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BUKOVINIAN STATE MEDICAL UNIVERSITY OF
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**TEACHING AND METHODOLOGY MANUAL "LIFE
SAFETY"**

for students of medical specialties of higher educational institutions

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INTRODUCTION

Problem of protection people from the dangers arose with the advent humanity in the world. In the XXI century humanity has entered a difficult period in the history of it's development, when it possessed an enormous scientific and technical potential, but has not yet learned how to carefully and efficiently use it. Rapid urbanization and industrialization, a sharp increasing in world population, the intensive using of chemicals in agriculture, strengthening of many other types of human pressure on nature, violated the biological cycle of substances in nature, damaged its regenerative mechanisms, and began its progressive destruction. This jeopardized the health and lives of present and future generations of people, the existence of human civilization. Throughout history, humanity strives to make life comfortable. In the human quest for knowledge often means replacing the target and person becomes an appendage to the created by himself, and his creations are a threat to him.

As a normative educational discipline, "Life Safety" is an integrated humanitarian-technical discipline that summarizes information relevant for scientific and practical activities, forms a conceptual-categorical theoretical-methodical apparatus necessary for the further development of labor protection, environmental protection, civil protection and other disciplines studying specific dangers and methods of protection against them. This training course does not address specific security issues. This is a question of special subjects, such as labor protection, civil protection, industrial ecology, communal hygiene, etc. As a world view discipline, the safety of life involves general education in the field of safety, is a scientific and methodological basis for all special disciplines without exception. It is based on a multifaceted understanding of the object and perception of reality, which requires the integration of various strategies, spheres, aspects, forms and levels of knowledge. A specialist who has mastered the subject "Life Safety" acquires special competencies to act in conditions of danger and protect himself, his life and health, and the life and health of others.

TOPIC 1

"THEORETICAL BASIS OF THE LIFE SAFETY"

1. ACTUALITY OF THE TOPIC

Every day, the mechanisms of interaction between man and nature, man and technology, individual and the environment are more often violated. This leads to the appearance of dangers that stand in the way of human activity. A manifestation of this is significant costs in the form of human casualties, damages from accidents, catastrophes, natural disasters, etc.

2. EDUCATIONAL OBJECTIVE

- master knowledge of life safety as an integrated educational discipline, its purpose, tasks, components, importance of knowledge of life safety for doctors of various profiles;
- learn the basic principles and safety methods of ensuring human life.

3. LIST OF QUESTIONS ASKED IN THE CLASS

- Terminological and conceptual apparatus of life safety.
- Main tasks of the discipline.
- Axiom about potential danger. Hazard classification.
- The concept of risk. Risk management.
- Principles of determining the acceptable level of negative factors in relation to human health.
- Principles and methods of ensuring human life safety.
- Basics of life safety management.

4. PROFESSIONAL COMPETENCES

The student must:

Know:

- basic concepts, definitions and terms of life safety
- hazard classification
- principles of determining the acceptable level of negative factors

Be able:

- identify the danger
- determine the causes and possible consequences of hazards
 - to classify dangerous, harmful and impressive factors
- assess the level of security
- to determine risk indices of the occurrence of dangerous events
- suggest possible measures to reduce hazards • calculating the risk of injury to people engaged in a certain type of activity

5. SYNOPSIS OF THE SUBJECT OF THE TOPIC

Life safety (BZhD) is a science that studies the general laws of the occurrence of hazards, the consequences of their impact on the human body, methods of prevention and protection against them, which ensures health, longevity and optimal conditions for the existence of mankind. The discipline "Life Safety" uses terms that require interpretation. Security is a state of protection of a person and society against the risk of being harmed.

The term "life activity" consists of two words - "life" and "activity". Life is one of the forms of existence of matter, which is characterized by the ability to reproduce, grow, develop, actively regulate its composition and functions, the presence of various forms of movement, response to irritation, the ability to adapt to the environment, and the presence of metabolism. Activity is a specifically human form of activity, a necessary condition for the existence of human society, the meaning of which is the expedient change and transformation of the environment in the interests of man. Therefore, life activity is a process of balanced existence and self-realization of an individual, a group of people, society and humanity in general in the unity of their vital needs and opportunities.

The tasks of the "Life Safety" discipline are:

- identification of potential dangers;
- determination of negative factors caused by the sources of these dangers and forecasting the consequences of their impact on the human body;
- ensuring normatively acceptable levels of influence of negative factors on people and the natural environment;
- development of measures and their application to create healthy and safe living conditions in the "man - living environment" system and in the event of emergency situations;
- prevention of emergency situations, and in the event of their occurrence, taking adequate decisions and carrying out actions aimed at their elimination;
- use of the legal framework for human and environmental protection, individual rights to work, medical care, protection in emergency situations, etc.

The main object of studying BZhD is potential and real danger. A hazard is a condition or situation that occurs in the environment and is capable of causing harm to people, the natural environment, and material values. Any human activity is potentially dangerous, that is, any human environment that has a certain energy, chemically or biologically active

substances or other factors incompatible with living conditions is potentially dangerous.

Based on this, an axiom about potential danger is formed: potential danger is a universal property of the process of human interaction with the environment at all stages of the life cycle. The axiom of potential danger determines that all human actions and all components of the living environment (primarily technical and technological) in addition to positive properties and results have the ability to generate negative factors. At the same time, any new positive action or result of human activity is inevitably accompanied by the emergence of a new potential danger or group of dangers. Even with the highest level of technical development, the absolute elimination of sources of danger is impossible. The conditions under which the danger can turn into an event is called a dangerous situation. A situation in which an accident may occur is considered dangerous, or an emergency, and if people die, it is considered catastrophic. In addition to dangerous situations, there are also extreme situations.

A situation is called extreme when a person's psychophysiological load has reached such a level that he can lose the ability to rational actions and adequate actions in accordance with the circumstances that have arisen.

Hazard classification:

- by origin (natural, man-made, social, political, combined);
- by the time of manifestation (impulsive, cumulative);
- by location (space, atmosphere, lithosphere, hydrosphere);
- by consequences (illness, injuries, death, decrease in normal physical, mental, emotional level of human activity, fire);
- for damage (social, technical, environmental);
- by field of manifestation (domestic, industrial, service, sports, road and transport);
- by structure (simple, complex, derivatives);
- by the nature of the action on a person (active, passive).

Dangers of natural origin:

- climatic - depend on meteorological conditions, the level of solar activity, movement of air masses, fluctuations in atmospheric pressure, distribution of heat and moisture, which cause sudden cooling and onset of heat, torrential rains, storms, hurricanes, storms, etc.;

- soil - defined by the characteristics of different types of soil, the possibility of erosion, landslides, formation of ravines;
- geomorphological - due to the peculiarities of the structure of the geological structures of the Earth's interior, relief, susceptibility to earthquakes, volcanic activity;
- biotic - impact on humans of dangerous representatives of flora and fauna, viruses, microbes.

Man-made hazards:

- technical - depend on the level of reliability and the degree of ergonomics of the equipment, the use in its design of protective barriers, safety devices, signaling and blocking means, the perfection of technological processes, the correct sequence of performed operations, etc.;
- sanitary and hygienic - arise in case of increased content of harmful substances in the air of the living environment, insufficient or irrational lighting, increased noise level, vibration, unsatisfactory microclimatic conditions, presence of various radiations above permissible values, violation of personal hygiene rules, etc.;
- organizational - this is a system of rules, norms, instructions, standards regarding the performance of work, scheduled and preventive maintenance of equipment, organization of supervision of dangerous work, use of equipment, mechanisms and tools as intended, etc.;
- psychophysiological - determined by human fatigue during the production process due to excessive physical and psychological stress, failure to maintain a healthy lifestyle.

Social dangers:

- state-legal - caused by the absence or insufficient elaboration of the legislative and legal framework, universally binding norms of behavior, as well as a weak state guarantee of the protection of law and order (increase in illegal actions, terrorism, crime and criminalization of society, speeches of certain sections of society in defense of their rights);
- ethno-social - depend on the peculiarities of life, customs, culture, religion of the ethnic community (international conflicts);
- informational and psychological - informational pressure on society and the individual.

Political dangers - conflicts at the international and interstate levels, spiritual oppression, political terrorism, ideological, inter-party and armed conflicts, wars.

Combined hazards: natural and man-made hazards: smog, acid rain, ozone holes, "greenhouse effect", dust storms, soil erosion, decrease in soil fertility, emergence of deserts, landslides, mudslides, earthquakes and other tectonic phenomena that occur due to human activity; natural and social dangers: drug addiction, epidemics of infectious diseases, venereal diseases, AIDS; socio-technogenic hazards: occupational morbidity; occupational injury; mental disorders and diseases caused by industrial activity; mass mental disorders and diseases caused by the influence of the mass media on the consciousness and subconsciousness of a person, drug addiction. In order to effectively prevent the occurrence of undesirable consequences, it is necessary to be able to quantitatively assess the danger of this or that environment of a person's stay. For the purpose of unification, any consequences of a hazard are defined as damage. Each individual type of damage has its own quantitative expression. For example, the number of dead, wounded or sick, the area of the infected area, the area of the forest that burned, the value of the destroyed buildings, etc.

The most universal quantitative means of determining damage is value, that is, determining damage in monetary terms. The second, no less important characteristic of danger, or more precisely, the measure of possible danger, is the frequency with which it can manifest itself, or risk.

According to DSTU 2293-99, "risk is the probability of causing harm, taking into account its severity". Thus, risk is a quantitative characteristic of the effect of a hazard, which is formed directly by human activity (R), that is, the number of deaths, the number of cases of illness, the number of cases of temporary or permanent loss of working capacity (disability) caused by the effect on a person of a certain hazard (electric current, dangerous substance, moving object, etc.); (n) in relation to a certain number of people (N) in a certain period of time (t):

$$R = \frac{n}{N \cdot t}$$

According to the degree of admissibility, the risk is:

- neglected - has such a low level that it is within the permissible deviations of the natural (background level);
- acceptable (permissible) - is considered such a level of risk that society can accept (allow), taking into account technical, economic and social opportunities at this stage of its development;

- maximum permissible is the maximum risk that should not be exceeded, regardless of the expected result;
- excessive - characterized by an exceptionally high level, which in the vast majority of cases leads to negative consequences. The first three types of risk are acceptable and justified in many types of activities, and excessive risk should be classified as unjustified.

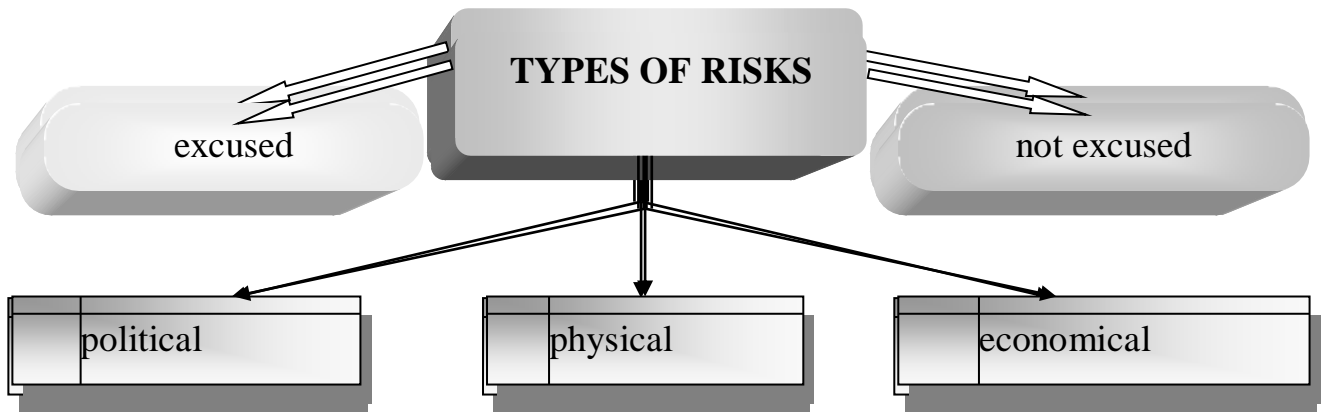


Figure 1. Types of risks

The essence of the concept of accepted (tolerable) risk is the desire to create such minimal security as is perceived by society at present, based on the standard of living, socio-political and economic situation, and the development of science and technology. The concept of acceptable risk can be effectively applied to any field of activity, industry, enterprises, organizations and institutions.

Acceptable risk combines technical, economic, environmental, social and political aspects (fig. 1) and represents a compromise between the level of safety and the possibilities of achieving it. First of all, it should be taken into account that the economic possibilities of improving security, for example, of technical systems, are not unlimited. Spending too much money on improving their security can cause damage to the social sphere, for example, worsen medical care. In order to determine the seriousness of the danger, there are different criteria.

The categories of severity of danger (table 1) establish the quantitative value of the relative seriousness of the probable consequences of dangerous conditions. The use of a hazard severity category is very useful in determining the relative importance of using preventative measures to ensure life safety when applied to certain conditions or system damage. For example, situations belonging to category I (catastrophic hazards) require more attention than those classified to category IV (insignificant hazards).

Hazard probability levels (table 2) are a qualitative reflection of the relative probability that an undesirable event will occur, which is a consequence of an unremedied or uncontrollable hazard.

