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THEORETICAL FOUNDATIONS OF MEDICAL REHABILITATION

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In modern medicine, medical rehabilitation technology successfully developed and are an integral part of the effectiveness of the treatment of most diseases. The main objective in this case is to restore the structural and functional organization of organs and tissues to restore directed by discount disease functionality of an organism. It should be emphasized that the stimulation of the pathology of the compensation of disturbed functions in rehabilitation of existing technologies is always based on the inclusion of urgent adaptation mechanisms by increasing the intensity of functioning structures which, through subsequent actions (processes) are activated processes of hypertrophy and regeneration to ensure an increase in the number of functioning structures the basis of morphological changes are the basis of long-term mechanisms of adaptation / compensation, which are the basis of clinical adaptation. One of the promising methods of adaptation can be external bioprogramming.

Keywords: *medical rehabilitation, external bioprogramming, adaptation.*

Medical rehabilitation is by far the actual direction of modern medicine, which is due to its great social importance. Despite the development of modern technologies rehabilitation questions of theoretical frameworks and mechanisms of formation of the effects of rehabilitation treatment is practically described. Accordingly, the WHO definition of rehabilitation (fr. *Rehabilitation* from lat. *Re* again + *habilis* comfortable fit) is a set of coordinated activities carried out by the medical, physical, mental, social, professional and pedagogical nature, aimed at possibly achievable for a given individual's recovery of health, physical, mental and social (including health) status, due to the lost illness or injury to restore autonomy, disability and health of persons with physical and mental disabilities as a result of postponed (rehabilitation) or congenital (habilitation) diseases as well as a result of injuries. **Medical rehabilitation (MR)** - a system of measures aimed at the recovery of the patient, compensation and restoration of disturbed body functions and systems, prevention of recurrence of the disease, its complications.

Perhaps MR should be represented as linear network structure based on the holistic nature of the response to injury. Thus, in fact, formed pathological processes largely determines the state of the disease. However, at the same time in the body triggered numerous adaptive mechanisms, ie, included, and then picking up and there are even "replacement power" (by VV Podvysotskiy). Adaptive mechanisms to varying degrees affect the course of pathological processes, reduce the extent of the damage, that is to modulate the course of disease, contributing to the recovery of the body. The combination of these predominantly compensatory adaptive mechanisms can be defined as sanogenesis.

Sanogenetic mechanisms are essential to the completion of the period of the disease, when there is incomplete recovery of previously lost functions. The set of health interventions aimed at restoring the adaptive capacities of the organism and is the essence of rehabilitation medicine.

When exposed to sanogenesis possible stimulation:

- The intensity of the functioning of the damaged organ (system) - functional, metabolic;
- The intensity of the functioning of other organs and systems, followed by "unloading" of the damaged organ - a functional, metabolic;
- Formation of a new dynamic stereotype adaptation functions like, metabolic;
- Increasing the number of elements in the functioning of organ damage - hypertrophy, hyperplasia, stem cells, gene therapy;
- Replacement of the affected organ or part of it - the replacement heart valve, kidney transplants, etc.

Important to forecasting and evaluate the effectiveness of rehabilitation is rehabilitation potential (RP) - a set of biological and psychological characteristics of the person, as well as social and environmental factors that allow a greater or lesser extent to realize his potential ability. Evaluation of RP involves determining somatic-personal abilities of the individual, preserved in spite of the disease and a prerequisite for the restoration of the status, as well as the possibility of predicting the level of restoration or compensation of limitations. It includes the definition of the level of physical development and physical endurance, level of mental and emotional development and sustainability, the definition of social - psychological status, taking into account the overall development, personality, status and sustainability of mental processes. In determining the RP are three levels that characterize patient rehabilitation opportunities for certain types of activity. High RP - provides a full recovery or a high degree of recovery of the specific form of life in the process of rehabilitation. Moderate RP - suggests a partial restoration of the specific form of life in the rehabilitation process. Low RP - indicates the absence or slight recovery of a particular kind of life as a result of rehabilitation. The influence of physical factors should head to optimize the reactivity and correction processes of excitation and inhi-

bition in the central nervous system.

