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Information concept of the human health phenomenon as a guarantee of bioecosystem stability

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Abstract. The current idea of the phenomenon of human health is strongly associated with a harmonious, well-developed personality. A healthy person in all respects can be called one who adequately responds and adapts to the changing conditions of the ecological, biological and social environment. The main prerequisites for health are the stability of the bioecosystem and sustainable resources. Aim/tasks is the theoretically substantiate the information-structural model of human health and the characteristics of its components. The theoretical and methodological basis of the work was the synergistic use of the principles of science and a systematic approach, which led to the choice of research methods: general scientific (analysis, synthesis, systematization, generalization of literary sources); interdisciplinary (structural-system approach, axiological method). Based on the use of the method of information-structural modeling, the modern trend of natural science is substantiated, which is the key to the stability of the bioecosystem - the information model of human health. It consists of the following blocks: information field of knowledge of the main subject areas; information and technological base of research; information and organizational management tools. The basics of a new interdisciplinary approach to the formation of a generalized idea of the phenomenon of human health from the standpoint of information-structural modeling: systematized information concept of integrated health as a unity of physical, mental and social health, verified it, obtained information about the system in as a whole by translating verbal-qualitative information into quantitative assessments. Conclusions. It is emphasized that the information space of individual health statuses is a holistic multidimensional dynamic system of a certain structure, in which the system-hierarchical homeostasis of interaction of physical, mental and social health statuses at different hierarchical levels is realized. It is proved that the information concept of the phenomenon of human health promotes the further integration of various data, builds constructive ways to formalize complex natural objects, and determines the stable functioning of the bioecosystem.

1. Introduction

The current view of the human health phenomenon is transversally associated with a harmonious, well-developed personality. A healthy person in all respects can be called one who is able

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to adequately respond and adapt to changing conditions of ecological, biological and social environment, systematically improves himself, maintains a high personal capacity [1, 2].

Relative stability of the bioecosystem and sustainable resources are considered to be important predictors of health, the presence of which allows everyone to realize their health potential [3]. The bioecosystems balance is considered not only in terms of stabilizing normal environmental conditions where they have not been damaged by previous anthropogenic activities, but also the restoration of damaged bioeconomy in order to prevent further disturbance of the ecological balance of the planet. Only consolidated efforts and active restoration and conservation activities can ensure the achievement in the future of a stable planetary ecosystem with optimal physico-chemical parameters for human existence [4].

The concept of sustainable resources involves not only the prevention of depletion of energy resources, minerals, raw materials. It is much larger and involves prudent management, taking into account the financial and material resources of countries, communities, individuals, unused resources of production, materials and tools, intellectual resources, the potential of public and private initiatives. The more different resources are in the assets of a certain structural entity (person, community, organization, region), the greater the potential for directing these resources to health measures.

At the present stage of the study of the multifaceted phenomenon of human health use the idea of health as an integrated system that allows to perform the main function of the viability of the organism and human life in society [5]. When it comes to the level of integral health, its high degree should be characterized by a functional balance of the body with the environment in the presence of physical, mental and social comfort [6, 7].

The modern information paradigm of the human health phenomenon concept is presented as the unity of physical, mental and social aspects [8]. Recently, it has become clear that further productive solutions to health problems are possible not only through the universalization of the definition of health, but also through new approaches, principles of its study, where sustainable development and information technology are special [9]. Thus, there is a clear approach to the study of the information concept of the phenomenon of human health as a guarantee of stability of bioecosystems.

The research aim is to theoretically substantiate the information-structural model of human health and to characterize its components.

2. Methodology

The theoretical and methodological basis of the work was the synergistic use of the following components: the scientificity principle to reveal the causal links in a complex system of integrated health and balance of the body with the environment in the presence of physical, mental and social comfort, and a systematic approach finding out the real difficulties that have arisen in the process of studying the phenomenon of human health and developing options for their elimination. This approach has led to the choice of certain research methods: general - analysis, synthesis, systematization, generalization of scientific content on the information concept of the phenomenon of human health from literary sources; interdisciplinary - axiological method was used to study the achievements of the scientific community in the field of information concept of integrated health; the method of information-structural modeling involved a multifaceted study of integrated health and the creation on this basis of information-structural model of human health, characterization of its components and relationships with the environment as a guarantee of stability of the bioecosystem. The combination of research selected methods is justified by the complexity and ambiguity of the studied problem and the need for in-depth knowledge, which is not limited to analysis and systematization of a wide range of scientific sources, but reaches the level of worldview generalizations.