Table 1

Hazard severity categories

The type of danger	Category	Description of the accident
Catastrophic	I	Death or system crash
Critical	II	Serious injury, persistent disease, significant damage to the system
Borderline	III	Minor injury, short-term illness, damage to the system
Insignificant	IV	Injuries, diseases, damage to the system are less significant than in category III

Based on the higher probability of danger of any system, it is possible to draw conclusions about specific types of human activity. Therefore, using both hazard severity and hazard probability techniques, hazards can be identified, studied, classified, and resolved based on hazard severity, potential consequences, and the likelihood that such consequences will occur.

Table 2

Levels of probability of danger

Type of hazard probability	Level	Description of consequences
Frequent	A	There is a high probability that the event will occur
It is possible	B	It can happen several times during the life cycle
Accidental	C	Sometimes it can happen during the life cycle
Distant	Д	An unlikely but possible life-cycle event
Unbelievable	E	It is so unlikely that it can be assumed that such a danger will never occur

By establishing an alphanumeric risk rating system, for each severity category and each probability level, risk can be further classified and evaluated by degree of acceptability (table 1, 2). The use of such a matrix facilitates risk assessment (table 3).

Table 3

Risk assessment matrix

The frequency with which the event occurs	Категорія небезпеки			
	I Catastrophic	II Critical	III Border-line	IV Insignificant
Often (A)	1A	2A	3A	4A
Authentically (B)	1B	2B	3B	4B
From Time to Time (C)	1C	2C	3C	4C
Removed (Д)	1Д	2Д	3Д	4Д
Incredible (E)	1E	2E	3E	4E

Hazard risk index

Risk classification	Risk criteria
1A, 1B, 1C, 2A, 2B, 3A 1Д, 2C, 2Д, 3B, 3C 1E, 2E, 3Д, 3E, 4A, 4B 4C, 4Д, 4E	Inadmissible (excessive) Unwanted (extremely acceptable) Acceptable with verifi Acceptable without checking (ignored)cation (acceptable)

The concept of risk combines two elements - risk assessment and risk management. Risk assessment is an analysis of the origin (occurrence) and scale of risk in a specific situation; risk management – analysis of the risk situation and development of a solution aimed at minimizing the risk. Any risk assessment begins with the analysis of information about previous events and their consequences. This assessment is a forecasting process based on past experience.

The risk management procedure consists of four stages:

- the first - related to the risk characteristics;
- the second stage – determination of risk admissibility;
- the third stage – the process of comparison by the "costs-benefits" method;

- the fourth (final) stage - control, which consists in obtaining information about the losses that occurred and the measures taken to minimize them.

When analyzing the degree of danger, individual and social risk are distinguished. Individual risk characterizes the degree of realization of a specific danger for an individual. Social risk is the degree of realization of a specific danger for a social group of the population. That is, social risk is a dependence between the frequency of hazards and the number of people injured.

Principles of determining the acceptable level of negative environmental factors in relation to human health Perception of the state and changes in the characteristics of the environment is carried out by a person with the help of analyzers (visual, tactile, auditory, etc.), which ensure the reception, processing and transmission of information to the corresponding areas of the cerebral cortex. In the cortex of the brain, which is the highest link of the central nervous system, this information is analyzed.

At the same time, the program of the appropriate reaction of the physiological and mental processes occurring in the human body is formed. In this regard, when solving the tasks of ensuring life safety, it is important to identify the acceptable level of negative factors of the environment in relation to human health.

The level of an external stimulus can be different - below the permissible level, permissible, above the permissible level. In the case of an external stimulus with a level below the permissible level (below the minimum sensitivity of the analyzer), a person does not feel it.

With the permissible intensity of the action of an external stimulus, a person perceives information that comes from the outside in a natural form. For example, she sees, perceives the surrounding world by touch, hears its sounds, inhales the aroma of various smells. That is, in this case, an adequate perception of the characteristics of the environment is ensured.

At a high level of an external stimulus (above the permissible intensity), non-standard biological effects are formed in the human body in the form of, for example, unpleasant sensations. If negative environmental factors at higher than permissible levels act for short periods of time and with fairly long breaks, then non-standard undesirable effects, in general, do not affect human health.

However, high levels of exposure to external negative factors over a long period of time can cause negative consequences, which in most cases can lead to somatic and genetic changes in the human body. Therefore, when assessing the impact of dangerous and harmful factors on the safety of human life, the main task is to establish the degree of influence of environmental factors and the labor process on the nature and level of changes in the functional state of the human body, its potential reserves, and the possibilities of the mechanism of adaptation to these factors. In order to exclude the occurrence of irreversible biological effects, the level of exposure to adverse factors is regulated, that is, safe or marginally acceptable levels of each negative factor are established.

Thus, for the production sphere, the maximum permissible level (MDL) is the maximum level of a negative factor that, affecting a person (isolated or in combination with other factors) during the work shift every day, throughout the entire production experience, does not cause him and his offspring of biological changes, even hidden and temporarily compensated, including diseases, changes in reactivity, adaptive and compensatory functions, immunological reactions, violation of physiological cycles, as well as psychological disorders (reduction of intellectual and emotional abilities, mental capacity, reliability of performance of production functions).

Regarding the characteristics of the air with regard to the content of dust and chemicals, the indicator of the maximum permissible concentration (MPC) of the harmful substance is used. When assessing the noise environment - the maximum permissible sound level (MDL), to assess the admissibility of work under the conditions of action of ionizing radiation - the maximum permissible dose (MDL).

As a rule, the degree of harmfulness of the negative impact of a factor directly depends on the duration of its action on the human body. In this regard, the values of the maximum permissible level of a separate negative factor for the production sphere and the environment in which a person is for a longer time differ from each other.

When establishing the maximum permissible level of influence of negative factors, the following principles are used:

- the priority of human health over other effects (technical feasibility, economic requirements, etc.);
- threshold of all types of negative factors in relation to human health;

- the priority of development and implementation of preventive measures compared to the moment of appearance of a dangerous or harmful factor in the production process.

Principles and methods of ensuring the safety of human activities For the organizational, constructive, material implementation of the selected principles and methods, with the condition of ensuring the safety of life, the principles of ensuring safety are used.

Table 4

Classification of security principles

Classification type	Signs of classification
Principle of rationing	Establishment of MDK, MDR, MDD
The principle of the weak link	Artificial introduction of an additional sensitive element into the object (system).
The principle of information	Timely provision of information necessary for the correct response of personnel
Principle of classification	Division of an object (system) into components, according to potential signs of danger
Guiding principle	Operator activity, humanization of activity, destruction, operator replacement, classification, elimination of danger, systematicity, reduction of danger
Technical principle	Blocking, vacuuming, sealing, distance protection, compression, weak link strength, shielding
Organizational principle	Time protection, information protection, incompatibility solutions, personnel selection, sequence of actions, ergonomics of objects
Management principle	Adequacy, control, feedback, responsibility, planning, stimulation, management, efficiency

In the production environment, which is represented by the "man-machine" system, there are the following two characteristic zones:

- the homosphere is the space (work zone) where a person is in the process of the considered activity.
- noxosphere is a space in which dangers, negative anthropogenic factors constantly exist or periodically arise.
- combining or crossing the space of the homosphere and the noxosphere is unacceptable from the point of view of human safety.

Security is achieved through the following three main methods:

- method A consists in the spatial and temporal division of the homosphere and noxosphere zones. This method can be implemented using means of remote control, automation, robotization of production processes, etc.
- method B - consists in normalizing the state of the noxosphere by eliminating hazards.

Examples of implementation of this method are measures that protect a person from noise, gas, dust, danger of injury, etc. Method B is a set of methods and tools that help adapt a person to the appropriate environment and increase his security. This method is implemented by professional training, psychological impact training, and the use of personal protective equipment. In real conditions, a combination of all considered security methods is implemented.

Security means are divided into the following two main groups:

- means of collective protection, which ensure the normalization of working conditions in general;
- personal protective equipment that solves the task of normalizing the living environment or production environment for an individual. In turn, means of collective protection and individual protection are divided into groups depending on the nature of dangers, constructive implementation, principles of protection, etc.

The main task of life safety management is to increase the safety level or system of objects.

The following measures are real ways of managing life safety:

- organizational and managerial, including control over the level of security;
- training people on security issues;
- stimulation of safe work;
- improvement of technical systems and facilities;
- development and use of special means of protection;

- replacement of dangerous operations with other, less dangerous ones.

A complex of these measures is always used to increase the level of object security. The selection of measures is carried out using a comparative analysis of the economic costs of the measures and the effect of the level of damage reduction expected as a result of their application. This approach to solving the task of reducing the risk of hazard manifestations is called risk management. BZhD management is understood as an organized influence on the "human - living environment" system with the aim of achieving set positive results. Managing BZD means practically realizing the possibility of transferring the object from one dangerous state to another - less dangerous.

TOPIC 2

“A MAN IN THE SYSTEM “MAN IN THE SYSTEM MAN – EXTERNAL ENVIRONMENT”

1. ACTUALITY OF THE TOPIC

A person, his life and health are the greatest value of society. However, the number of dangerous and harmful factors that affect the human body, worsen its health, and reduce life expectancy increases every year. Therefore, determining the ways of human interaction with the external environment and how exactly all changes in the external environment affect the state of the human body, reflected in her mind is relevant for the student.

2. EDUCATIONAL OBJECTIVE

To form in the student a system of knowledge about the functional systems of the human body in ensuring the safety of life and protective functions of the body, the mode of work and rest of a person, as well as motivation regarding the need to preserve one's own health and the health of others.

3. LIST OF QUESTIONS ASKED IN THE CLASS

- Man as a bioenergetic system. Unity of biological systems of the body.
- Functional systems of the human body in ensuring the safety of life activities. Protective functions of the body.
- The role of receptors and analyzers of the human body in assessing environmental factors. Weber-Fechner law.
- Psychological factors determining a person's personal safety.
- The psychophysiological state of the human body and its dependence on external stimuli.

4. PROFESSIONAL COMPETENCES

The student must:

Know:

- Functional systems of the human body in ensuring the safety of life activities.
- Protective functions of the body.

Be able:

- To evaluate a person's mode of work and rest.
- To propose a method of psychophysiological unloading of a person.

5. SYNOPSIS OF THE SUBJECT OF THE TOPIC

Man is like a bioenergetic system. Man is an element of the biosphere, he exists in it as a biological subject. The definition of "human" as a

biological category indicates the qualitative difference between humans and animals and characterizes the general qualities and features characteristic of all humans, which are defined in the term "Homo sapiens" - "intelligent human".

One of the main, characteristic features of a person is consciousness, which is evaluated not only in terms of understanding the life situation, but also in the knowledge of the surrounding reality. Based on this, it follows that the main difference between man and animals is a way of life, which is interdependent with the level of consciousness. The life of animals proceeds naturally, and in humans it is determined by social and social conditions, and is considered as a category - life activity. Activity is the active interaction of a person with the environment to achieve a consciously set goal that arose in him as a result of the manifestation of defined needs. Such needs can be both material and moral. A need is a need for a person for those elements of the environment that ensure his existence, both from a physical and psychological point of view.

One of the specific forms of activity inherent in a person is work. Work is a purposeful activity of a person, in the process of which he affects the biosphere and uses it for the purpose of producing material goods necessary to satisfy his physiological, moral and psychological needs.

Each person is characterized by the level of development of three main systems:

- the biological system is determined by the level of development of the physical and physiological characteristics of a person;
- the mental system refers to the inner spiritual world of a person - his emotionality, will, experiences, memory, character, etc.;
- the social system is determined by the social status of a person in society and the level of development of this society.

Analyzing the essence of a person's psychological and social systems, it follows that they are interdependent and indirectly affect the development of his biological system. Thus, a person is an objective unity of biological, psychological and social systems.

Unity of biological systems of the human body.

The human body consists of a number of biological systems (blood circulation, digestion, thermoregulation, immunological protection, etc.). Autonomous regulation of the activity of these systems takes place in the

human body. All body systems function in a relationship, and therefore the human body, like any complex biological system, is a single entity.

All systems of the human body are divided into:

- somatic (related to biological processes, organs of the human body);
- mental (combined by the human nervous system, which manages the functions of the entire body).

The central nervous system takes part in the reception, processing and analysis of any information coming from the external and internal environment through the appropriate analyzers, forms appropriate images of perception of the external world. At excessively high levels of exposure to external stimuli, overvoltage of the analyzers may occur. Therefore, in the process of human evolution, the nervous system is able to determine not only the degree of their influence, but also to form appropriate protective reactions. So, for example, with the appearance of high levels of pain sensations, the central nervous system causes the appearance of tears, which is a protective reaction of the human body.

The protective reaction in this case is that the signal of the pain analyzer branches out and goes not to one area of the brain, but to two. Thus, the intensity of the signals that come from the analyzer along nerve fibers and directly affect the corresponding areas of the cerebral cortex is significantly reduced.

At the same time, the preservation of the physiological functions of the central nervous system and individual human organs is ensured. If the level of action of an external stimulus on the corresponding analyzer is outside the permissible limits, the following reaction of the central nervous system is manifested - the automatic disconnection of the analyzers from the human cerebral cortex.

Factors that ensure human health.

