Historical Heritage. I.V. Davydovsky about the Adaptive Mechanisms of an Organism Etiology of Health

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Abstract: Ippolit Vasilyevich Davydovsky (1887-1968) was the most famous Russian anatomic pathologist, academician and the Vice President of the Academy of Medical Sciences of the USSR. He worked on the issues of contagious diseases, pathogenesis, sepsis, battle traumas, traumatic complications, atherosclerosis and, at the end of his life, gerontology, the problems of causes of diseases and health preservation. The health state is the state of stable equilibrium, normally passing physiological processes, which are provided by the activity of the central nervous system with regard to balancing the influence of the environment on a human and adaptation of the functional systems of an organism to it. The health fullness is the fullness of environmental readiness for adaptation under the influence of changing environmental factors. Etiology being the science of cause and effect relationship of the environment and the human nature can be the true basis of the preventive medicine.

Key words: I.V. Davydovsky · Adaptation · Immunity · Disease etiology · Health etiology · Own ecology

INTRODUCTION

I.V. Davydovsky (1887-1968) was the academician and the Vice President of the Academy of Medical Sciences of the USSR. He worked on the issues of pathological anatomy, contagious diseases, pathogenesis, sepsis, battle traumas, traumatic complications, atherosclerosis and, at the end of his life, gerontology, the problems of causes of diseases and health preservation. The reserves of the adaptive capability of the organism's functional systems at changing environmental factors allow preserving health. When reserves are insufficient, physiological reactions turn into pathological-this is the adaptation of physiological functions to the new conditions of existence. Due to the demographic aging of the population, the especially significant line of the healthcare system activity is the preservation of employability and social importance of a human, improvement of the level of his individual health and extension of his labor activity. That is why currently the reserves of adaptive capabilities are studied by many scientists [1-11].

Body of the work. In [12], I.V. Davydovsky (1956) noticed that there was no absolute opposition between physiological and pathological processes. The health state is the state of normally passing physiological processes, which are provided by the activity of the central nervous system with regard to balancing the influence of the environment on a human and adaptation of the functional systems of an organism to it. Health does not mean that there is no pathogenic agent in the environment. The cause of a disease is always the attitude of an organism to the factor of environmental influence on a human, but not the factor itself. If there are pathogenic factors, but the organism adapts to them and balances their influence (including balancing by immunity reflex), the disease does not take place-the organism is in the state of stable equilibrium. When influenced by external causes, the reliability of health preservation is ensured by the tools that cause deep restructuring of physiological relations within the organism. If the factors of natural immunity (adaptation) are insufficient, disease may occur. Health disorders often develop gradually without displaying any subjective or objective signs.

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In [13], I.V. Davydovsky noticed that physiological or pathological mechanisms in an organism were regular integral adaptive reactions with common and local displays for leveling the internal environment through biological contacts with other organs. Interorgan connections ensure the principle of functional integration of systems, the basis for the regulatory activity of the organs and the whole organism. When influenced by excessive external causes, the expansive compensatory and adaptive processes often manifest themselves as desolated forms of organs and systems damage. Therefore, functional disorders always precede morphological and clinic disorders. In pathological circumstances, even more new and delicate connections of organs are revealed. The essence of pathological processes is their adaptive and compensatory reactions.