Interconnection and interdependence of the etiology and pathogenesis substantiates the possibility of pathogenetic therapy affect to some extent the cause of the disease. Eliminating the symptoms of pathological syndromes under the influence of treatment, is the basis of syndromic treatment. In this regard, it is necessary to analyze the clinical picture of the syndrome of the disease with the release of the dominant (leading) syndrome, based on identified clinical syndromes pathogenetic choose optimal rehabilitation factors.

Important in the MR is the principle of individual treatment. On the basis of it, the use of physical factors, the doctor must take into account the reactivity of the organism and its form factors: age, sex, presence of comorbid conditions, the degree of training of its adaptive and compensatory mechanisms biorhythmic activity of the major functions of the body. Optimal therapeutic effect of physical factors in patients occurs due to conducted a course of treatment. Only reflex-humoral mechanism of action of physical factors provides orientation reactions systemic nature closely related to the initial functional state system (s), as you can see an improvement in self-regulation mechanisms of homeostasis. The patient should be treated by bringing the disease to the optimal variant thereof depending on the mechanism and the degree of deviation from it. Solve local objectives must be based on the leading syndrome, in ways that do not conflict with the global goal of optimal variant of the disease. Therapeutic measures should be correlated with the state of health of the patient and his changes.

Among the many pathophysiological, and pathomorphological pathobiochemical factors and processes that make up the nosologic forms of diseases, dysmetabolic syndrome is not only typical, but has a universal meaning in the formation of any and all disease. Correction of metabolic disorders should be differentiated and defined by their type, compensation, electrolyte disturbances, and clinical manifestations.

In modern medicine, medical rehabilitation technology successfully developed and are an integral part of the effectiveness of the treatment of most diseases. The main objective in this case is to restore the structural and functional organization of organs and tissues to restore directed by discount disease functionality of an organism. It is known that the state of health and disease is different levels of adaptive abilities of the organism. Increase healthy human adaptation to a constantly changing environment is the primary measure of health and made the main measure of health and at the expense of adaptation mechanisms. Adaptation to the conditions of the sick person carried out due to the existence of compensation mechanisms. Adaptive and compensatory mechanisms are based on the identical nature of the functional, biochemical and morphological properties and reactions of the organism. This conclusion has already been formulated by R. Virchow and lies in the fact that the disease does not appear in the body is nothing new, and there are any changes in the number of operating elements, and they can vary in time and location, which is manifested in disease diagnosed in quantitative morphological functions and biochemical changes. Thus, the development of both adaptation and compensation is based on increasing the functionality of the existing structures and functions. Over thirty years ago FZ Meyerson described two possible mechanisms for increasing the power of any functioning structure. Firstly s, improving body functions (tissue), possibly by increasing the intensity of functioning structures e.e. thus increasing the adaptive capacity of the organism by increasing the functions of existing structures. This series provides adaptive response in the first place, immediate coping mechanisms of the organism to external and internal factors in health, but they are the same as the trigger mechanism for immediate compensation for pathology.

Morpho-functional basis of the reactions of urgent adaptation compensation are on the one hand the inclusion of functional

response increases the device, structures previously not functioning (or little). So well known that in the lungs, kidneys and other organs in a functional rest works only some of the structural and functional elements. On the other hand, the function of elements working body at rest, ie, basic functional state usually is not maximal, so the force of cardiac contraction may increase largely, though always engaged during the entire cardiac muscle. However, the strength of the interaction of actin and myosin in cardiomyocytes varies widely.