Human health is an important medico-biological and social category of a person in the process of his existence in the "man - environment" system. The World Health Organization (WHO) defines that "health is not only the absence of diseases and physical defects, but also a state of complete physical, spiritual and social well-being."

By its biological and social essence, health is the process of adaptation of the human body to the influence of positive and negative factors of the environment, health includes the following main elements:

- genetic level – determined by a person's genetic fund;

- phenotypic level – individual adaptability of a person to new conditions of existence;
- metabolism - metabolism, which includes the processes of assimilation of substances, their breakdown in the human body and the construction of new living tissues or their restoration;
- homeostasis – the relative dynamic constancy of the composition and features of the internal environment of the human body and the stability of its main physiological functions;
- immunity – maintenance of existing and development of protective properties of the body;
- regeneration of health – restoration of health that is disturbed due to the action of negative factors, restoration of the structure of damaged organs or body tissues;
- conditioned or conditioned-reflex reactions of the body to external stimuli, which contribute to the adaptation of a person to the conditions of his existence.

Functional systems of the human body in ensuring its safety of vital activities.

Protective functions of the human body In the course of evolutionary and social development, under the influence of negative factors, a person has formed a natural perfect system of protection against dangers, which depends on the level of these factors. At the same time, man in his existence is also a source of potential and real dangers.

Thus, in the process of vital activity, it emits harmful substances, emits heat, can be the cause of the occurrence of various types and levels of dangers as a result of erroneous actions, for example, in production.

Thus, for a safe state of the "man - habitat" system, it is necessary to harmonize the characteristics of a person and the elements that make up the environment.

In cases where such agreement is not provided for, the following consequences may occur:

- psychological depression of a person;
- reduction of human working capacity;
- development of common diseases, injuries of workers;
- development of occupational diseases; • occurrence of accidents, fires, explosions, etc.

Adaptation of the vital activity of the human body when external conditions change is carried out thanks to the regulatory function of the

central nervous system (CNS), especially its upper part — the cortices of the large cerebral hemispheres brain Perception of the surrounding world is carried out by a person through a complex of analyzers (receptors) that perceive and transmit relevant information to the cortex of the large hemispheres.

In the process of evolution, a number of security systems have been created in the human body along with perception systems. For example, the eye provides visual perception of images, but at the same time it has eyelids, two musculo-cutaneous folds that close the eyeball when closed. Thus, the eyelids have the function of protecting the eyeball, protecting the organ of vision from excessive light flux or mechanical damage, contributing to moistening its surface and removing foreign bodies with tears.

The human ear provides auditory perception of the external environment. However, with excessive noise intensity, the protective reaction of the auditory analyzer comes into effect. The two smallest muscles of the middle ear contract sharply, and the three smallest bones (hammer, anvil, and stirrup) stop oscillating. Thus, the blocking mechanism is activated, and the bone system does not allow high levels of sound vibrations to enter the inner ear. There are also protective reactions in other analyzers. An important system of natural protection is the movement provided by the activity of the musculoskeletal system.

Active movement can dull both mental and physical pain. The system of protection of nerve centers is extremely perfect. Under the influence of intense external stimuli, impulses are transmitted to the cerebral cortex, while there is a threat of disruption of the activity of important nerve centers. In the process of evolution, the organism developed a protective system in which information signals are redistributed with a corresponding decrease in their levels.

For example, when a person suffers a mental injury, the first instinctive reaction of the defense system is to create a competing center of excitation in the cerebral cortex. The direct, immediate external manifestation of such a reaction manifests itself in a quarrel, a fight, etc.

But the manifestation, implementation of such a reaction is natural, basically, only in the world of animals, but in the world of people it will be considered hooliganism. Therefore, another source of excitement is activated - lacrimation. Immediate, abundant irrigation with tears intensifies the activity of the receptors of the nasal cavity. A new powerful

center of excitement is created in the brain, which diverts the danger of overvoltage from the cells of the cerebral cortex.

Thus, this mechanism is a reliable automatic protection system for the entire human nervous system. Moreover, nature provides for the activation of this mechanism even when there are too large levels of positive factors, for example, when there is joy. A perfect system of immune protection also functions in the human body. This is a property of the body that ensures its immunity or resistance to the action of foreign proteins, pathogenic microorganisms, toxins, etc.

According to the nature of the formation, natural and acquired immunity are distinguished.

Natural immunity is a species characteristic that is transmitted at the genetic level. For example, humans are not infected with rinderpest. In the process of development, natural biological and mechanical protective elements were formed in the human body, the action of which is directed against various pathogenic microbes. So, for example, intact skin is a reliable barrier to the penetration of pathogenic microorganisms into the body.

In addition, secretions of mucous membranes and skin have bactericidal properties. The secretion of mucus, as well as a number of reflex reactions, such as coughing, sneezing, vomiting, leads to the mechanical removal of microbes from the body. Gastric juice, which includes hydrochloric acid, destroys some microorganisms.

Tears, saliva, sputum, blood, leukocytes, and breast milk contain lysozyme, a substance that has a bactericidal effect. Such organs of the human body as the liver, spleen, and lymph nodes are also able to retain and partially neutralize microbes that spread in the body through blood and lymph.

Acquired immunity of the human body can be of natural or artificial origin.

The natural form of acquired immunity is formed as a result of the transferred disease.

An artificial form of acquired immunity develops during artificial immunization in the form of preventive vaccinations.

An important role in the development of human immunity belongs to specific protective biological elements (antibodies), which appear in blood serum after a disease, as well as during artificial immunization. Antibodies

have a selective effect in relation to microbes or products of their vital activity.

The role of receptors and analyzers of the human body in the evaluation of the factors of the system "man - living environment".

Weber-Fechner law. Perception of the surrounding world is carried out by a person through a complex of analyzers (receptors), which perceive and transmit relevant information to the cerebral cortex.

In the course of evolution, a number of special functional and structural systems developed in the human body, designed to perceive the conditions of the living environment, compensate for adverse changes in external conditions, and organize the level of vital activity in accordance with these conditions. Therefore, when the habitat or production environment changes, information is formed in the human body, thanks to which compensatory processes are produced in such a way that this external change does not lead to damage and death of the organism. So, for example, in response to an increase in the temperature of the external environment, which can lead to an increase in body temperature and further - to a pathological change in protein in the human body, as a result of the appropriate analysis of external signals, corresponding reactions of a compensatory nature are formed.

The latter can be:

- behavioral, for example, withdrawing the hand from a hot object;
- biological (internal), which consist in reducing heat production, increasing heat output, regulating the intensity of metabolic processes in the human body.

With the help of the sensory system, various information about the surrounding world is perceived, transmitted to the human brain, which analyzes it, synthesizes it and issues appropriate commands to various organs and systems. Any analyzer consists of three parts: peripheral (or receptor), conductive and central, where analytical and synthetic processes are completed based on the assessment of the biological significance of the stimulus.

Due to their similar structure, all analyzers have common psychophysiological properties:

- extremely high sensitivity to adequate stimuli;
- a certain limit of sensitivity to the stimulus;
- ability to adapt;

- ability to train; • the ability to retain sensations for a certain time after the cessation of the stimulus;
- constant interaction with each other.

German scientists physiologist A. Weber and physicist G. Fechner established a law according to which the intensity of sensations is proportional to the logarithm of the intensity of the stimulus.

In mathematical form, the Weber-Fechner law is expressed as follows:

$$S = C \lg I,$$

where S - is the intensity (or strength) of sensation,

I - is the size of the current stimulus,

C - is the proportionality factor.

According to the Weber-Fechner law:

- there are quantitative relationships between the intensity of the feeling and the intensity of the stimulus;
- sensations change disproportionately to the intensity of the stimulus;
- the intensity of the feeling grows much more slowly than the strength of stimuli.

The greatest importance in ensuring the safety of life is played by four analyzers: visual, auditory, tactile and visceral.

Visual analyzer. Vision plays the most important role in human life. More than 90% of information about the outside world is received by a person through the visual analyzer. The sensation of light arises as a result of the impact of electromagnetic waves with a length of 380-780 nanometers (nm) on the receptor structures of the visual analyzer. The first stage of the function of the visual analyzer is the transformation of the energy of the stimulus in the retina of the eye into the process of nervous excitation, which is transmitted to the central nervous system, where light perception is formed.

Psychologists claim that color can affect not only the mood, but also the well-being of a person, so the color green has a calming effect on the nervous system, relieves headaches, fatigue, irritability; red - increases the content of adrenaline in the blood, increases work capacity; yellow – stimulates brain activity; purple - improves the work of the heart, blood vessels, lungs, increases the endurance of the body; yellow-hot - improves mood and is therefore indispensable in stressful situations.

The auditory analyzer is the second most important for a person's perception of the environment and its safety. Mechanical vibrations of the air through the complex system of the auditory analyzer (the middle and inner ear) are perceived as sounds.

The tactile analyzer plays an exceptional role in a person's life, especially when it interacts with visual and auditory analyzers during the formation of a person's holistic perception of the surrounding world. With the loss of sight and hearing, a person can "hear", "read", that is, act and be useful to society, with the help of a tactile analyzer, due to training and various technical devices. Tactile sensitivity is due to the functioning of the mechanoreceptors of the skin analyzer. The source of tactile sensations is mechanical effects in the form of touch or pressure on human skin.

The visceral analyzer plays a special role in human health and life. If external analyzers warn a person about the obvious danger of the environment, then this analyzer determines the dangers of a hidden nature.

The visceral analyzer perceives and transmits to the central nervous system signals about the state of the internal environment and the activity of human internal organs. It coordinates the activity of internal organs and brings them into line with the needs of the whole body. Internal organs have a huge number of various receptors - interoceptors, which are located on the inner surface of blood vessels, in mucous membranes, in almost all cavities of internal organs. Interoceptors are divided into mechanoreceptors, chemoreceptors, thermoreceptors, osmoreceptors, and pain receptors.

Psychological factors determining the personal safety of a person. The psychology of safety should be understood as the application of knowledge about human psychology in relation to the specific state of the "man - living environment" or "man - production environment" system in order to ensure safe living conditions.

Psychological factors that lead to the realization of danger are divided into two groups: objective and subjective.

Subjective factors include:

- lack of discipline of a person in terms of compliance with safety rules;
- reassessment of one's professional skills;
- discrepancy between the level of psychological training and the specific conditions of the external environment (both the living environment and the production environment).

The group of objective psychological factors includes:

- insufficient level of professional training;
 - low level of requirements for permission to perform works characterized by increased danger and harmfulness;
 - non-compliance with ergonomic requirements for the workplace, equipment, color design of the workplace;
 - insufficient control over the state of health of workers.

The listed groups of main psychological factors are in many cases interdependent.

TOPIC 3

“IMPORTANCE OF THE EXTERNAL ENVIRONMENT THE “MAN – EXTERNAL ENVIRONMENT”

1. ACTUALITY OF THE TOPIC

Human activity takes place in a certain environment, which is called the environment. There are different approaches to defining the concept of "environment". Some equate it with the "natural environment", that is, the environment, others with the concept of "living environment", that is, as part of the universe. Still others — with the cultural environment, where factors of both material culture and spiritual work. But the most successful is the definition that states that the environment is a unity of system-forming components of natural and material origin that form the conditions for the functioning of the environment. In connection with the intensive anthropogenic denaturation of the environment, the importance of the problem of public health has recently increased, as the state of health of people has changed significantly and new patterns of prevalence and nature of human pathology have emerged. The human body is in constant interaction with the environment. Therefore, students need to know the specifics of the influence of the components of the biosphere on sanitary living conditions and the state of health of the population, to be aware of the importance of a healthy lifestyle for preserving and strengthening health.

2. EDUCATIONAL OBJECTIVE

Master the theoretical foundations of the ecosystem approach and the general scheme of studying the impact of a complex of environmental factors on the safety of life and the health of the population.

3. LIST OF QUESTIONS ASKED IN THE CLASS

- The concept of the external environment and environment of human activity.
- Classification and characterization of negative factors of the human external environment.
- Physical and energetic negative factors.
- Chemical and biological negative factors.

- Psychophysical negative factors. Social dangers.
- Peculiarities of the state of ecological security of Ukraine.

4. PROFESSIONAL COMPETENCES

The student must:

Know:

- Basics of a healthy lifestyle as a result of a harmonious relationship with the environment.
- Classification of environmental factors.
- Basics of the ecosystem approach.
- Main risks to existence.

Be able:

- Develop recommendations for environmental protection.
- Identify natural and man-made negative factors for life safety.
- Live in harmony with nature.
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5. SYNOPSIS OF THE SUBJECT OF THE TOPIC

The system "man - environment" and its components.

Human activity takes place in a certain environment, which is called the environment. There are different/approaches to defining the concept of "environment". Some equate it with the "natural environment", that is, the environment, others with the concept of "living environment", that is, as part of the universe. Still others — with a cultural environment, where factors of both material culture and spiritual are at work. But the most successful is the definition formulated by R. Latsko, who claims that the environment is a unity of system-forming components of natural and material origin, which form the conditions for the functioning of the environment.