The unity of the organism and the environment is the basis of development of morphological structures and their functional (physiological) activity, which is inextricably tied to them [14]. Qualitative changes of the environment cause evolutionary processes of organisms. Transformation of physiological reactions to pathological is a sort of adaptation of physiological functions to the new environment. The versatile nature of interaction of the organism's systems with internal and external factors as a consequence of species, hereditary, age- and sex-specific, social and other peculiar features results in different displays of particular integrity of each person (individual, health, disease, senility, longevity, etc.). The most important property of live systems is self-regulation, i.e. maintenance of stability of their structure and quality at changing circumstances, the regular nature of processes, "equifinality (ability to achieve the same final result with different original conditions and through different ways)". These abilities ensure the broad range of adaptive reactions, from compensation or sub-compensation to decompensation. Only integral organisms have the ability to adapt. Self-regulation of an integral organism ensures its changeability, is carried out permanently and sometimes insensibly. The high intensity of technical development of the modern civilization at a swift rate changes both the environment and the adaptation of an organism to it. Adaptation to these changes cannot be painless. Those are restructuring and adaptation to new circumstances that ensure the principle of natural selection. As the environment activates, an organism can form new structures for overcoming exhaustion of the functional reserves---this is how tissue regeneration takes place after traumas. The more versatile the environment is, the more complex is the organism and the larger number of types of adaptation exist. Adaptive processes have achieved their top development with human, as he has added to the natural adaptive acts the factor of their conscious training. The health fullness is the fullness of adaptation to the changing factors of the environment. Syndromes of diseases show the adaptive processes of various tension, reversibility and duration. Depending on the extent of influence of the environment, there are two types of the organism's reactions: defensive, which consciously targets escaping from life threats and adaptive, which are fulfilled reflexively,--these are automated physiological acts of biological training of the organism in its restructuring depending on the circumstances. The idea that defensive reactions of the organism are the effect of leukocytes, phagocytosis, products of antibodies, etc. against the attack of microbes, viruses, tumor cells, etc. is erroneous. It substitutes the effect of the adaptive mechanisms by separating the organism from the environment. Adaptation and compensation are relative but different concepts. Adaptation is a biological concept, which ensures existence and development of species in the nature. It can be normal (without any harm to health) or pathogenic (when it turns into a disease). The concept of compensation refers to an individual. In the circumstances of this level, the influence of the external environment mirrors the perfect harmony in the operation of the body's functional systems and ensures the equilibrium of the integral organism. For example, the compensatory hypertrophy of a sportsman's heart enables him to do more intensive physical exercises. Compensation is the positive level of individual's adaptation. When the force of the environment influence steps out of the margins of compensatory abilities of an organism, the process transforms into sub-compensation or decompensation. It is not the loss of adaptive abilities; such a sick person can live for years, just his organism adapts to the lower level of abilities. Many adaptive acts of an organism have an unconditionally reflexive basic reaction to the influence of external factors with creation of temporary connections and acquired reflexes. They are implemented automatically in a self-regulating organism: blood circulation, external and internal respiration, operation of the cardiovascular system, maintenance of homeostasis, secretory functions, etc. A special role in the generation of complex adaptive acts (adaptation) belongs to the endocrine system and its relation to the central nervous system. Adaptation is not always ideal—the more complicated the environmental situation is, the more extensive is the test of physiological
systems' reliability. Immunity is the most important adaptive device—it is the product of centuries-long adaptation to environmental factors. It concerns both contagious and non-contagious diseases. The inherited immunity can be strengthened with an immense number of factors (nutrition, climate, profession, etc.). Acquired immunity is the result of the individual development process. The higher the level of stability of the in-born and acquired adaptive mechanisms is, the more adequate to various influences the immunity is; reactions of the organism follow the compensatory path; the processes are physiological, which ensures health.

In [15], I.V. Davydovsky considered the importance of the etiology term for the theory and the practice of medicine. In terms of cognition of natural phenomena, the etiology concept and the disease essence form a unity. However, they are not identical. For example, the cause of fire (strike of a lightning, child's misconduct, etc.) is not identical with the substance of the burning process. It is important not only to treat the theory of etiology as a set of causes of diseases (the mechanistic determinism), but also reveal the causal links in the complex regularities of the real life, which cause certain consequence. The revealed links must have properties of a law: be relatively stable, orderliness and repetitiveness in their manifestations. It is important to realize the unity of the cause and its link to the action. Absence of the cause and effect (causal) thinking causes biased approach: the near is exaggerated in its significance; the far sinks out of sight. F. Engels said that interaction excludes anything absolutely primary and absolutely secondary. Practical medicine simplifies to a certain extent the issues of theory for ease of practice. Therefore, various opposite separation of natural phenomena occur: external-internal, physiology-pathology, disease-health. At extensive causal consideration of the issue, multiple phenomena interweave in the form of “complex equation with few known and multiple unknown values”. The result will be disease or non-disease. Thus, etiology cannot be associated with the disease concept. “We can equally speak about the health etiology. This would be the basis of hygiene”. Etiology being the science of cause and effect relationship of the environment and the human nature can be the true basis of preventive medicine. The human body is inhabited by staphylococci, streptococci, pneumococci, Escherichia coli, Proteus, fungi and hundreds of species of bacteria and viruses. But they do not act as pathogenic factors with respect to everyone. It is important to study biological regularities, which reveal the cause and effect relationship between a trauma-causing factor and a traumatic process, implementation of contagium and infection, etc. Where etiology is the external, pathogenesis is the internal, “i.e. organism refracts the external in its own manner”, thus forming mechanisms of disease development. Thus, pathogenesis is a certain “physiological appointment of a phenomenon”. It is directly referred to “the principle of environmental adequacy of structures and functions of the body, on the one hand and the irritants of the external environment, on the other hand”. An individual can train or inherit “his own pathogenic mechanisms”. Disorders of blood circulation, degenerative and infiltrative processes, inflammation, regeneration, atrophy, hypertrophy, tumor, immunity, etc. are the set of compensatory and adaptive reactions of an organism living in a particular external environment. The negative balance of nitrogen, sulfur, phosphorus at the affects that injure the organism appear as a catabolic reaction-the disorder of the protein and mineral metabolism. In fact, due to the body's own resources, regeneration is facilitated by the deploying an adaptive act of mobilization of the required substances. Therefore, in terms of etiology as a theory, for prevention of diseases it is more important to know the “causes of inaction”, i.e. the health etiology, “in order to understand the action from the scientific point of view”. Prevention of morbidity and decrease of the extent of its “legibility” is more important than the treatment of a sick person itself. This, in terms of the biological nature of the human, the biological training of the organism to restructuring itself depending on the environmental conditions and its ecology, requires studying and developing preventive measures targeting the change of the conditions and the style of human life. This is the true etiotropic treatment of its main diseases. “This is the future of medicine in its main trends”. Development of technology has given birth to the conflict between the initiative social principle in the nature of a human and the “conservative stability” of his animality. The result is the diseases, which are social by origin and biological by their adaptive nature. The objective of the preventive medicine is to solve this conflict. The insufficiency of adaptive mechanisms causes the main number of pathogenic factors. Since ancient times, the idea of health’s opposition to diseases exists in medicine. But the states of disease and health depend on the intensity of the external or internal irritants and the ability to “react to them in adaptive manner”. The adaptive structures and functions ensure saving the organism's stamina. It must be “ready for irritation and adaptation”, which means the reserve. Equal irritants can cause different effects depending on the functional state.
of the live system. For example, autoinfection is the consequence of insufficient adaptability to the actions of its own microorganisms. Exogenous diseases act in the same manner. Failure to adapt causes disease as a legitimate phenomenon. Success in adaptation means health. Adaptation is carried out reflexively and the conditioned reflexes are improved by training. If they are well-trained (environmental readiness of an organism to adaptation), the environmental factors become natural for the life. Adaptation as a factor of evolution is the transition to a new qualitative level of organism's processes. I.V. Davydovsky suggested making a healthy person the object of medical research, to search for “not only individual, but also for typological and collective adaptive abilities”. It is important for medicine to “know, first of all, the biomechanisms of surviving, i.e. adaptation, in order to understand the mechanisms of their missing or insufficiency”. Absence of principal, natural sciences grounds and theoretical generalizations in science repeatedly causes its crisis, including stagnation of practice”. The real change of the morbidity situation is to involve in-depth changes of the style and the conditions of human life: expansion of the range of human adaptive abilities, correct ratio of the labor and rest rhythms and skillful arrangement of intellectual labor.