3. Results

The use of information-structural modeling involves a deductive way of dividing a complex problem into qualitative blocks that contain information about the structure and functioning of the subject of modeling, as well as a description of the overall organization of these blocks and their problem-oriented verbal components [10, 11]. Based on this method use, the current trend of natural science, which is the key to the stability of the bioecosystem, is the information model of human health. It consists of at least three blocks: the information field of knowledge of the main subject areas; information and technological base of research; information and organizational means of management (figure 1).

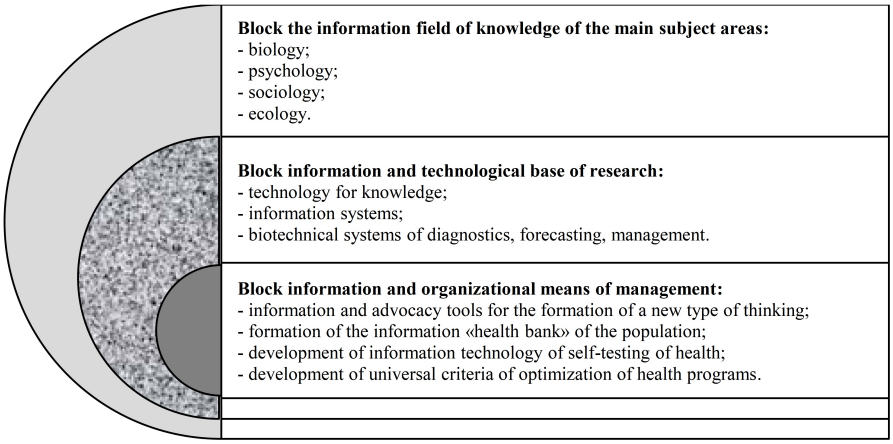

Figure 1. The information model of human health

The first block is the information field of knowledge of the main subject areas which is divided into such subject areas that constitute the necessary knowledge of interdisciplinary research and are basic for the category of human health: biology, psychology, sociology, ecology. It provides basic knowledge for shaping health concepts as a guarantee of bioecosystem stability. It is through these disciplines that a systematic synergistic approach to the problem of health from the standpoint of the unity of physical, mental and social aspects in the functioning of biosystems, implements interdisciplinary research methodology, conceptual exchange of constructive information. The criterion for the separation of knowledge in these subject areas is the criterion of compliance of knowledge with the global goal of research on the phenomenon of health, namely:

(i) human health in different environmental environments from the standpoint of physical, mental and social status;

(ii) the dependence of health on the interaction of major factors: genetic, environmental and lifestyle;

(iii) the formation, maintenance and development of human health in a single intrasystem (human) and system-environmental (human + environment) information space.

Biology, formulating patterns of functioning of individual organs and physiological systems of the body, makes it possible to determine individual deviations or features of these manifestations in the body of a particular person in the range of norms in the form of appropriate normative indicators. Biological sciences gain knowledge about the structural and functional organization of the brain, individual characteristics of the central and peripheral nervous systems, higher nervous activity. Psychology, the object of study of which is a person, his personality, social

relations, belongs to the humanities. She studies the patterns of manifestation and development of the psyche, mental phenomena that are divided into mental processes, properties and states. This division is conditional, because all mental processes are interdependent. The course of mental processes always occurs against the background of certain mental states, and individual differences in mental processes act as characteristics of mental properties.

Sociology studies the social mechanisms of the relationship personality-society, specific forms of manifestation of general laws in the field of social interaction of people in historically formed forms of communication. More important for the problem of health is the aspect of phenomena and processes that occur when people interact with society, group interactions with other people in accordance with generally accepted moral and ethical values in this society. The nature of moral relations, conflict or comfort of social behavior of the individual as a member of a social group affect the mechanisms of its systemic and environmental homeostasis.