Ensuring the safety of human life has always been one of the most important conditions for the harmonious development of civilization. Success on this path can be achieved only when humanity understands and realizes the real world in which its life is spent. Such an understanding gives rise to the solution of a whole complex of complex and multifaceted problems. First of all, a person needs knowledge about the surrounding world and the rules of safe behavior in it. Once upon a time, in the early stages of its development, man continuously felt the influence of factors of natural origin: air temperature fluctuations, atmospheric precipitation,

natural phenomena, etc. She was also unprotected from the animal world. The constant struggle for existence prompted man to invent means of protection: fire, clothing, housing, etc.

Over time, these means of protection were improved, new ones appeared, which led to the emergence of man-made factors of human influence; these are vibration, noise, concentration of toxic substances in the air, water bodies, soil, electromagnetic fields, ionizing radiation and many others. In addition to the mentioned negative factors of natural and man-made origin, factors of a social nature appeared: terrorism, inter-ethnic and religious wars, drug addiction, psychopathy, etc. In today's globalized society, their number is constantly growing and destabilizing human life. As we can see, having entered the third millennium, humanity has made impressive progress in its development, created relatively comfortable conditions for its existence on Earth, went into space, learned some laws of the universe, but at the same time, its active activities only created even more dangers, which threaten his life and health. And this encourages to invent and improve protection systems.

Therefore, human activity takes place in a certain system of interconnected components of natural, man-made and social origin. The totality of these components creates the environment.

A person, like any living organism, actively interacts with all components of the environment in which he is. As the ancient Greek philosopher Protagoras said: "Man is the measure of all things." Human activity can be both positive and negative. The criterion of activity is knowledge or ignorance. The consequence of human activity is benefit or harm. That is, adapting to the environment, a person either contradicts the laws of nature, or, having learned them, adapts them to his life needs.

The interaction between man and the environment is subject to certain laws, which were formulated by the prominent Ukrainian scientist V. Vernadskyi. Namely:

- man and the environment — a dialectical unity;
- the environment contributes to human existence;
- the leading role in the interrelationships "man - environment" belongs to man.

So, first of all, man and the environment have always been, are and will be interconnected and interdependent. This is a completely objective pattern. Secondly, the existence of a person, his activity and behavior must

obey certain conditions of functioning of the environment. The principle "Man is the king of nature" is changed to "Man is for nature."

The system "man - environment" ("L - NS") has its own structure and properties. It can exist and develop only under the condition of maintaining homeostasis. Accordingly, the "L — NS" system changes in the event of a change in any of its components. After all, the components of the system depend on each other and react sensitively to any changes. So, for example, the natural component of the environment changes due to the impact on it of the material, energy and informational factors of the man-made component. At the same time, the social component is supported by the life-supporting functions of nature.

The "L — NS" system belongs to open systems where energy and information are exchanged both between the components of the system and between the external environment (the so-called metabolism). The development of a system is a change in its state, which is determined by a set of values characteristic of this system, which are called parameters.

Each component of the system has its own parameter characteristics. In case of deviation of parameters from the norm, the efficiency of functioning of each component in particular, and the efficiency of functioning of the system as a whole may decrease. This can lead to its degradation or to the cessation of existence. That is why it is so important to determine the optimal level of parameters of each system component. It is worth noting that the task is extremely difficult, considering the scale of anthropogenic impact on natural disasters.

Therefore, the environment in which a person lives can be imagined as a system of interconnected components of natural, man-made and social origin. There is a dialectical relationship between man and the environment, where man plays a leading role, that is, he is responsible for the development and state of the "man - environment" system. And it is she who must ensure that the parameters of the system components approach the optimal level.

The relationship between man and nature is the biggest problem that worries modern society. This is understandable, because nature is one of the components of the human habitat, and the future of all mankind depends on its condition. Nature — in the broadest sense of the word — is the entire material, energetic and informational manifestation of the universe. Of course, this concept also applies to the living world of planet Earth, including humans.

The natural environment or environment is determined by the presence of abiotic and biotic factors of human existence in the environment.

Abiotic factors are a set of inorganic substances that are the basis of the existence of the biosphere. For example: the composition of atmospheric air, the presence of impurities in it, the composition of water and the presence of inorganic substances in it, air temperature, atmospheric pressure, radiation background, etc.

Biotic factors are a set of living organisms that influence other organisms, including humans, through their vital activity. For example: plants emit oxygen, which is necessary for people and animals, and they, in turn, ensure the entry of carbon dioxide into the atmosphere, which is used by plants in the process of photosynthesis.

There are four groups of basic functions that the natural sphere performs in relation to humans:

- physiological — supports human life as a biological species;
- social — ensures the formation of a person as a society;
- economic — determines the activity of economic conditions of human existence, as well as human reproduction as a labor resource;
- ecological — forms, regulates and supports the state of the ecosystem in which human activity takes place.

As a result of the development of natural laws (physical, chemical, biological) about 5 billion years ago, life on Earth arose and continues to develop. Living beings were born, gradually evolved from the simplest to increasingly complex systems with their center - the brain, created a new environment called the "noosphere".

Man is the highest stage of development of living organisms on earth, the subject of social historical activity and culture. V. Vernadsky emphasized that a person cannot exist without the natural environment that supports his existence. There is a constant exchange of substances between the human body and the natural environment. The body receives oxygen and nutrients from the natural environment, and harmful decay products enter the natural environment. In favorable environmental conditions, a person gets an opportunity for his comfortable existence, but, at the same time, the deviation of environmental parameters from the norm creates a threat to his life and health.

The human body is affected by various natural factors: atmospheric pressure, temperature fluctuations, humidity, solar radiation level, cloudiness, precipitation, wind, earthquakes.

Atmospheric pressure is the force with which the air presses on the earth's surface, on all objects that are on it. Normal atmospheric pressure is 760 mm Hg. Art. Pressure decreases with height. Pressure also depends on air temperature. There are two main types of atmospheric circulation. Cyclones are rising atmospheric eddies with a closed area of low pressure in the center, and anticyclones are low atmospheric eddies with high pressure in the center.

Excess pressure is created by the front of a shock wave during accidents at explosive objects or during a nuclear explosion. At the same time, depending on the amount of excess pressure, a person can receive injuries of varying degrees or die.

The air temperature depends mainly on the geographical latitude of the area. Atmospheric circulation and the underlying surface also affect the annual and daily course of temperature. Ukraine is located in a temperate climate zone, has a temperate continental climate, and only the southern coast of Crimea is subtropical. The temperature mainly depends on the amount of solar radiation. Average temperatures in January are $-2—8\text{ }^{\circ}\text{C}$ in most of the territory of Ukraine and $+2—4\text{ }^{\circ}\text{C}$ in the south of Crimea. Average temperatures in July are $+17—19\text{ }^{\circ}\text{C}$, and in the southern regions and in the Crimea $+22—23\text{ }^{\circ}\text{C}$. The optimal air temperature, at which maximum work productivity is ensured, is a positive temperature of $18-22\text{ }^{\circ}\text{C}$. Extremely high temperature or very low with high humidity significantly affects the coordination of human movements and the accuracy of the reaction, which in the conditions of industrial activity can cause emergency situations.

Humidity depends on climatic conditions, time of year and day. Relative air humidity is an extremely dynamic parameter. On the territory of Ukraine, the value of this parameter can vary from 90% to 100% in rainy weather, and up to 40% in dry weather. However, such changes in humidity do not pose a danger to life.

Illuminance is the amount of light flux falling on a unit of surface. It should ensure visual perception of objects or their registration with the help of devices. Improper location of light sources, low or high lighting can lead to an emergency situation.

In general, the parameters of the natural environment have a very active influence on human life. However, if, under the influence of certain factors, the parameters go beyond the limits of the stable ones for a certain region, then conditions will be created that can lead to disruption or complete cessation of life activities. Such conditions are considered dangerous, and the circumstances that have arisen are characterized as danger.

According to scientists, in recent years, the number of explosions on the sun has increased, which carry charges of the magnetic field, causing "geomagnetic storms", which have a very negative effect on people who have cardiovascular diseases.

As a result of purposeful human activity, tools and comfortable living conditions were developed and created. As a result, for many centuries man interfered in the natural sphere, using more and more of its resources. Moreover, unlike other creatures, man used not only those substances necessary for his physiological needs (oxygen, water, food), but also a huge amount of minerals, forest and other materials needed for the functioning of hundreds of thousands of power plants, factories, factories. Waste entered the environment in an amount that exceeded its self-cleaning capabilities, which led to a violation of the ecological balance on the planet. As a result of such production activity of mankind at the end of the 20th and beginning of the 21st centuries, the number of various types of dangers on Earth increased; dangers of a global nature appeared.

Among such global problems of humanity that threaten its security, the following can be distinguished:

- depletion of reserves of minerals and energy sources;
- change in quality characteristics of global geospheres (atmosphere, hydrosphere, lithosphere);
- uncontrolled population growth;
- urbanization of cities;
- disposal of industrial and household waste;
- comet-asteroid threat;
- arms race, testing of nuclear weapons.

Let's consider each of these problems in more detail.

Depletion of reserves of minerals and energy sources. The consumption of minerals and natural energy sources in the field of material production in the world is increasing from year to year.

Planet Earth has huge, but not unlimited reserves of minerals and energy sources. Today, the population annually produces and consumes energy equivalent to approximately 5 billion tons of the best coal - anthracite. According to scientists, this consumption will double every 20 years, which may lead to the complete depletion of the planet's natural energy resources — coal, oil, and gas, which, by the way, are non-renewable. Limited resources are one of the factors that in the coming decades will contribute to the development and use of the latest technologies, ensuring a reduction in the specific consumption of energy resources, and reducing environmentally harmful emissions.

There is a huge margin for reducing specific energy consumption. For example, energy consumption for every 100 dollars. GDP is 13 kg of oil equivalent in Japan, 18 kg in Germany, 35 kg in SILA, 50 kg in Canada, 254 kg in Romania. In developing countries, energy is used even more inefficiently, reaching 187 kg of oil equivalent per 100 dollars. GDP in China, 154 kg — in Algeria, 132 kg — in India, 105 kg — in Egypt, 94 kg — in Zimbabwe, 93 kg — in Venezuela.

Change in quality characteristics of global geospheres (atmosphere, hydrosphere, lithosphere). Human production activities lead to changes in the quality characteristics of global geospheres (atmosphere, hydrosphere, lithosphere). The specified processes of impact on the environment are also extremely important economic factors. This is confirmed by the fact that any processes of purposeful impact on the natural environment are associated with costs (financial, material, energy, information).

A number of facts testify to climate change. Over the past 10 years, all meteorological "records" have been broken in Europe: the hottest summer, the coldest winter, the strongest period of drought; during these 10 years, more storms and hurricanes were recorded in the world than during the entire other period of the last century. For example, it rained at the North Pole, which last happened, according to archaeologists, 160,000 years ago; the polar ice is melting, the ice mass has decreased by 20% over the last 15 years.

The total supply of oxygen in the air is more than 1.2×10^{15} tons. Annually, it decreases by approximately 1×10^{10} , and in 150-200 years at

an accelerated pace of scientific and technical progress, it can be expected to decrease by several percent. Suffice it to say that the human body is sensitive to a decrease in oxygen concentration already by 1-2%.

Uncontrolled population growth. The demographic growth is extremely fast. According to the UN, in the 20th century, modern civilization is characterized by fast rates of population growth:

- the beginning of our era — 220 million people;
- 1900 — 1.6 billion people;
- 1941 — 4.6 billion people;
- 1950 — 2.5 billion people;
- 1987 — 5 billion people;
- 1996 — 5.6 billion people;
- 2005 — 6.5 billion people;
- 2020 – 7.5 billion people.

According to scientists' forecasts, this rate of population growth on the planet will continue in the 21st century as well. Specialists of the international organization "World Wattle" came to this conclusion based on forecasts according to which the population of the Earth will increase in the next 30 years to 10 billion. In order for people to receive adequate food, its production must increase three times, but the resources of sustainable agriculture ran out. There is every reason to believe that if the Earth's population grows at such a rate, in 40 years the world may be at risk of starvation.

Thus, at least as much food, housing, hospitals, goods of daily demand, which can be used to ensure the life of the population, must be added to the existing consumption funds, and this, accordingly, significantly increases the man-made load on the natural sphere.

Data on population growth are given in table. 1. Currently, 88% of population growth occurs in developing countries. In developed countries, it does not exceed 1%.

Today, the population of Ukraine is about 47 million people. Since 1992, the mortality of the population in Ukraine began to outpace the birth rate, which can cause depopulation, that is, a threat to the nation's gene pool.

There has been oversaturation, absolute overpopulation of the planet, which is threatened by the action of environmental factors that depend on population density. The increase in population has turned into a threat to man and humanity in general.

Table 1**Population growth**

Years	World population, billion	By region, %			
		Asia/Oceania	North and South America	Africa	Europe
1990	5,4	59,4	13,7	11,9	15,0
2025	8,1	58,6	12,8	20,9	7,7
2100	12,0	57,0	11,0	23,9	8,1
2150	12,2	56,8	10,8	24,5	7,9

At the same time, according to the UN, approximately two out of three people living on Earth are hungry, and approximately 1 billion live in poverty

Man-made environment and man.

As a result of active human activity in the habitat, it slowly changed its appearance, which led to the disruption of the biosphere and the appearance of an artificial environment, which is called technogenic (technosphere). According to scientific data, today almost all the environment in which a person is is man-made. The man-made technosphere covers almost the entire planet and even went beyond it into space.