Increasing input Ca^{++} in cardiomyocytes is the signal that increases the interaction of myofibrils and increases the power of the heartbeat. Due to urgent adaptation mechanisms can increase the specific functionality of virtually any body at least twice that evolutionarily incorporated as one of the most important mechanisms for the adaptation of the organism. In physiology and diagnosis, there is the concept of functional reserve, which characterizes the maximum functionality of the body. This concept is widely used in functional diagnostics in cardiology and in recent years - kidney.

Inclusion and stimulation intensification functioning structures engaged by the relevant regulatory authority for each signal (neurogenic, endocrine), which is usually accompanied by an adequate increase in blood supply to the organ or tissue. However, intensification of functioning structures provides only short-term adaptation mechanisms (compensation) due to the fact that the energy and the plastic possibilities parenchymatous cells vigorously functioning, exhausted.

Along with the intensification of the structures begin to form stable long-term adaptation mechanisms. Morpho-functional basis of these mechanisms is to increase the number of functioning structures that occurs either in hypertrophy, when the number of structures increases strongly functioning cell (increase in the number of mitochondria, myofibrils, lysosomes, etc.) or an increase in the cells themselves - hyperplasia. Due to hypertrophy and hyper-

plasia formed the foundations of long-term morphological adaptations, thus ensuring long-term adaptation in the health status of or compensation for an illness.

It should be noted that the term adaptation mechanisms are preferably volatile to (ergotropic) reactions, while the long-formed on the basis of reactions with increasing trophotropic synthesis of proteins and other polymeric biostructures. In this connection, the first switch occurs almost immediately after the regulator signal, and to generate second must usually 7 to 12 days, and that way, and determines the period of rehabilitation, as the time required to form the structural basis of the physiological mechanisms of adaptation and compensation in pathology.

The notion of stress-limiting systems, their role in the modulation of the stress response, providing resistance of the organism and its prevention of stress and other damage is the ideal point in this book. It is necessary to take into account, respectively, under emotional stress, which arose under the influence of the new complex situation, the device determines the emotions of at least two interconnected link holistic response. With Tresses-limiting modulatory systems of the body ensure the effectiveness of behavioral reactions, warning him of stress damage, and consequently, the major non-communicable diseases in the pathogenesis stress plays a crucial role. This combination of problems of stress-limiting systems is one of the many great examples of how evolution generates economically regulatory mechanisms of the body.

The first link, turned into the environment of the patient, it is - emotional behavior and thinking - energetically wasteful and chaotic at first glance, the processes actually provide the search for new solutions, new mode of behavior and, thus, are of primary biological importance. The second link is realized "inside" of the body, manifested by activation of adrenergic and pituitary-adrenal systems, which cause standard set of metabolic and physiological changes necessary to ensure that the energy and

structural search behavior, ie. E. Ultimately to the formation of a new structural fixed functional system responsible for adaptation.

Currently, it is obvious that stress-limiting systems simulate both link constituting being emotional stress, thereby limiting redundancy vector and specify how behavioral reactions and standard stress reaction, deployed inside the body. It is this that determines the adaptive biological significance of stress-limiting systems.

The adaptation process consists of two steps:

- Stage 1 of urgent adaptation;
- 2nd stage of stable and long-term adaptation.

Special adaptation - Is an immediate response of the organism in the form of enhancing the function of a system to the action of some external factor without significant morphological changes. This functional adaptation. In the case of acute exposure to it and the lack of preparedness of the body has to function at maximum capacity, so it is not always able to cope with the stresses arising. Such is often the case when to participate in sports competitions, sports and recreational activities for the delivery of standards for physical education allowed poorly trained or even untrained persons. If the impact is much more than functionality, the special adaptation may result in breakdown or even damage to the body. For example, not enough trained athlete or groups, even a relatively small load can lead to over-development of infarction and congestive heart failure.

