world of person is essential condition of the life.

Claude Bernard wroute: "Status quo of internal media is necessary term of free life of organism." Complicated metabolic processes determinating consistency of external media of body directed and tuned autonomic nervous system. Vegetative nervous system concentrates interior control systems, which predetermine life activity.

Thereby the operation of this extraordinarily cencitive mechanism year by year, more and more is disturbed by environment factors. Intensive temp of modern life, urbanization and conjugated with it pollution of environment with allergents and toxic gases, increased consuming of spasmodical compounds like nicotine and acohol, sedentary life and row of other factors disturb physiologic motion of the prosesses in the billions of cells of body. Amazingly tuned vegetative automation can not overcome with such volume of work and surrender.

For normalization of pathologic disturbanses of old age may be enough information about the ratio of concentration of fourth macroelements. For normalization of homeostatic dynamic equilibrium fourth compositions is insufficient. It will be naturally include into the indicator chart the microelements, which considerably will increase the number of prescriptions, but their amount always will be incomparably less then quantity of modern medications. That is because the number of symptoms considerably more then macro and micro elements of the blood serum.

In conclusion we wish remind that all discussed here about clinical medicine is not related to dietics, mechanotherapy, endocrinology, surgery, gigiene and immunology. It has been noted that data from indicator chart are nor sufficient for comprehensive assessment of patient conditions, because chart does not reflect morphological distortion and clinical manifestations of diseases. Their analysis can display that conservative treatment is not require, but intervention of another sort, like operative or intensive therapy at acute conditions of chronic illness, should be used.

Examples from our medical practice

Patient E., man, 33, during many years suffers from eczema, which becomes acute in fall and in winter time, but disappears in summer. The disease is slowly in progress. There were lingering acute periods during last two years, first of them started in winter time. Patient was treated in Dermatology Institute, and then he was in sanatorium during two months. In summer time acute phenomena went away, second acute period became in deep autumn. The patient was treated by intravenous injection of calcium chloride, but the pathology enhanced. The patient face was totally inflamed wet surface, essential part of the skin of hands and legs was inflamed and covered by wet parts. The patient suffers from persistent, intensive itch and pain.

There were made 8 intravenous injections from November to January according to five analysis of blood serum.

Eczema phenomena went off, wounds from scratches healed. Treatment was discontinued.

Patient D., woman, 56, sick with lung tuberculosis. During last year her condition became sufficiently worse. She lost weight more than 18 kg, and has no appetite. She is acutely weak, walking with difficulty; her body temperature oscillates from 35.6 °C morning to 39.5 °C afternoon, diarrhea.

From 07.19 to 09.05 four intravenous injections were made based on three blood serum analysis. The diarrhea discontinued, the patient gets appetite to Aug 8, to Sept 5 she gains in weight 3 kg, feels herself brisk, temperature is normal. She was discharged from hospital.

Patient T., woman, 34, suffers from headache starting more than 10 months ago. Intensity of headache gradually increased, paroxysms of pain became more frequent, and vertigoes began two - three months later. The phenomena intensified as much as she forced quit job. Woman was healed in neural clinic but betterment not ensued. The cause of headache, according to explanation of the patient and her husband, who is physician, was not cleared, diagnosis was not determined. The last time vertigoes were so intensive as woman felt down, and headache accompanied with vomiting. Seven intravenous injections were made. Treatment was discontinued. The patient felt herself healthy.

Patient A., woman, 23, has osteomyelitis of left humerus in diagnosis. The neoplasm was appeared in age 14, accompanied with acute pain in left humerus area and high body temperature. The surgery operation was made in clinic; one month later second operation was made, then again after one month later – third. During following years the exacerbation was repeated, the surgery and conserving methods of treatment were ineffective.

In time of next aggravation we proceeded to heal according our method. Three intravenous injections were made. Treatment was discontinued. The patient began walking, fistulae closed. Twenty years flew, woman studied and was graduated from medical university, was working, the exacerbations not occurred.