- the technogenic environment (technosphere) as a component of the environment is a derivative of human activity that arose as a result of the influence of anthropogenic factors. Acting in a man-made environment, a person continuously performs at least two main tasks: ensures a comfortable stay in the living environment;
- creates and uses protection systems against its negative impact factors.

Let's consider the impact of negative factors of the technosphere on a person. Until the middle of the 20th century, man was still unable to initiate large-scale accidents and catastrophes that would cause changes in the biosphere. The emergence of nuclear energy facilities, powerful chemical enterprises and their high concentration in certain regions led to the destruction of the ecosystem. Classic examples are the tragedy in Chernobyl (Ukraine), Bhopal (India). The technology, created by the hands and mind of a person, seemed to be designed to satisfy his needs for comfort and safety as much as possible, but in general it did not live up to expectations. The biosphere in many regions of the planet was actively replaced by the technosphere. This, in turn, led to a decrease in the quality of the components of the "L — NS" system and, above all, of the natural environment.

According to scientists' forecasts, this influence will continue to increase with the deepening of the globalization of the world economy. Distinguish between direct and indirect effects of negative technosphere factors on the environment and the human body.

The direct impact is industrial and domestic injuries, occupational diseases.

Indirect impact is the deterioration of air quality, water quality, food, etc. Under certain conditions, this negative impact can lead to an increase in the concentration of impurities in the biosphere and a worsening of the ecological balance, an increase in the number of diseases of the population and animals, and an increase in epidemiological distress.

The environment of the technosphere of modern human existence is divided into domestic and industrial.

The production environment is the space where a person carries out his work. It includes enterprises, organizations, institutions, educational institutions, transport, communications, etc. The production environment is characterized by certain parameters of its viability and vitality, specific for each production. In the conditions of the production environment, human health can be affected by dangerous and harmful production factors.

Some of these factors are:

- electric current;
- noise level;
- vibration level;
- the level of thermal and electromagnetic radiation;

- the degree of gassiness, dustiness.

Electric current is a widespread impacting factor in production and in everyday life due to the wide use of electrical devices and units. When working with them, it is necessary to observe the rules of electrical safety (organizational and technical measures and means that ensure the protection of people from harmful and dangerous effects of electric current).

Noise — production, household — directly affects the quality of work. Long-term work in a noisy environment can lead to disruption of the central nervous system and cause accidents at work. An increase in noise intensity above the natural level in a person causes rapid fatigue, a decrease in mental activity, and when it reaches 90-100 dB, it causes a gradual loss of hearing. In particular, for example, the noise generated during a quiet conversation between students in the classroom is measured at 10-12 dB, which is already harmful to the educational process.

There is a positive vibration that is used in engineering to solve technological problems (construction, medicine, etc.). And the harmful vibration that occurs during the movement of vehicles, the operation of turbine engines, etc. It can lead to destruction and vibration sickness in people.

Electromagnetic radiation (EMR) is the process of formation of a free electromagnetic field, which emits accelerated moving charged particles that affect the environment and the person in it. Sources of EMR are power lines, radio and television, operation of some industrial and household appliances. Thermal radiation is radiation that is produced due to the internal energy of matter and increases the temperature of the environment. It is characterized by the presence of heat flow (the amount of heat that passes per unit of time through a unit of surface); can burn, cause an explosion.

Thermal radiation is radiation that is produced due to the internal energy of matter and increases the temperature of the environment. It is characterized by the presence of heat flow (the amount of heat that passes per unit of time through a unit of surface); can burn, cause an explosion.

The listed dangerous and harmful production factors must meet certain parameters that a person determines himself when designing and building certain objects. The limit of changing parameters should

guarantee safety, and in some cases — also the comfort of work. At the same time, the operation of the facility should be safe in general.

The action of dangerous and harmful production factors can lead to injury and occupational disease of a person. Every 3 minutes in the world, a person dies as a result of an industrial injury or occupational disease. Every year in Ukraine, more than 60,000 people are injured at work. Of them, approximately 2,000 people died. 10 thousand people acquire occupational diseases and 6 thousand become disabled. Annually, as a result of industrial accidents, the economy of Ukraine suffers losses in the amount of UAH 4 billion.

In countries with rapid population growth (Asia and Africa), there is a shortage of natural resources and, first of all, drinking water, as well as an increasing load on resources that are decreasing and not renewable.

Urbanization of cities. Today, most of the inhabitants of the planet live in cities. This causes the growth of industrial production and energy consumption, which, in turn, pollutes the environment even more, and thus worsens the health of people. The highest rates of urbanization are observed in developing countries.

Disposal of industrial and household waste. With the development of NTP, the invention of new production technologies, some negative aspects of the interaction between man and nature began to appear.

The problem of industrial, agricultural and household waste must be put first among them. It is known that the production of the military-industrial complex (MIC) produces the bulk of the most toxic and dangerous waste, which negatively affects the biosphere.

It is worth noting that the problem of waste disposal has always existed in the biosphere, long before the existence of man, since the functioning of any system without waste is impossible. But this problem was solved by nature itself on the basis of the law of circulation of substances, conservation and transformation of energy, photosynthesis. For example, the organic remains of dead plants, leaves, and animal corpses as a result of natural processes and the vital activity of soil microorganisms were transformed into a layer of humus, which had a positive effect on soil fertility. All these organisms were in a state of perfect balance. And even the appearance of man and his creation of substances that did not previously exist in nature did not disturb this balance. However, due to social processes (demographic growth of the population, urbanization of

cities, wars) and the rapid development of the scientific and technical process, this balance was gradually disturbed. Nature, with the help of its mechanisms of neutralization and disposal, is no longer able to destroy a significant part of the waste that accumulates in the biosphere in a geometric progression.

Today, about 150 billion tons of solid, liquid, and gaseous waste are added annually to the already existing mass of waste. The areas of landfills are increasing, especially near large cities and industrial centers, gradually poisoning the environment. For example, the world's largest municipal waste dump is located in New York on Staten Island. During the 48 years of its existence, 68 million m³ of garbage accumulated there.

In the Istanbul region of Umraniye, which is located near the Bosphorus, Turkey's largest municipal waste dump is located. According to some data, it is even inferior to the New York landfill. A chemical reaction took place in its bowels for a long time, and on April 28, 1993, the landfill exploded. Quarters of the districts located near the landfill felt a tremor with a strength of up to 6 points. As a result, 11 houses were destroyed, 39 people died. After the explosion, the landfill was closed, and this event was called the "Turkish Chernobyl".

Modern sewage treatment plants allow to neutralize no more than 40% of waste, and the rest in the form of untreated effluents end up in lakes, rivers, and seas.

Waste incineration plants dispose of 15-20% of household waste, the remaining 80-85% is deposited on the surface of the earth. In addition, millions of tons of pesticides, herbicides, and other chemicals enter water bodies from fields every year.

Parallel to this danger is the danger of the spread of toxic substances left over from the Second World War. Technologies for their destruction and disposal do not exist to this day, so the remains are simply drowned in the seas. In the Baltic Sea alone, 303,000 tons of chemical munitions and their components, which are currently at a depth of 100 m at a temperature of 2-4 °C, were sunk by the friendly efforts of Germany, Great Britain, and Russia.

The situation is similar in the Black Sea, where thousands of tons of chemical and conventional ammunition were buried at a depth of 50-80 m. This is only part of the waste of civilization that fills the waters of rivers, seas, oceans and soils. It can be said that waste gradually displaces man from his territory, like how man displaces nature.

Today, the total amount of interestingly accumulated waste in Ukraine exceeds 25 billion tons, which is about 40 thousand tons per 1 m² of territory. More than 400 tons per person. The gaseous waste of industry turned into a garbage dump and the atmosphere. The total amount of these emissions has already reduced the transparency of the atmosphere by an average of 5%, and in such industrial regions as Donetsk-Prydniprovskiyi in Ukraine — by 12-15%.

As a result of gaseous waste entering the atmosphere, the chemical composition of the atmosphere is disturbed, where there is already a 3% lack of oxygen and a 5% higher content of carbon dioxide. The change in the balance of the chemical composition became the cause of the so-called greenhouse effect and the warming of the climate.

According to various estimates of scientists, in recent years the average air temperature on the planet has increased by 0,5-1,5 °C, which has led to an increase in the number of natural disasters, floods, droughts, as well as outbreaks of epizootics and infectious diseases of mankind. As a result of gaseous emissions, including by enterprises of the military-industrial complex and aviation, methane, weak acid solutions, and chlorofluorocarbons, which destroy the ozone sphere, accumulate in the atmosphere.

In addition, over 40-50 years of space exploration and space technology launches, space is gradually turning into a garbage dump. According to various data, about 3,000 wastes in the form of broken parts, household and other types of garbage have accumulated in the orbits around the Earth. The main mass of waste rotates near the Earth in a radius of 2000 km at a speed of 10 km/s. In the event of a collision of objects at such a speed, the energy has a huge destructive force, which is very dangerous in the event of the displacement of objects from orbit and their fall to Earth. It is predicted that if space exploration continues at such a pace, by 2010 the total mass of such waste will reach 10,000-12,000 tons, and by 2050, it will make any type of activity in Earth's orbits impossible for at least 50-100 years.

Computer and human health. Life activity is directly related to the performance of a certain type of work and labor productivity, which is determined by both the human factor and the means of production, as well as technological and organizational and working conditions.

Today, the activities of most workers of modern professions in the production sphere are connected with the use of computer technology.

When working with a computer, a person is exposed to various factors: electromagnetic fields (radio frequency range: HF, UHF and microwave), infrared and ionizing radiation, noise and vibrations, static electricity.

Nowadays, outdated equipment is often used in many institutions and enterprises. Labor safety requirements are currently in effect. Working with a computer requires considerable mental stress and is accompanied by the nervous and emotional stress of operators, high stress of visual work and a rather significant strain on the muscles of the hands while working with the PC keyboard. The rational design and location of the elements of the workplace is of great importance, which is important for maintaining an optimal working posture during the work process.

In the process of working with a computer, it is necessary to observe the correct mode of work and rest. In the opposite case, the staff experience dissatisfaction with work, headache, irritation, sleep disturbances, fatigue and pain in the eyes, lower back, neck and arms.

Depending on the placement of windows in the room where computers are installed, the following color of its walls and floor is recommended:

- the windows are oriented to the south;
- the walls are green-blue or light blue; the floor is green;
- the windows are oriented to the north;
- the walls are light orange or orange-yellow in color; the floor is red-orange;
- the windows are oriented to the east — the walls are yellow-green in color; the floor is green or red-orange;
- the windows are oriented to the west;
- the walls are yellow-green or blue-green in color;
- the floor is green or red-orange.

Computer equipment is a source of heat generation, which can cause an increase in temperature and a decrease in relative humidity in the room. In the premises where computers are installed, the necessary microclimate parameters must be observed (Table 2).

The volume of premises in which computer work is carried out should not be less than 20 m³ per person, taking into account the maximum number of people working at the same time.

Mechanical ventilation and air conditioning systems, as well as natural ventilation, are used to supply air to the premises.

Table 2

Normative microclimate parameters for personal computer (PC) rooms

Period of the year	Air temperature, °C	Relative humidity, %	Air speed, m/s
Cold	22—24	40—60	0,1
	21—23	40—60	0,1
Warm	23—25	40—60	0,1
	22—24	40—60	0,2

The noise level at the workplace of economists and programmer operators should not exceed 35-45 dB, and in the halls of information processing on computers - 56-70 dB. To reduce the noise level, the walls and ceiling of the room where computers are installed should be lined with sound-absorbing materials.

The level of vibration in the premises of computer centers can be reduced by installing the equipment on special foundations and vibration isolators.

Toning (x-ray) radiation. Studies show that the monitor is not dangerous for the PC user because the intensity of such radiation is lower than the maximum permissible standards (MRL). According to the "Radiation Safety Norms of Ukraine" (NRBU-97), the maximum permissible power of the exposure dose of X-ray radiation at a distance of 5 cm from the screen of the video terminal is 7.74×10^{-12} Kl/kg, which corresponds to an equivalent dose of 0.1 mb/h (100 mkr/h).

Optical radiation includes: ultraviolet (UV), light, and infrared.

UV radiation affects, as a rule, human skin and eyes. Analysis of studies of workplaces of PC users shows that in 86% of the measurements carried out, i.e. in most cases, UV radiation was not detected. In the same cases, when such radiation was detected, its level was on average $0,001 \text{ w/m}^2$.

Light radiation mainly affects the eyes and provokes their fatigue and inflammation of the iris. However, these symptoms pass quickly and do not cause pathological changes.

Infrared radiation radiation - the wavelength is limited from 0,76 mm to 1 mm. For most biological materials, radiation in this range is considered opaque. The conducted studies showed that the intensity of infrared radiation of video terminals is lower than the indicator provided by DSanPiN.

Electromagnetic radiation (EMR) of the radio frequency range. The source of EMR is the monitor. Therefore, when choosing a workplace for a computer, it is necessary to remember that its back and side walls can be a source of much greater EMR than the screen. The question of the impact of EMF on the biological system remains open.