It should be noted that it is always sufficiently strong impact special adaptation is accompanied stress reaction, ie. Activation of the pituitary-adrenal system with increase in the blood concentration of adrenaline, noradrenaline, corticosteroids, and other hormones that facilitate the adaptation of the organism to the new conditions of operation. L is affixed to a sufficiently strong influence of the environment causes the formation of a specific dominant functional system responsible for the mainte-

nance of homeostasis. For example, when exposed to cold, in addition to the thermoregulatory system, in reactions include additional mechanisms, such as activation of the cardiovascular system, the redistribution of blood between the separate areas, and others. Furthermore, regardless of the specificity factor arises nonspecific stress reaction, whose role is primarily to mobilize energy reserves.

To go urgent adaptation into sustainable, long-term need to within a specific functional system structural changes took place that would have increased the reserve capabilities of the system to the required level, which would allow the body to successfully and long cope with the effects of the environment. And this is possible only through prolonged or repeated exposure of a given factor. Thus, the *long-term adaptation* - is gradually evolving body's response to repeated or prolonged exposure to external factors, leading to an expansion of the functional capacity of the organism due to morphological changes. At the heart of this process is the activation of the synthesis of nucleic acids and proteins in the cells of organs and systems responsible for the adaptation, which leads to structural changes in the formation of a system of structural trace and ultimately is the material basis of reliable and sustainable improvement of body functions.

Single brief exposure and load limited time only, predominantly functional changes in the body in the form of urgent adaptation responses; under the influence of sufficiently long or repeated exposure to cell structures of bodies responsible for the adaptation, there is a constant activation of the synthesis of nucleic acids and proteins that gradually provides enhanced functionality of organs and systems. So urgent adaptation is gradually transformed into a long-term with the formation of a system of structural trace.

Proteins are synthesized in the cell structures - ribosomes - the matrices-RNA samples, which are obtained by copying a single gene with DNA. In gene contains a

set of models for all kinds of cellular proteins, and in addition, the mass of special genes that control the synthesis of certain proteins, depending on the activity of cells in a given period. "Broken" genes are disabled. They include activated only by signals coming from the working cell elements and from the regulatory systems of the organism, acting through specific hormones. That is, there must be a "request for synthesis."

Consequently, one of the main mechanisms of transition to long-term adaptation is existing in the relationship between the function of cells and genetic machinery. In connection with this regularity any functional biological load, any sufficiently strong effects leading to activation of the genetic system, which, in turn, causes increased synthesis of nucleic acids and proteins, forming the basic cell structure. As a result, the growth of these cell structures formed structural system track which leads to an increase in the functional capacity of the system responsible for adaptation. In turn, the presence of the relationship between the function and the genetic apparatus may lead to the opposite eventuality. Thus, the termination of the influence of environmental factors on the adapted organism leads to a fairly rapid decrease in the activity of the genetic apparatus of cells in the system responsible for adaptation. This is followed by an adaptive decay protein, the disappearance of the structural system track constituting the basis of the adaptation, which leads to maladaptation, i.e. a decrease of functional, adaptive capabilities of the organism.

It has been established that all living proteins naturally break down into simpler molecules at a constant speed. Its value is defined as a "half-life". For example, for cardiac muscle proteins it is about 30 days. This means that 200 grams of protein a month there will be only 100, and a month later - only 50 grams, and so on. G., If during that time no new molecules are synthesized. Thus, in the cell, and accordingly in the body, two processes. In the case of training (enhancing the function of any

organ or system) is sufficiently strong external stimulus causes the molecule to function all “workers” elements of the cell with a maximum voltage, maximum of them is “Request for synthesis” in the DNA of the ribosome, and they synthesize new protein. The “old” protein which continues to decay at a constant rate. However, as a result of sufficient load synthesis overtakes decay and weight of the protein increases. Of course, increases and power functions. In the case of a sharp weakening of external influences occurs corresponding reduction function and a decrease in “request for the synthesis of” new protein molecules. At the same time The accumulated weight of the protein previously continues to decay at the same rate. Decay begins to overtake synthesis, reduced protein mass (atrophy), and the ability to function decreases.