Patient S., man, 15, wound back side of second finger by bit of lathe, tendon of extensor is cut. In outpatients' clinic wound was sutured, bleeding continued. It appeared that the patient suffered from haemophilia. Four days after wounding the patient delivered to the surgery clinic in serious condition. Following several days the condition catastrophically worsened. The inflammation with putrefactive decay of tissues extended to lower part of forearm; shoulder and shoulder-girdle are edematous. Gangrenous decomposition of tissues intensified. Haemophilic bleeding continued, the patient was exsanguinated. Haemophilic bleeding, inflammation, and heavy total septic visualizations did not let resort to high amputation of shoulder. After five days in clinic patient condition became catastrophic.

We proceeded to intravenous injections, at 7 p.m. the first injection was made according our method, next day at 11 a.m. all layers of bandage, tampons and dead tissues were removed. Bleeding was not observed. Following process proceeded smoothly and completed by recovery with limited motion of hand.

Patient E., woman, 30, in postpartum period has thrombophlebitis of left crus, lung abscess, exudative double-sided pleurisy, pyaemia with temperature (fluctuation from 36.0 to 41.8 °C) and with

fever duration from 1 to 2 hours. She gets edema of both feet which spreaded in follows on the crura, huckles and abdomen area.

March, 6 patient was moved to Dr. A. S. Samokhotskiy for treatment. This day intravenous injection was made, repeated injections were made March 9 and 12. March, 13 patient fever diminished, the patient feels better, edema began decreased. March, 20 edema almost disappiered, fever stopped. March, 27 temperature was normal. She was discharged from hospital in good condition.

Patient K., woman, 32, entered into the clinic because of chronic exacerbation trombophlebitis of the lower extremities and nagging pain at hip aria. The patient can not walk because of pain, is nervous and has incomnia. The pain gradually intensified, edema increased.

After blood plasma analysis 3 intravenous and 2 hypodermic injections were made. Already on third day after treatment start the patient was allowed to walk. Edema diappiered, during the walk has not pain. The patient feels better. Hovever after several days cutting pain and feeling of weight arised, the patient went the stairs a lot. Hypodermic injection eliminated these phenomenon.

After 15 day beginning of treatment the patient was discharged from hospital in good condition, she was walking free, had not edema and the pain.

Now we finish this not complet illustration of the application of our method for healing of various deseases and wish to add that mostly appropriate results were obtained for healing endarteritis, septic processes, psychosis and senile infirmity.

Appendix

Created by Dr. V. A. Bacherikov.

Appendix I.

Nervism is the theory that the nervous system plays the dominant role in the regulation of the physiological functions and processes that occur in animals and human.

Based on the research of I. M. Sechenov, the concept of nervism was introduced into physiology by I. P. Pavlov in 1883. Sechenov's research, S. P. Botkin's clinical applications of nervism, and the investigations of I. P. Pavlov and his school developed into the scientific tradition in Russian and Soviet physiology by which the nervous system is studied. The idea that the nervous system plays an important and even dominant role in regulating functions was persistently developed by Pavlov in his studies on the physiology of blood circulation and digestion. Pavlov's teachings on higher nervous activity contain the most brilliant and completely developed statement of nervism. Pavlov wrote in 1935, "the more developed the nervous system becomes in an animal, the more centralized it is and the more its highest division acts as the director and distributor of all the functions of the organism. This highest division controls all the phenomena that originate in the body" (I. P. Pavlov, *Poln. sobr. trudov*, vol. 1, 1940, p. 410).

The importance of the nervous system was observed even earlier by several investigators, including F. Magendie in 1830 and C. Bernard in 1866 and 1867. Nevertheless, Pavlov is indisputably credited with formulating and confirming the principle of nervism.