Scientists prove that radio frequency radiation affects the central nervous system and is a significant stress factor. Conducted studies have shown that a cactus placed/near the monitor can be a means that “catch” radiation (the type and size of the plant is important), but it still plays the role of a psychological calming factor rather than an anti-radiation agent. Most scientists believe that both short-term and long-term exposure to all types of radiation from the monitor screen is not dangerous for the health of personnel who maintain computers. However, comprehensive data on the danger of exposure to radiation from the monitor on people who work with computers have not yet been obtained, research in this direction is ongoing.

To reduce the impact of the listed types of radiation, it is recommended to use monitors with reduced radiation capacity, as well as to observe a regulated regime of work and rest.

The domestic environment is the living environment of a person, that is, a set of residential buildings, sports and cultural facilities, as well as communal and household organizations and institutions. Some parameters of this environment: the amount of living space per person; degree of electrification and gasification of housing; availability of heating, cold and hot water; level of public transport development, etc.

Therefore, the parameters of the living environment completely determine the comfortable living conditions of people in a certain region and depend on the degree of civilization and the standard of living of people.

In normal living conditions, the parameters are maintained by the people themselves. However, under the influence of certain factors, and, above all, natural and man-made, these parameters can go beyond the

norm, and thus worsen the physiological functions of the human body, create a danger to his life and health.

In the conditions of the technosphere, the interaction in the system “person - household environment” is characterized as:

- comfortable (optimal), when connections correspond to optimal conditions of interaction (positive conditions for activity and rest are created);
- there are prerequisites for revealing the highest work capacity and productive activity);
- guarantee the preservation of human health and the integrity of habitat components;
- admissible when the flows, affecting the person and the living environment, do not have a negative effect on the health of the person, but lead to discomfort, reducing the efficiency of the activity;
- compliance with the conditions of permissible interaction guarantees the impossibility of occurrence, as well as the development of irreversible negative processes in humans and the living environment;
- dangerous, when the flows exceed the permissible levels of negative impact on human health, causing disease with long-term exposure, and (or) cause degradation of the natural environment;
- extremely dangerous, when streams of high levels in a short period of time can cause injury, cause death, cause destruction in the natural environment.

Of the four characteristic states of human interaction with the living environment, only the first two (comfortable and permissible) correspond to positive conditions of everyday life, and the other two (dangerous and extremely dangerous) are unacceptable for human life processes.

The city as a source of danger. Today, the inhabitants of the developed countries of the world are mostly urban dwellers. However, along with the convenience, they have also created a lot of difficulties for themselves. The city is a cluster of contrasts.

Streets. One of the most dangerous objects of the modern city, where a person can expect various troubles. Every year in Ukraine, more than 30,000 people die under the wheels of cars. In almost all cases, this happens due to inattention and violation of "Traffic Rules".

Therefore, knowing well the way from home to the place of work, you need to pay attention to the places that need increased attention. For example, crossing the street, dangerous intersections, narrow streets, etc.

Residents of the city become a source of danger for each other in extreme conditions (for example, when there is a fire in the premises of a store, cinema, etc.).

Social environment and man In the process of life, a person is surrounded by other people, the relationships between which form a human community, the so-called social environment (society).

Society is a system of subdivisions and spheres of social life, the harmonious interaction of which ensures the integrity of society, and vice versa, the disharmony of which causes conflicts and deformations. The sphere of social life includes: material, socio-political, spiritual and cultural and household.

The social environment is understood as a part of the life environment that characterizes human achievements in the creation of socio-political, spiritual-material and intellectual (informational) values that shape a person's worldview and determine behavior in the sphere of relationships with the environment.

Man is a social being. It can develop only in the environment of its own kind, live and act only in society, communicating and combining its efforts with others. its life and activities are determined not only by natural, but also by social factors, which are the regulators of the functioning of human society, which has gone through disasters, the lessons of history, and through bitter experience it is clear that the most valuable are not political ideas, technological achievements, or utopian ideas of universal happiness, but simple survival and secure existence. People are becoming more and more aware that without observing certain rules and norms in the relationship between themselves, technology and nature, they can disappear forever.

Society must be responsible for its existence on Earth. Therefore, people's lives should be balanced, deeply meaningful, and activities should be oriented not only to the fleeting present, but also to the future. This is largely determined by the level of culture of society, which is a condition for the formation of people's outlook on their safe existence.

The features of the society of the third millennium can be considered: the globalization of the economy, large capital flows, the movement of masses of people, the emergence of transnational crime, infectious diseases, etc.

Every person acquires certain habits in the course of life. Habits are a form of human behavior that appears during learning and repeated

repetition in various life situations, the components of which are performed automatically.

The psychophysiological basis of habits is a dynamic stereotype, that is, a well-learned and fixed program of action. In relation to human health and lifestyle, habits can be useful or harmful.

Factors of reducing vital activity.

Bad Habits Useful, for example, is the habit of following a daily routine. It contributes to strengthening health, increasing work capacity, and ultimately longevity. The earlier this habit was formed, the more organized a person is, the stronger his health, and the easier he gets rid of troubles.

Harmful habits, on the contrary, disorganize a person, weaken his will, reduce work capacity, worsen health and shorten life expectancy. The earlier they are formed, the more harmful they are and the more difficult it is to get rid of them. These habits bring many troubles and sufferings. The most common factors that negatively affect a person's health are such bad habits as alcohol, smoking, and drugs.

Alcohol is an insidious and very dangerous enemy that destroys health, destroys a person morally and physically. Alcoholism is a disease that occurs as a result of frequent alcohol consumption. Alcohol intoxication is a gross violation of the normal physiology of the brain as a result of poisoning. Due to its psychotropic properties, alcohol belongs to narcotic substances, but it is not a drug. According to the World Health Organization, about 6 million people die from alcoholism every year — that's more than die from such a terrible disease as cancer.

Alcoholism is defined as an exogenous mental illness (drug addiction), which, in case of continuous or recurrent course, leads to alcohol addiction. The need for alcohol becomes dominant in the motivational sphere. Most crimes are committed while intoxicated. Alcohol has a negative effect on the central nervous system, affecting all organs, leading to the degradation of the personality. Alcohol abuse causes mental disorders. Such mental disorders as "white fever", alcoholic hallucinosis, epilepsy occur most often.

According to statistics, there are 1,6 million alcoholics in Ukraine, more than 200,000 of them are women. Drinking alcoholic beverages impairs mental and physical performance and increases fatigue. Alcohol reduces work capacity by 16-17%, while fatigue sets in faster than usual. Work capacity is especially sharply reduced in persons whose professional

activity requires increased attention. Alcohol changes the speed of the motor reaction. Thus, after drinking a glass of beer, the motor reaction speed decreases by an average of 13-16%, the accuracy of the reaction to a moving object by 17-21%, and the accuracy of muscle effort by 14-19%. Alcohol disrupts the normal physiology of the brain as a result of its intoxication. This violation is explained by the fact that alcohol accumulates especially intensively in nervous tissue. Therefore, its concentration is much higher in the brain than in the blood. After taking even small doses of alcohol, stability and intensity of attention decreases, thinking and memory processes are disturbed. The employee needs more time to assess the production situation and make a decision, and this slows down his readiness to act.

Smoking is the cause of many serious diseases. The craze for smoking is taking on dangerous proportions. This is a bad habit not only of men, but also of women.

Ukraine is ahead of most European countries in terms of the number of smokers. According to statistics, the number of smokers is 12 million citizens, which is 40% of the population of working age (3.6 million of them are women, 8,4 million are men). Every 3-4 women of reproductive age (20-39 years old) smoke.

According to the experts of the World Health Organization (WHO), this bad habit causes more than 100 thousand deaths in Ukraine every year. Public opinion, unfortunately, has little or almost no condemnation of this bad habit, which, in fact, is a form of drug addiction.

It was found that tobacco smoke contains about 8% of carbon monoxide, nicotinic, cyanide, formic, butyric, sulfuric, lead sulfate, benzopyrene, arsenic trioxide, the radioactive element polonium, tobacco tar and other poisonous substances.

Nicotine is one of the most harmful substances for human health. The smoke from 25 cigarettes contains about two drops of pure nicotine, that is, the amount of poison that is enough to kill a dog. In the world, 2,5 million people die from smoking every year, and according to the forecast of specialists, this figure will reach 12 million by 2050. On average, each cigarette shortens the life of a regular smoker by 5,5 minutes.

Smoking contributes to the occurrence of various diseases. The central nervous system is the most sensitive to the effects of nicotine: it is first excited, and then depressed. Nicotine has a detrimental effect on memory, as a result of which the speed of memorization, the volume of

memory decreases, the speed and clarity of the reaction slows down, attention is dulled, visual acuity deteriorates, and muscle strength decreases. Nicotine, by narrowing the vessels of the brain, makes it difficult for blood to flow to the brain, resulting in headaches and dizziness. Nicotine disrupts activity of the cardiovascular system, increases the tone of the vascular wall, causes narrowing of blood vessels, slows down the speed of blood movement. Insufficiently oxygenated blood slowly flows through narrowed vessels, causing oxygen starvation of body tissues and, above all, the heart muscle (myocardium). First, there is pain in the area of the heart, there is a disorder of blood supply to the myocardium (death of its area, that is, a myocardial infarction). Smokers are 12 times more likely to have a heart attack than non-smokers. When a person smokes, his pulse speeds up to 15-18 beats/min, blood pressure rises. Smokers heart rate is 12,000 to 15,000 times greater per day than that of non-smokers, and smokers die suddenly from cardiovascular diseases 5,000 to 8 times more often.

The harmful effect of nicotine on the respiratory organs was also revealed. During smoking, a very harmful substance is formed, the so-called tobacco tar (resinous dark coating that settles in the lungs of smokers). A person who smokes a pack of cigarettes daily absorbs 700-800 g of tar per year. Tar tar substances are carcinogenic and cause lung cancer. Smokers often forget that while smoking they can cause trouble to the people around them, and without even wanting to, they become passive smokers.

Cigarette smoke pollutes the atmosphere, increasing the concentration of carcinogenic substances in the air. Tobacco smoke that enters the environment contains more harmful substances and tobacco resins than smoke inhaled by the smoker himself.

In the developed countries of Western Europe and the USA, since the 60s of the 20th century, a persistent fight against smoking has been carried out. As a result, mortality from lung cancer decreased. At the same time, specialists predict an increase in the number of lung cancer cases in the CIS countries, because tobacco products are imported here in large batches, and not always of the best quality.

Drug addiction is a real evil for all countries of the world. It is a disease caused by the systematic use of drugs, most of which are of plant origin (morphine, cocaine, heroin, pantopon, Indian hemp and their derivatives in the form of hashish, marijuana, anashi, etc.). Drug addiction

is a syndrome of mixed reaction, mental and physical dependence, as well as some mental and social phenomena. Drug addiction also includes the abuse of sleeping pills.

According to the World Health Organization, drugs have become the main cause of premature death of people, ahead of cardiovascular diseases and malignant tumors. Scientists claim that every drug is dangerous, even a single use of it leaves a mark in the nerve cells of the brain, liver, kidneys and heart muscles. In the case of repeated use, a habit appears imperceptibly, but inevitably. The nervous system is also excited by the action of drugs, ecstasy, painful excitement and hallucinations occur. In the absence of the drug, a person is in a particularly painful state (withdrawal), he is haunted by despair, restlessness, irritability, impatience, pain in bones and muscles, he suffers from severe insomnia or terrible dreams. Scientists claim that over the past ten years, the number of drug addicts has increased dramatically, especially among teenagers who abuse natural and synthetic poisonous substances. The number of drug overdose deaths increased 12 times, and among children - 42 times. And this is not taking into account children and teenagers officially recognized as drug addicts.

Drug trafficking is one of the most destructive threats to human society. Over the past 20 years, the drug industry has grown from a pantry-sized enterprise to a highly organized international business involving hundreds of thousands of people and billions of dollars in profits. According to statistics, today more than 200 million people consume drugs, and the volume of their trade is estimated at approximately 400 billion dollars, which is equal to 8% of world trade.

Social danger of drug addiction:

- drug addicts are poor workers, their working capacity (physical and mental) is reduced;
- drug addiction causes great material and moral damage, is the cause of accidents at work;
- drug addicts degrade physically and morally, are a burden on society;
- drug addicts are at risk of spreading AIDS;
- drug addiction in all its manifestations is socially dangerous, mental illnesses threaten the future of the nation, in this connection the problem acquires global importance.

AIDS (acquired immunodeficiency syndrome) is an infectious disease that affects the immune system, in particular suppresses cellular immunity.

For the first time, humanity encountered this disease at the end of the 20th and the beginning of the 21st centuries.

In recent years, this socially dangerous disease in Ukraine has gained threatening proportions, especially in the youth environment. Despite the fact that the Law "On the prevention of AIDS and social protection of the population" was adopted in Ukraine and the developed "Program for combating AIDS" is being actively implemented, the number of patients has not decreased as a result. In 1987, there were 6 AIDS patients in Ukraine, in 1988 — 20, in 1994 — 34, in 2003 only those infected with HIV (HIV — human immunodeficiency virus) who passed through medical institutions — 106 thousand, 46 thousand HIV- infected are beyond the control of state medical authorities. According to experts' forecasts, today in Ukraine there are from 5 to 10 unrecorded AIDS cases for each recorded AIDS case.