Ecology as a science studies the patterns of formation and functioning of biological systems in their interaction with the environment. In the complex of environmental problems of human health is a central system-forming factor that combines various studies aimed at studying the patterns of influence of various external influences on the human body. Nowadays, the issue of environmental conditionality of the population is very important. To solve it, one must learn to objectively assess not only human health, but also the health of the environment. It should be noted that the environment is diverse, unstable and multifactorial.

Within the studied focus of the problem in this subject area requires knowledge of the econorm as a systemic-environmental homeostasis of human interaction with different environments - natural (environment), social, informational and spiritual. Equally important is knowledge of methods and techniques for diagnosing the functional state of man in extreme environments, its ultimate ability to adapt to them, as well as knowledge of methods and tools to maintain systemic and environmental homeostasis of the human body in various extreme environments.

Logically related to the latter is the knowledge of diseases treatment methods of various environmental environments that surround man. By diseases treatment we mean the creation, if possible, of such an eco-environment (natural, social, informational, spiritual), which would not harm human health and contribute to the disclosure of all its potential: physical, spiritual, intellectual, etc.

The second block of the health problem is the information technology research base. Today, each of the sciences described above has its own methods and diagnostic tools that assess the indicators of mainly their side of human health (body, brain behavior) in changing environmental conditions. The current level of development of new information technologies with their methodology, methods, tools of analysis and synthesis allows to reach a new level of awareness and presentation of already known and new knowledge. However, the development of such a unified technology for integrated health research, taking into account its complex bioecosystem nature, is just beginning.

This unit is conventionally divided into the following components: information technology for knowledge; information systems; biotechnical systems of diagnostics, forecasting, management. The first component includes the following components:

(i) technology of data awareness - obtaining information;
(ii) information awareness technology - obtaining knowledge.

Note that this division of the first component is consistent with the main idea of information technology, namely the awareness of the triad data - information – knowledge. The component Information Systems, in turn, is divided into:

(i) information and reference systems;

(ii) information-analytical systems (diagnostic, forecasting, control, and monitoring, working in different time slices: continuous monitoring of the state of the object of study and discrete-continuous);

(iii) information and consulting systems;

(iv) expert and polyalgorithmic expert systems of diagnostics, forecasting and management.

The separation of biotechnical systems of diagnostics, forecasting and management as a separate unit of information systems (because sometimes a biotechnical system can be considered as a type of information system) is due to its direct connection with man (healthy or sick) as opposed to information system with a person both directly and indirectly. In addition, information systems also deal with the information field of knowledge about the human environment.

The block isolation of information-technological base of research with its components provides facilitation and streamlining of work with large flows of information in the multifaceted field of knowledge. The purpose of this block is to collect, store and analyze the information field of knowledge of the subject areas of biology, psychology, sociology, ecology, as well as the transformation of this knowledge to solve problems of maintaining and promoting health.

The third block consists of information and organizational tools for health management: information and advocacy tools for the formation of a new type of thinking (development of healthy lifestyle skills, fashion for health); formation of the information health bank of the population according to the unified technology of bioecomedicine; development of information technology of computer self-testing by the user of the integrated health index; development of universal criteria of adequacy and optimization of health programs aimed at the formation and maintenance of health at all ages of human life.

Health as the most important process of life of the human body and personality is influenced by a whole range of environmental factors - physical, spiritual and social. It follows that it is absolutely necessary to distinguish the physical, mental and social aspects of health, which are equally represented in the overall structure of health as a holistic bioecosocial system. At the same time, it is possible to form an informational idea about the block structure of the health category by decomposing it as a whole.

The health information structure can be represented as a hierarchically branched tree with five levels. Each level, in turn, contains a different number of information models that reflect its current state.

The first level of health structure is individual integrated health.

The second level is formed by certain aspects of health - the so-called statuses: physical, mental and social.