Nervism strongly influenced the development of physiology in the USSR and was reflected and elaborated in the works of many of Pavlov's students and followers, including K. M. Bykov, L. A. Orbeli, A. D. Speranskii, N. E. Vvedenskii, A. A. Ukhtomskii, and I. S. Beritashvili. However, after the joint session that took place in 1950 between the Academy of Sciences of the USSR and the Academy of Medical Sciences of the USSR, the idea of nervism was unjustifiably overemphasized by some physiologists. As a result, the role of humoral and hormonal regulation was underestimated and neglected. Given O. Loewi's discovery in 1921 of the chemical link between the nervous system and the heart and given the discovery of the chemical nature of the linking transmitters, it is fallacious to contrast the influence of the nervous system with the action of humoral or hormonal factors. Consequently, the modern concept of neurohumoral regulation, which is widely accepted, assigns an important role to both nervous regulation and humoral-hormonal factors in the control of physiological processes. [V. N. Chernigovskiy. *The Great Soviet Encyclopedia, 3rd Edition (1970-1979).*]

Appendix II.

Neurohumoral Regulation in animals and human joints influence of the nervous system and humoral factors on the regulation, coordination, and integration of bodily functions and processes. Humoral factors, which include metabolites, hormones, and mediator substances (chemical transmitters), are biologically active substances, which are contained in the blood, lymph, and tissue fluid.

Neurohumoral regulation plays an important role in helping the body adapt to changes in the external environment; it also has a homeostatic role, that is, neurohumoral regulation helps to keep the composition and properties of the body's internal environment relatively constant. In lower organisms, the connection between different types of cells and organs is realized by chemical substances. As organs and tissues differentiated and grew more complex over the course of evolution, these substances acquired specific physiological functions; they became mediators, neurohormones, and hormones.

Humoral regulation and its subtype, hormonal regulation, merged with nervous regulation. In addition to directly influencing cells, tissues, and organs, the numerous biologically active metabolic products that are elaborated in response to a nerve impulse can cause a chemical reflex by acting as stimulants to the endings of sensory nerves. These metabolic products also act as the humoral link in reflex arcs, that is, they transmit information to the brain and spinal cord, which subsequently produce a wave of nerve impulses that spread out from the central nervous system to the effector organs.

The activity of the brain and spinal cord depends not only on nerve signals but also on nutrition, metabolism, and the chemical composition and physicochemical and biological properties of the tissue fluid that surrounds the nerve cells. It is in these capacities that the closest interrelationship of neural and humoral processes occurs. For example, CO₂ stimulates the cells of the respiratory center, and stimulation of certain nerve formations leads to the secretion of mediator substances into the synapses (such as acetylcholine, noradrenaline, and serotonin). Should the mediators enter the bloodstream, they participate in the humoral regulation of bodily functions; they can therefore be called neurohormones.

Participation of hormones in neurohumoral regulation makes it possible to speak of a single neurohumoral-hormonal mechanism of regulation of bodily functions. The juxtaposition of different types of bodily regulation, for example, reflex versus humoral-hormonal regulation, is not consistent with the modern physiological viewpoint. The biosynthesis and action of many biologically active substances can occur in response to a conditioned reflex. This is regarded by a number of investigators as an indication of the participation of the cerebral cortex in neurohumoral regulation.

Chain reactions by which the body adapts to such strong stimuli as physical and mental tension, pain, disease, or trauma - all of which produce a state of stress - serve as examples in which the action of a humoral mechanism of regulation follows that of a neural mechanism in stepwise fashion. The chain reaction begins when excitation arises in the cerebral cortex and is transmitted through subcortical elements to the hypothalamus, where the higher centers of neurohumoral regulation are located.