The main factors of AIDS infection can be:

- sexual contacts when one of the sexual partners is infected or sick with AIDS;
- use of non-sterile syringes for injections, in particular among drug addicts; — blood transfusion from an infected person;
- intrauterine infection by a mother infected with HIV or AIDS, etc.

HIV-infected people may not know they are carriers of the virus until the results of the HIV test are announced or the first symptoms appear. The initial symptoms are not specific, they can resemble the course of other diseases and manifest as weight loss, increased sweating, and fatigue. Only an HIV antibody test can confirm or deny HIV infection. An HIV-infected person looks healthy and does not have any complaints during the long period of infection. However, a healthy appearance and the absence of complaints do not guarantee safety for sexual partners or newborn children.

To date, medicine has not developed means that would make it possible to treat a person from AIDS.

HIV is not transmitted through kissing, touching, and firm hugs.

A person can protect himself from HIV infection only by applying knowledge about HIV prevention and safe behavior. In addition, this disease is closely related to other socially determined diseases: the

presence of HIV/AIDS significantly increases the risk of tuberculosis and sexually transmitted diseases. The latter factors significantly affect the state of human reproductive health.

TOPIC 4

"ENSURING THE SAFETY OF HUMAN LIFE ACTIVITIES"

1. ACTUALITY OF THE TOPIC

In connection with the intensive anthropogenic denaturation of the environment, the importance of the problem of public health has recently increased, as the state of health of people has changed significantly and new patterns of prevalence and nature of human pathology have emerged. The human body is in constant interaction with the environment. Therefore, students need to know the specifics of the influence of the components of the biosphere on sanitary living conditions and the state of health of the population, to be aware of the importance of a healthy lifestyle for preserving and strengthening health.

2. EDUCATIONAL OBJECTIVE

To master the theoretical foundations and the general scheme of studying the influence of a complex of environmental factors on the health of the population.

3. LIST OF QUESTIONS ASKED IN THE CLASS

- Basics of a healthy life style as a means of preserving and strengthening the health of the individual and the population as a whole.
- Classification of environmental risk factors.
- The concept of "health" and its criteria.
- Harmful and dangerous consequences of abusing drugs, alcohol, and smoking.
- Peculiarities of the health effects of smoking, alcoholism, and drug addiction.
- Methods of combating bad habits.
- Physiological and hygienic bases of tempering.

4. PROFESSIONAL COMPETENCES

The student must:

Know:

- Methods and means of personal hygiene and hardening of the body.

Be able:

- To introduce the basics of a healthy lifestyle into health care practice.
- Identify signs of drug, alcohol, and tobacco abuse in patients, carry out health-improving and preventive measures.

5. SYNOPSIS OF THE SUBJECT OF THE TOPIC

HEALTH is a natural state of the human body, which is characterized by the degree of stability of the functional and biochemical systems of a person, as well as the interrelationships in the "man - environment" system.

Population health is characterized by a complex of socio-economic and demographic indicators, the level of physical development, the incidence and frequency of premorbid conditions, and the disability of a certain population group.

Individual theoretical health is a state of complete social, biological and mental well-being, when the functions of all organs and systems of the human body are balanced with the environment, there are no diseases, morbid conditions and physical defects. Individual actual health is the state of an organism in which it is able to fully perform its social and biological functions. To evaluate it, you can use, for example, the following indicators:

- functional state of the main organs and systems;
- the level of physical development and its harmony;
- the body's resistance to adverse environmental factors (determined by the frequency and duration of diseases throughout the year).

Three main groups of health indicators are used to characterize health:

Group I (medical indicators):

- morbidity;
- mortality (general and infant mortality);
- physical development;
- disability.

Group II (indicators of social well-being):

- demographic situation;
- condition of environment;
- Lifestyle;
- level of medical care;
- social and hygienic indicators.

Group III (indicators of mental well-being):

- incidence of mental illnesses;
- frequency of occurrence of neurotic states and psychopathies;
- psychological microclimate.

The World Health Organization (WHO) has developed a list of criteria for social well-being:

- the percentage of the gross national product that is spent on health care needs (according to the WHO, the average cost of health care is 8% of the global gross domestic product);
- availability of primary health care;
- providing the population with high-quality and safe water supply;
- the percentage of persons immunized against six infectious diseases that are particularly common among the population (diphtheria, whooping cough, tetanus, measles, poliomyelitis, tuberculosis);
- the percentage of services provided by qualified personnel to women during pregnancy and childbirth;
- percentage of children born with low body weight (less than 2500 g);
- average life expectancy;
- level of sanitary literacy of the population.

The system "man - habitat" is represented by a structure consisting of several levels. Each of the elements of the system that make up these levels is characterized by a different degree of reliability in the organization of life safety.

Considering such a hierarchical structure in terms of human health, it follows that it has the following four main interdependent levels:

- the global level, which characterizes the health of the Earth's population in the "man - biosphere" system. In this system, the formation of the health of the Earth's population is carried out, on the one hand, by the natural laws of the development of the biosphere, and on the other hand, by human activity. In this way, this comprehensive indicator consists of components that reflect the level of technical and ecological development of states and regions, their psychological climate;
- social or state level, which characterizes the state of health of the state as a whole or several states united into a community and characterized by one level of development;
- the health of a social group of individuals. In this case, a social group is considered a production, social or family collective of people who are in relatively equal conditions of the life environment;
- health of the individual.

The primary basis of this level is the individual, physiological and mental properties of each person, his heredity. In the process of

development, an individual's health is affected by his lifestyle, social, family status, etc.

The health of an individual actually reflects the living conditions not only of an individual, but also of the corresponding group of people, society as a whole.

As a result, human health is determined by a complex of interdependent biological and social factors of the environment. Some of these factors are positive, and some are negative.

The group of factors affecting human health is divided into objective and subjective. The group of objective factors includes, for example, biological hereditary signs of human health, the level of development of the society in which a person exists. Subjective factors in particular include acquired signs of a person's health throughout his life, psychophysical lifestyle, and social status.

Considering human health as a social category, it follows that it largely reflects the influence of the entire complex of factors of society's vital activities on a person. The level of human health in the state forms its age structure and determines potential development opportunities.

The level of both physical and moral health in the state is quite complete, its perspective is reflected by the pyramids of the age structure of the population (fig. 1). These pyramids are built on the basis of census data in the state.

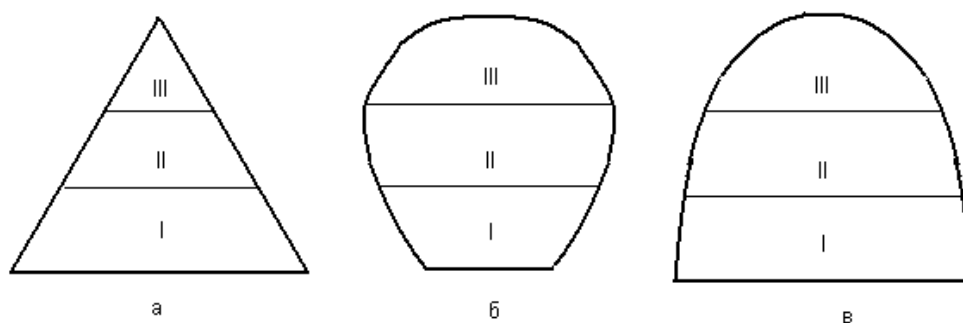


Fig. 1. Typical forms of pyramids of the age composition of the state's population:

a – a young promising state; b - a state that needs to solve demographic problems;

c - a highly developed promising state;

I, II, III – respectively, the relative number of the population under the age of 18, from 19 to 50, and over 50 years old.

Each such pyramid contains three conditional levels of the age structure of the population - I, II and III.

The first level reflects the available population under the age of 18, the second level covers the population aged 19 to 50, and the third the population over the age of 50.

According to the biological characteristics of a person, the first level of the pyramids represents the population of the pre-reproductive, the second – reproductive and the third – post-reproductive periods.

Thus, on the basis of the analysis of the configuration of the pyramids of the age composition of the population, it is possible to draw demographic conclusions, evaluate the prospects of the state's development, etc.

In principle, there are three main types of pyramids that clearly reflect the demographic situation in the country and possible prospects for its development (fig. 1): a state whose population is characterized by a large number of people of pre-reproductive age (up to 18 years), a fairly significant number of people in the reproductive period, and a small percentage of the population of post-reproductive age. Such a country is promising for the future, as it has a significant potential of young people and a relatively small number of the population that is on social security. b - a state whose population is characterized by a significant number of people in the reproductive period, a small share of young people, and a rather large percentage of people over 50 years old.

Such a pyramid of age composition reflects the demographic situation in a highly developed country, which is characterized by a high level of technical, political and social development at the time of the census.

However, in the future, such a country may experience a decline in its level of development. This is due to the fact that, on the one hand, the country's economy is heavily burdened with social benefits, and on the other, it may have problems replenishing the population that is employed in the production and scientific spheres, that is, people in the productive period.

Thus, in contrast to the state, the pyramid of the age structure discussed above, in the current case, the power structures of such a state need to solve a purely demographic problem - to increase the birth rate. c is a state whose population determines its high level of development and significant potential. This is due to a large number of young people under the age of 18, a sufficient number of people employed in the field of

production and science, and a relatively small percentage of the population that belongs to the group of social welfare.

The second qualitative indicator of health is the birth rate in the state. However, since this characteristic has its own national, religious and ethical aspects, it cannot uniquely characterize health as a complex social category and, in this regard, should be used in combination with other indicators. There are three levels of "health" in the social subsystem:

- biological - the level of physical health of a person, which is determined by hereditary traits that develop in combination with natural biological systems of self-regulation of the body - a system of adaptation and regeneration;
- social - the level of human health in biological and psychological aspects, which is determined by its relation to the social problems of the state and world politics.
- special psychological level is a psychological and physiological strategy of a person's life position in relation to his health, which is produced during a person's life under the influence of factors of the external environment and internal biological and mental state.

From a physiological point of view, "health" is considered as a natural biological state of a person. The primary signs of health are passed on to the child from the parents as an inheritance. In the process of human development, naturally, his health also changes. That is, the health of a person is such a state of his body, in which the physiological, biological and mental processes that take place in him ensure the normal functioning and development of his organs and systems.

The ability of the human body to develop and maintain its health at a certain level is ensured by the mechanism of adaptation to the conditions of the external environment. This mechanism includes the following two levels:

- genetic - which ensures the preservation of the population due to the natural preservation of healthier individuals;
- phenotypic level, which consists in the individual ability of each person's organism to adapt to the changing conditions of the external environment.

The main signs of human health:

- normal functioning of all organs and systems;
- normal flow of physiological and biochemical processes;
- the ability to fully perform basic social functions;

- participation in social activities, socially useful work, etc.;
- dynamic balance of the body's physiological and biochemical processes with changing environmental factors;
- the ability of the organism to maintain normal life activities under the influence of negative factors of the external natural and industrial environment due to the processes of adaptation and regeneration;
- absence of painful processes, diseases or painful changes;
- complete physical, spiritual, mental and social well-being, a harmonious level of development of the body's physical and spiritual forces, compliance with the principle of its unity, self-regulation and harmonious interaction of all organs.

Physical health is determined by such factors as individual features of the body's anatomical structure, the course of the body's physiological functions, heredity, and the level of functioning of the body's organs and systems.

The sphere of mental health includes individual features of mental processes and human properties, for example, excitement, emotionality, sensitivity. The mental life of an individual consists of needs, interests, motives, incentives, attitudes, goals, imaginations, feelings and is connected with the peculiarities of thinking, character, and abilities.

Spiritual health depends on the spiritual world of the individual, in particular the components of the spiritual culture of mankind - education, science, art, religion, morality, ethics. A person's consciousness, his mentality, vital self-identification, attitude to the meaning of life - all this determines the state of an individual's spiritual health.

Social health is related to economic factors, an individual's relationship with his family, organizations with which social ties are created, work, recreation, everyday life, social protection, health care, security of existence, etc.

These factors and components create a feeling of social security (or insecurity), which significantly affects human health. It is clear that in real life all four components - social, spiritual, physical, mental - act simultaneously and their integrated influence determines the state of human health.

HEALTH AND PATHOLOGY. Many factors influence the process of formation and the level of human health: climatic conditions, the ecological state of the environment, the adequacy of food supply, their

quality, socio-economic conditions of life, as well as the level of development and the state of medicine in the state.

It has been proven that approximately 50% of a person's health is determined by his lifestyle. Bad habits, unbalanced, improper nutrition, unfavorable working conditions, moral and mental overload, sedentary lifestyle, poor material conditions, misunderstanding in the family, loneliness, low educational and cultural level are negative factors in the process of forming human health. The formation of human health is negatively affected by an unfavorable environmental situation, in particular air, water, and soil pollution, as well as complex natural and climatic conditions. The state of the genetic fund of the population, susceptibility to hereditary diseases is also of great importance.

Abiotic factors of the environment, i.e. factors of a physical nature, can be the causes of disruption of the normal vital activity of the organism and the occurrence of pathological processes. There is an obvious connection between the geographical distribution of a number of diseases and climate-geographical conditions, the altitude of the area, the intensity of solar radiation, air movement, atmospheric pressure, relative humidity, etc. Human health is also affected by biotic components (factors) of the environment - features of the surrounding living nature (metabolism products of plants and microorganisms, pathogenic microorganisms, poisonous substances, insects and animals dangerous to humans). The pathological condition of a person can also be related to anthropogenic factors of environmental pollution: air, soil, water, industrial products.