The third level consists of the health status components, each of which has its own structure and function. The components of physical health are: the body's internal physiological systems and the body's control systems. The components of mental health are: intelligence, emotions and character. The components of social health are: personal-environmental and personal-moral aspects.

The fourth level is formed by the component elements. For components of the internal physiological system of the body - these are individual physiological systems of the body, such as cardiovascular system, respiratory system, blood system. For the governing system of the body - the nervous system, immune system and endocrine system. The components of the intellectual component are: properties of thinking, memory, attention and perception. The components of the emotional component are the subjective experiences of the individual - the impressive and expressive components. The components of character are the qualities of the individual responsible for maintaining and maintaining health. The following are accepted as components of the social component: adaptation to physical living conditions; adaptation of

personality to working conditions; adaptation to the moral and ethical norms of society. The personal and moral component is formed by: honor, conscience, dignity, responsibility, charity.

The fifth level of the structure of health is formed by separate indicators of all components of health. Thus, for the cardiovascular system as a component it is: heart rate, systolic blood pressure, diastolic blood pressure, cardiac output, etc. Values of physical health indicators are obtained by clinical-diagnostic and laboratory methods or by calculations. Indicators of mental and social status are determined by methods of field and laboratory observation, testing, surveys, questionnaires, etc. We describe the principles on which the concept of the human health phenomenon as a guarantee of stability of the bioecosystem.

The generalization principle of the information knowledge field. The general picture of the information field of interconnected flows of knowledge in the subject areas of biology, psychology, sociology, ecology, which are changing dynamically, is represented by the function of a specific task of interdisciplinary research to be solved.

The principle of systematic research. In order to optimize the solution of complex problems of different fields of knowledge, it is necessary to consider the object as a holistic system, identifying the diversity of types of connections in it and reduce them to a single theoretical picture.

It should be noted the relationship between the principle of systematic research with the principle of generalization of the information field of knowledge. Systematics directs the researcher to a comprehensive intrasystemic study of the interconnected functioning of physiological systems of the body, on the one hand, and systemic-environmental interaction of man with the environment - on the other, which allows to distinguish between general and specific patterns of environmental impact as the unity of physical, mental and social statuses. The systems approach prompts the researcher who solves a specific problem to be included in the general picture of the information field of knowledge in the subject areas of biology, psychology, sociology, ecology.

The principle of homeostasis at different levels of biosystems organization. For the harmonious evolutionarily adequate functioning of the complex object man + eco-environment it is necessary to maintain a dynamic balance of system-environmental interaction in changing eco-environments, onto- and phylogeny. Thus, the observance of this principle as an attribute of systematics pursues the goal of forming the harmony of the bioeco-object.

The adequacy principle of system-environmental interaction. To ensure the adequate functioning of the object of study in the comprehensive diversity of its conditions in terms of human health - its physical, mental and social status, and the state of eco-environments, including extreme, with which man interacts, it is necessary to individually objective adaptation of system-environmental interaction, ie intrasystemic adaptation of a specific complex object of functioning man + eco-environment.

The internal systemic adaptation of such a complex object should be understood not only as the mutual adaptation of man - eco-environments, but also the adaptation of only man to eco-environments or only eco-environments to man. In this case, individual-object adaptation can be carried out due to both the evolutionary mechanisms of adaptation, and introduced external control actions.

The principle of adequate optimality of system-environmental interaction makes it possible to understand that in the formation, maintenance and development of human health should rely not only on its ability to adapt to environmental conditions, but also on the transformation of ecosystems in the interests of human health, physical, spiritual, intellectual and social needs. Thus, compliance with the principle of adequate optimality of system-environmental interaction is a necessary condition for the implementation of the principle of homeostasis at different levels of organization of bioecosystems.

The principle of evolutionary compensation. Evolution-appropriate management actions are a priority to ensure individual-object adaptation. In this case, evolutionary adequacy is

determined by the specific object of study.

The humanization principle. To ensure the comfortable functioning of man in the environment, regardless of the state of his physical, mental and social status, it is necessary to create such eco-environments that are adequate to the capabilities of the individual, meet his physical, spiritual, intellectual and social needs and contribute to its potential.