CONCLUSION

The former approaches to the etiology of diseases and health turned out to be inconsistent—they do not meet the requirements of the prevention tasks. The factors of external environment permanently test the human adaptive mechanisms for endurance and flexibility of structures, which determine the non-disease. The majority of the affects of the environmental factors “are mainly the health organizers”; they force the organism to respond in accordance with the principle of unconditioned and conditioned reflexes. Currently, we face, on the one hand, the increase of living amenities and, on the other hand, “herbal poisons, insecticides, intensive... treatment... by the chematherapeutic agents, hormones,... intervention in the reactive status of an organism (serums, vaccines), “atrophy” of physical labor and hypertrophy of nervous labor with nervous fatigue”; it requires the contemporary medicine to study it out very seriously. The time to study out seriously this loading of the human adaptive abilities has come. Therefore, the issue of the necessity to develop the problems of environmental readiness of human body for adaptation is a matter of high importance. It is important to study etiology, pathogenesis, the subject matter of diseases and the health state from the perspective of adaptive mechanisms, which guarantee the organism's self-protection. It is also important for a human heading to longevity to be proficient in the methods of enhanced studying his own ecology and his own nature, thus expanding the potential opportunities of maintaining his health.

Summary:

- The health state is the state of normally passing physiological processes, which are ensured by the activity of the central nervous system with regard to balancing the influence of the environment on a human and adaptation of the functional systems of an organism to it.
- The essence of pathological processes is the adaptive and compensatory reactions.
- Adaptation can be normal (without any harm to health) or pathogenic (when it turns into a disease).
- The ability of adaptation is the basis of health.
- The health entirety is the entirety of adaptation to the changing factors of the environment.
- Adaptation is not always ideal—the more complicated the environmental situation is, the more versatile the test of physiological systems' reliability is.
- It is important to reveal and develop methods of determining the environmental readiness for adaptation of a human organism.
- Etiology being a study of cause and effect relationship of the environment and human nature is equally related to the concept of disease etiology and to the concept of health etiology.
- The concept of health etiology is the basis of hygiene and is directly related to preventive medicine.
- Diseases are related to the person's activity, his way of living and the state of ecology and physiology of the person.
- It is important to study etiology, pathogenesis, the subject matter of diseases and the health etiology from the perspective of adaptive mechanisms, which guarantee the organism's self-protection.
- Winning longevity requires in-depth study of human’s own ecology and nature with the purpose of expansion of the potential opportunities for preservation of his health.

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