These mechanisms of training and detraining are universal for all cells (muscle, nerve, and others.) And for all functions. There is an increase in heart weight, capacity of coronary arteries, the masses of the respiratory muscles, developing phenomenon of hypertrophy and hyperplasia of the lung alveoli, the respiratory center neurons, increased affinity for oxygen CNS. Activated neurohumoral mechanisms of adaptation, in particular, the hypothalamic-pituitary-adrenal system, which increases the level of endurance and the body’s resistance to various stresses. Normalized neurohumoral response to traumatic exposure, increases resistance to psychoemotional factors.

In MR is to eliminate all the pathological symptoms, correction of homeostasis autonomic tone and reactivity of the organism requires a differentiated approach depending on the shape of their violations. Based on the above set out the mechanisms of adaptation and compensation modern medical rehabilitation rehabilitation based on the methodology of management of adaptation and compensation. Moreover, it should be emphasized that the restoration of functionality based on the fact that the disease is always the case damage (violation) of organs and tissues, which causes

The decrease of physiological functions, and hence the level of adaptation to the environment, ie level of health.

Of course, these mechanisms restore the body’s adaptive capabilities and achieve a state of complete recovery is only a first attempt to systematize the theoretical principles of rehabilitation medicine. In summary, it should be emphasized that the stimulation of the pathology of the compensation of disturbed functions in rehabilitation of existing technologies is always based on the inclusion of urgent adaptation mechanisms by increasing the intensity of functioning structures which, through subsequent actions (processes) are activated processes of hypertrophy and regeneration to ensure an increase in the number of functioning structures the basis of morphological changes are the basis of long-term mechanisms of adaptation / compensation, which are the basis of clinical adaptation.

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Резюме

**ТЕОРЕТИЧЕСКИЕ ОСНОВЫ
МЕДИЦИНСКОЙ РЕАБИЛИТАЦИИ**

*Гоженко Е.А., Бадин И.Ю.,
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В современной медицине технологии медицинской реабилитации успешно разрабатываются и являются неотъемлемой частью эффективности лечения большинства заболеваний. Основной задачей при этом является восстановление структурно-функциональной организации органов и тканей направлено на восстановление сниженных при болезни функциональных возможностей организма. Стимуляция процессов компенсации нарушенных при патологии функций в существующих реабилитационных технологиях всегда основана на включении срочных механизмов адаптации за счет увеличения интенсивности функционирующих структур, которые посредством последующих воздействий (процессов) активируют

ют процессы гипертрофии и регенерации обеспечивающих увеличению количества функционирующих структур на основе морфологических изменений, являющих базой долговременных механизмов адаптации/компенсации, которые являются основой клинической адаптации. Одним из перспективных методов адаптации может быть внешнее биопрограммирование.

Ключевые слова: медицинская реабилитация, внешнее биопрограммирование, адаптация.

Резюме

**ТЕОРЕТИЧНІ ОСНОВИ МЕДИЧНОЇ
РЕАБІЛІТАЦІЇ**

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У сучасній медицині технології медичної реабілітації успішно розробляються і є невід'ємною частиною ефективності лікування більшості захворювань. Основним завданням при цьому є відновлення структурно-функціональної організації органів і тканин направлено на відновлення знижених при хворобі функціональних можливостей організму. Стимуляція процесів компенсації порушених при патології функцій в існуючих реабілітаційних технологіях завжди заснована на включенні термінових механізмів адаптації за рахунок збільшення інтенсивності функціонуючих структур, які за допомогою наступних дій (процесів) активують процеси гіпертрофії і регенерації забезпечують збільшення кількості функціонуючих структур на основі морфологічних змін, що виявляють базу довготривалих механізмів адаптації / компенсації, які є основою клінічної адаптації. Одним з перспективних методів адаптації може бути зовнішнє біопрограммування.

Ключові слова: медична реабілітація, зовнішнє біопрограммування, адаптація.

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