Under the influence of nerve signals, the cells and nerve endings of the hypothalamus release noradrenaline in bound form. Noradrenaline, by acting on elements of the reticular formation of the brainstem that are sensitive to it, promotes excitation in the central and peripheral divisions of the sympathetic nervous system. The impulses that enter the adrenal gland along sympathetic nerves intensify the formation of adrenaline in the adrenal medulla. Upon entering the blood, the adrenaline passes into the hypothalamus, where it produces excitation of the adrenergic nerve elements - neural structures that are specifically sensitive to adrenaline. The excitation of the adrenergic elements in the hypothalamus stimulates the secretion of releasing factors, under whose influence adrenocorticotrophic hormone (ACTH) is synthesized and released from the hypophysis. The presence of ACTH in the blood is the signal for the formation of the adrenocortical hormones - corticosteroids that produce a many-linked chain of neural and humoral reactions in the body and hence actively participate in the body's adaptation to stress.

References for Appendix II.

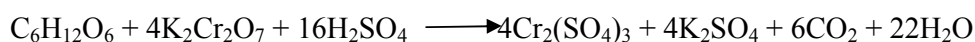
- Kassil', G. N. "Neiro-endokrinno-gumoral'nye vzaimootnosheniia pri porazheniakh dientsefal'noi oblasti." In the collection Fiziologiya i patologiya dientsefal'noi oblasti golovnogo mozga. Moscow, 1963.
- Grashchenkov, N. I. Gipotalamus, ego rol' v fiziologii i patologii. Moscow, 1964.
- Lissak, K., and E. Endroczi. Neuroendokrinnaia reguliatsiia adaptatsionnoi deiatel'nosti. Budapest, 1967. (Translated from Hungarian.)
- Aleshin, B. V. Gistofiziologiya gipotalamo-gipofizarnoi sistemy. Moscow, 1971.
From G. N. Kassil'. The Great Soviet Encyclopedia, 3rd Edition (1970-1979).

Appendix III.

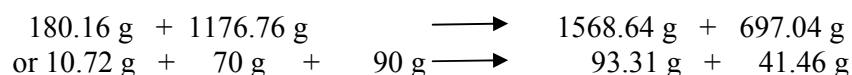
Procedure for preparation and application of medical solutions according to Dr. A. S. Samokhotskiy.

Starting solution of trivalent chromium Cr^{3+} was prepared based on usual method in tanning industry: 70.0 g of potassium bichromate was dissolved in 120 mL of distilled water. To this solution 90.0 g of sulfuric acid (66° B) was added slowly with caution. After addition was finished, the solution of 64.0 g of glucose in 50 mL of water was added dropwise to the cold mixture of bichromate and H_2SO_4 . Obtained solution of chromium sulfate was deluted by water to volume of 525 mL.

Reaction of bichromate reduction is running according to equation:



Calculation of amounts of reagents according to equation:



Taken into reaction:

$\text{C}_6\text{H}_{12}\text{O}_6$ 64,0 g (0,355 mol, M. w. 180,16 g/mol)
 $\text{K}_2\text{Cr}_2\text{O}_7$ 70,0 g (0,238 mol, M.w. 294.19 g/mol)
 H_2SO_4 90 g (66° Baume, Sulfuric Acid 93% with a density of 1.8354 g/mL (83.7 g of 100%))

Yield:

$\text{Cr}_2(\text{SO}_4)_3$ 93.31 g (0.238 mol, M.w. 392.16 g/ mol)
 K_2SO_4 41.46 g (0.238 mol, M.w. 174.259 g/ mol)

After delution with distilled water to 525 mL 0.453 M solution of $\text{Cr}_2(\text{SO}_4)_3$ or K_2SO_4 should be obtained. For preparation of injection solution Dr. A. S. Samokhotskiy used 30 mL or 60 mL of this solution in 1000 mL of final solution that was corresponded to 0.0136 M or 0.0272 M solutions respectively. He did not report in his dissertation about preparation of chromium sulfate solution starting from sodium bichromate $\text{Na}_2\text{Cr}_2\text{O}_7$, but we supposed that it should be obtained the same concentration of $\text{Cr}_2(\text{SO}_4)_3$ and Na_2SO_4 .

At beginning of his research, Dr. A. S. Samokhotskiy used for treatment of patients following composition.