The principle of ethics and aesthetics of human interaction with eco-environments. In order to form, maintain and develop health as an alternative to the endless treatment of human diseases and eco-environments, it is necessary to cultivate consciously caring attitude to eco-environments and consciously caring eco-environments, remembering that the main commandment of medicine Do no harm directly, but also indirectly, through the eco-environments that surround it.

The principle of the information space intellectualization. In order to optimize the process of solving complex problems in a single information field of knowledge of the subject areas of biology, psychology, sociology, ecology should use the latest information technology, including methods, algorithms, mathematical, informational and verbal models, hardware and software, resulting in information product, the power of information intellectualization which is determined by the ability of the researcher to form it and gain new knowledge, including those that go beyond the task. The ability to generate new knowledge and generalize them depends on the intellectual component of the researcher: logical, associative, algorithmic thinking.

4. Conclusions

It is established that the information space of individual health statuses is an integral multidimensional dynamic system of a certain structure, in which the system-hierarchical homeostasis of interaction of physical, mental and social health statuses at different hierarchical levels is realized. It is proved that the information concept of the phenomenon of human health promotes the further integration of various data, builds constructive ways to formalize complex natural objects, and determines the stable functioning of the bioecosystem. The basics of a new interdisciplinary approach to the formation of a generalized view of the phenomenon of human health from the standpoint of information-structural modeling: systematized information concept of integrated health as a unity of physical, mental and social health, verified it, obtained information about the system in as a whole by translating verbal-qualitative information into quantitative assessments. The main purpose of this approach is to learn to assess the limits of harmonious human interaction with the environment and to learn the mechanisms that ensure this harmony. To achieve this goal requires information integration and transformation of knowledge accumulated in the subject areas of biology, psychology, sociology, ecology - building an information space using the latest information technology to develop adequate and optimal measures, including diagnostic, treatment, rehabilitation, prevention. This space is the only field of knowledge of these subject areas, which is focused on the formation, maintenance, development and restoration of human health, which operates in different environments. The algorithm for achieving the global goal in the form of a set of principles reflects the essence of a systematic approach to solving specific problems. Today, as never before, people are increasingly realizing that the formation, maintenance and development of their health depend on a single field of knowledge in different subject areas. Combining knowledge of the subject areas of biology, psychology, sociology, ecology as the most important for human health is the first contribution to the formation of a healthy society of the future as a guarantee of bioecosystems stability.

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References

[1] Voronova O A and Ponomarenko V S 2005 *Health Basics* (Kyiv: Alaton)
[2] Olsen K M and Dahl S 2007 *Soc Sci Med* **64**(8) 1665–1678 URL https://doi.org/10.1016/j.socscimed.2006.11.031
[3] WHO 1986 Ottawa charter for health promotion *Ottawa Charter for Health Promotion: First International Conference on Health Promotion* (Ottawa) URL https://www.healthpromotion.org.au/images/ottawa_charter_hp.pdf
[4] Acemoglu D and Robinson J A 2012 *Why nations fail: the origins of power, prosperity, and power* 1st ed (New York, USA: Crown Publishers)
[5] Gritsenko V I, Below V M and Kutova A 2006 *Bulletin of the National Academy of Sciences of Ukraine* **6** 51–56
[6] Apanasenko G L 2015 *Environment and health* **3** 8–13
[7] Moskalenko V F, Hulchii O P, Hruzieva T S, Lekhan V M, Pershahen Y and Hernandez R 2013 *Public Health* (Vinnitsa, Ukraine: New book)
[8] Khrystova T Y 2018 *Scientific and methodological bases of using information technologies in the field of physical culture and sports* **2** 120–123
[9] Knihavka V H 2015 *Medical informatics* (Kharkov, Ukraine: KhNMU)
[10] Gorokhovatskaya O Y 2004 *Science and science* **2** 74–79
[11] Lange T 2006 *Model selection and information fusion in grouping problems* Ph.D. thesis Swiss Federal Institute of technology URL https://doi.org/10.3929/ethz-a-005280052