Composition № 476.	
Chromium sulfate solution - 30 mL.	Thioglycolic acid- 0.5 mL.
Lactic acid/lactate ion buffer solution - 60 mL, <i>pH</i> 6.22.	H_2O to 1 L.

Colloidal sulphur was prepared as following: 30 mg of sodium hyposulphite was dissolved in 50 mL of distilled wated and then 0.1 mL of concentrated sulfuric acid was added. After several

minutes the solution became opalescent with a slight tinge of blue, which gradually becomes milky. When this change of the color occurred, the resulting colloidal sulfur was poured to the solution of chromium salt.

Composition № 510.	
Chromium sulfate solution - 30 mL.	Colloidal Sulphur - 50 mL.
Lactic acid/lactate ion buffer solution - 60 mL, <i>pH</i> 6.22.	H ₂ O to 1 L.
Thioglycolic acid - 0.5 mL.	

Compositions № 476 and № 510 were used in the initial stages of study as external remedy.

Thereupon all surgery operations were carried out at the local application of composition No 549. After surgery an intravenous infusion in an amount of 2 – 4 mL were performed. Intravenous injections were made also in the following 5-6 days.

Composition № 549.	
Chromium sulfate solution - 30 mL.	Colloidal Sulphur - 50 mL.
Alum solution 5% - 20 mL	Thioglycolic acid - 0.5 mL.
Lactic acid/lactate ion buffer solution - 60 mL, <i>pH</i> 6.22.	H ₂ O to 1 L.

Hereafter, after many experiments, including animal experiments, self-experiments and patient healing experiments, Dr. A. S. Samokhotskiy developed StCa and StK medical solutions for intravenous injection. In the treatment he usually used StK solution and, if improvement in the condition of the patient was not appeared, then StCa solution was injected.

Compositions of medical solutions.			
StCa		StK	
Chromium sulfate solution (from sodium bichromate)	30 mL	Chromium sulfate solution (from potassium bichromate)	30 mL
Alum solution 5%	20 mL	Alum solution 5%	20 mL
Sodium hydroxide 1N solution	40 mL	Sodium hydroxide 1N solution	40 mL
Lactic acid 38% solution	4 mL	Lactic acid 38% solution	4 mL
Colloidal Sulphur	50 mL	Colloidal Sulphur	50 mL
Calcium chloride 1N	20 mL	Calcium chloride 1N	-

Sodium salicylate	1.0 g	Sodium salicylate	1.0 g
Resorcin	0.4 g	Resorcin	0.4 g
Methylene Blue 0.5% solution	4 mL	Methylene Blue 0.5% solution	4 mL
Thioglycolic acid	1 mL	Thioglycolic acid	1 mL
Distilled water	H ₂ O to 1 L.	Distilled water	H ₂ O to 1 L.

Subsequently, Dr. A. S. Samokhotskiy had prepared a standard solution StNa.

Composition StNa	
Chromium sulfate solution (from sodium bichromate)	30 mL
Alum solution 5%	20 mL
Sodium hydroxide 1N solution	40 mL
Lactic acid 38% solution	4 mL
Colloidal Sulphur	50 mL
Sodium salicylate	1.0 g
Resorcin	0.4 g
Methylene Blue 0.5% solution	4 mL
Thioglycolic acid	1 mL
Distilled water	H ₂ O to 1 L.

The injection solutions were prepared by mixing of standard solution StNa or StK with solution of electrolyte, concentration of which in blood plasma was reduced according to the analysis data. In cases of decreased concentrations of Na⁺, Mg²⁺ and Ca²⁺ in serum to the 10 mL of StNa solution for injection 0.5 mL of 2N NaCl, or 0.05 mL of 1N MgCl₂, or 0.5 mL of 1N CaCl₂ were added. In case of decreased concentrations of K⁺, to the 10 mL of StK solution 0.05 mL 1N solution of KCl was added.