Chemical, radioactive, and bacteriological pollution of air, soil, water, and food products, as well as noise, vibration, electromagnetic fields, and ionizing radiation can cause serious pathological phenomena and profound genetic changes in the human body. This leads to a sharp increase in morbidity, premature aging and death, birth of defective children.

Against the background of negative environmental factors on the human body, oncological and cardiovascular diseases, allergies, diabetes, hormonal dysfunctions, impaired fetal development, and damage to the genetic apparatus of the cells of the human body occur.

Factors of the social environment, the demographic situation, the state and level of medical care, the spiritual and cultural level of society and the social environment of a person, material condition, social relations, mass media, urbanization, conflicts of various levels and many other things significantly affect the health of the population.

The health of the population is directly dependent on the health of society. In our country, to solve the problem of preserving the health and working capacity of a person, increasing his life expectancy, a health care system (PHS) has been developed and is functioning. It contains the following subsystems:

- scientific and medical
- medical and preventive
- sanitary and epidemiological
- sanitary and preventive
- health resort
- physical culture and health.

Concepts of valeology and sanology. Valeology (lat. valeo – to be healthy and greek. logos – teaching, science) is an integrated science of formation, preservation and strengthening of human health in spiritual, mental, physical and social terms.

The object of the science of valeology is a healthy person and a person who is in the “third state”, and its subject is the health of an individual living in a real, complex world.

People have to feel mostly negative influence of environmental factors that lead to their pre-disease state, or “third state”.

The task of valeology is not only the ascertainment of the “third state” of the organism, but also the development of methods and ways of removing a person from it, as well as preventing this state in order to improve health.

Thus, valeology focuses its efforts not on the elimination of diseases (this is mainly done by medicine), but on preventing them, creating conditions to prevent their occurrence. Valeology is mainly applied in nature and gives practical recommendations to a person to maintain health at all levels: spiritual, mental, physical and social. The main goal of this science is to educate a healthy, full-fledged member of society.

Methodological foundations of valeology. Valeology considers human health as an independent category, the essence of which can be quantitatively and qualitatively characterized by direct indicators.

Therefore, health can be "managed" - formed, preserved, strengthened. Health is considered as a more general category compared to pre-disease and disease. Pre-disease (“third state”) and disease - a special case of health, when its level is reduced or there are defects. The main feature of health processes in these cases is the compensation of the

pathological process. Transitional states are distinguished between health and illness: pre-disease and unmanifest pathological process. The approach to man and his health used in valeology is integrative (systemic), holistic (from holos - whole). Methods of influence are mainly non-medicinal, natural.

Sanology is defined as “the general doctrine of the body's resistance to disease”, which is based on sanogenesis - a complex of adaptive mechanisms arising under the influence of an extraordinary stimulus. Many of the mechanisms of sanogenesis during training can be significantly improved in order to increase the body's resistance and maintain health in general.

The mechanisms of sanogenesis operate constantly even in a healthy person. A pathological process occurs only when the balance between the force of the harmful factor and the adaptive capabilities of the organism is disturbed.

The culture of health is an important component of the general culture of a person, which determines the formation, preservation and strengthening of his health. A cultured person is not only a "consumer" of his health, but also a "producer" of it.

A high level of human health culture presupposes harmonious communication with nature and surrounding people.

An element of health culture is a careful and correct attitude of a person to himself, a desire for self-knowledge, formation, development and self-improvement of his personality. Health culture is not only the sum of knowledge, the amount of relevant skills and abilities, but also a healthy lifestyle.

The level of health culture is determined by knowledge of the body's reserve capabilities (physical, mental, spiritual) and the ability to use them correctly.

So, longevity, a healthy, happy life largely depend on the person himself.

If people often get sick, have excess body weight, drink alcohol, smoke, are irritable, feel uncomfortable with others, that is, do not follow a healthy lifestyle, it means that they have a low level of health culture.

Argued justification of the need to be healthy and strive to become so - these are the elements of health culture that every modern person should possess.

The main indicators of the individual level of health include:

- Heart rate (HR) at rest. The lower the resting heart rate, the stronger the heart muscle. For one contraction, a larger volume of blood is ejected, and the pause for muscle rest increases.

- Blood pressure. This indicator also characterizes the state of the cardiovascular system. It is possible to normalize the pressure at the initial stage of hypertension or hypotension with the help of a rational lifestyle (physical activity, proper diet, adequate sleep, etc.).

- Vital indicator, which is one of the most important means of controlling the vitality of the organism. It has been proven that the higher than normal body weight, the more often various disorders occur in the work of human organs and systems. There is a certain relationship between the volume of air that a person can exhale at one time (this volume is called the vital capacity of the lungs) and his performance, endurance and resistance to diseases.

- Height-weight index, the indicators of which indicate a person's vitality. Excessive or too low weight is evidence of problems in the human body.

- Physical training. With the optimal amount and intensity of physical training, health indicators increase.

- General endurance. One of the tests that characterizes the endurance of the cardiovascular and respiratory systems, the general working capacity, is overcoming a two-kilometer distance in a certain time. Without training, indicators of general endurance deteriorate.

- The effectiveness of the body's immune system, which depends on its resistance to colds.

- Presence of chronic diseases.

A risk factor (table 1) is a factor of any nature (hereditary, environmental, industrial, life style factor, etc.), which under certain conditions can provoke and increase the risk of developing health disorders.

Classification of environmental risk factors:

1. Exogenous

- 1.1. Uncontrolled (climatogeographical)

- 1.1.1. Lability of atmospheric pressure

- 1.1.2. Duration of exposure to sunlight

- 1.1.3. A cooling climate

- 1.1.4. Hot climate

- 1.1.5. Excess or lack of trace elements in soil and water
- 1.2. Managed
 - 1.2.1. Ecological
 - 1.2.1.1. Pollution of atmospheric air, soil, water bodies
 - 1.2.1.2. Urbanization
 - 1.2.2. Working conditions
 - 1.2.2.1. Chemical factors (gases, chemically active dust)
 - 1.2.2.2. Physical factors (noise, vibration, ionizing radiation, etc.)
 - 1.2.2.3. Tension of sense organs and central nervous system
 - 1.2.2.4. Hypodynamia
 - 1.2.2.5. Forced body position
 - 1.2.3. Social microclimate (stress)
 - 1.2.4. Lifestyle
 - 1.2.4.1. Mode of work and rest
 - 1.2.4.2. Social and household conditions
 - 1.2.4.3. Features of nutrition
 - 1.2.4.4. Bad Habits
- 2. Endogenous
 - 2.1. Uncontrolled
 - 2.1.1. Morphofunctional
 - 2.1.2. Genetic (hereditary predisposition to diseases, blood group)
 - 2.2. Managed
 - 2.2.1. Pathophysiological (arterial hypertension, psychoemotional imbalance)
 - 2.2.2. Biochemical (disorders of lipid metabolism, dyshormonal changes)

The risk is divided into:

- voluntary (driving a car);
- forced (inhalation of polluted air);
- natural (radon);
- artificial (synthetic substances);
- known (household detergents);
- exogenous (microorganisms created by genetic engineering);
- chronic;
- catastrophic (accident);
- self-controlled (driving a car);
- controlled by others (environmental pollution);
- justified (minimum given the circumstances);

- unjustified (maximum in this situation).

Table 1

Grouping of risk factors and their contribution to the formation of population health

№	A group of risk factors	Risk factors included in the group	Specific gravity of the group of officials, %
1	Life style	Tobacco smoking. Irrational food. Getting used to alcohol. Poor minds. Stressful situations. Hypodynamia. Filthy material and everyday minds. Low social and cultural level of life.	50
2	Genetic factors	Tendency to hereditary diseases	20
3	Environment	Pollution of water, air, soil. Climate change. Destruction of biodiversity.	20
4	Medical factors	Ineffectiveness of preventive measures. Low quality and untimely medical care.	10

Pathological processes (for example, birth defects, hereditary pathology, allergic diseases, and others), which occur under the influence of various factors, are classified as stochastic (probable) or somatostochastic. Through properly planned epidemiological and hygienic studies, it is often possible to identify and quantify the risk of developing certain non-infectious diseases in the population. The risk of harmful effects on health is the probability of the development of undesirable effects in the population at certain levels and duration of environmental

factors. Risk factors can be related to a person's lifestyle, the influence of environmental factors, genetic characteristics, biological factors (body status, gender, age, chronic diseases, etc.).

Under the action of mutagenic and carcinogenic factors that do not have a threshold of harmful effects, specific stochastic effects occur. The occurrence of these effects under the action of a specific factor is a probable event characterized by individual or population risk values. Individual carcinogenic risk is the probability of an individual getting cancer. Population carcinogenic risk characterizes the number of additional cancer cases in a specific population (for example, among residents of a certain city). For example, the amount of carcinogenic risk is $5 \cdot 10^{-4}$ means that with this action, the development of 5 additional (to the background level) cases of cancer in a population of 10,000 people is possible.

Environmental factors can play a modifying role, that is, change the clinical picture and worsen the course of a chronic disease. For example, atmospheric air pollution with nitrogen oxides provokes symptoms of impaired respiratory tract function in patients with chronic respiratory diseases.

In some cases, the studied factors may have a mixed effect. An example of mixed factors can be age and smoking when studying the impact of atmospheric pollution on the risk of developing respiratory diseases, smoking when studying the risk of developing lung cancer under the influence of asbestos.

Diseases can also be caused by a violation of the balance between the external and internal environment of the body, which is especially characteristic of endemic diseases. An excess or deficiency of natural chemical substances, a violation of their ratio in the presence of harmful chemical compounds in the environment can disrupt the said balance and cause endemic diseases (dental caries - with a deficiency of fluorine, fluorosis - with an excess of fluorine, etc.).

On average, lifestyle (tobacco smoking, alcohol and drug use, drug abuse, diet, working conditions, physical inactivity, financial and household conditions, family status, etc.) affects 50% of the population's health, genetic and biological factors - 20%, the state of the health care system (timeliness and quality of medical care, effectiveness of preventive measures) - 10%, environmental factors - 20%. In large cities, the state of health of the population is determined by social factors and lifestyle

(30%), urban and domestic environment (16%), industrial environment (18%).

According to the US Environmental Protection Agency, environmental factors play a major role in the development of half of all cases of malignant neoplasms. Sunlight (risk 1:3) and tobacco smoking (8:100) are the main carcinogenic risk factors. The total contribution of these factors is about 40%. Environmental pollution contributes much less (about 10%) to the carcinogenic risk. For example, the presence of harmful chemicals, including pesticides, in food products leads to a risk of 1×10^{-5} , chemical pollution of atmospheric air - 1×10^{-4} , pollution of drinking water - 1×10^{-5} of the occurrence of malignant tumors.

Among the causes of death in economically developed countries, cardiovascular diseases (33.5%), malignant neoplasms (23.5%), cerebrovascular diseases (6.7%), accidents (4.3%), chronic diseases take the main place lung (4.0%), pneumonia and flu (3.7%), diabetes (2.2%), suicide (1.4%), liver disease (1.2%). The main causes of death are environmental and lifestyle factors. The contribution of tobacco smoking to the risk of death from coronary artery disease is estimated at 21%, from cancer - 30%. Half of all deaths from murders, suicides and car accidents are related to alcohol consumption.

The constituent components of life support include various elements related to all spheres of health - physical, mental, social and spiritual. The most important of them are nutrition (including high-quality drinking water, the required amount of vitamins, trace elements, proteins, fats, carbohydrates and food additives), daily life (quality of housing, conditions for passive and active recreation, level of mental and physical safety), safe conditions work, motor activity (use of physical culture and sports, various wellness systems aimed at increasing the level of physical development, its support, recovery after physical and mental stress), compliance with the rules of personal hygiene. People's awareness and access to special preventive procedures capable of counteracting the natural aging process, appropriate environmental conditions, and a sufficient health care system are of great importance for CKD. In addition, there are many other components of healthy lifestyles that mainly concern not only physical and mental, but also social and spiritual health (absence of bad habits, the prevailing attitude to the priority value of health, etc.).

From the point of view of modern valeology, a healthy lifestyle is the so-called formula of health, which means all human actions directly aimed

at the formation, preservation, strengthening, consumption, restoration and transmission of health.

Of great importance is the correct choice of individual health systems or their combination and practical use for the purpose of improving health (self-massage, hardening, breathing exercises, autogenic training, etc.).

Adherence to a healthy lifestyle affects the formation, preservation and strengthening of health, contributes to the intellectual and spiritual development of the individual. A healthy lifestyle of a person, having a positive effect on the state of his health, on his spirituality, moral orientations, contributes to the formation of certain character traits (for example, will, optimism, purposefulness) and other qualities, makes it easier to overcome psycho-emotional loads, stressful situations, which indicates in turn, about the high level of her mental health.

The mechanism of the harmful effects of alcohol, smoking and drugs on the human body. Methods of combating bad habits Recently, the level of morbidity among the population has been increasing, which is associated with the spread of bad habits. This mass phenomenon is rightly called a disease of civilization, which has acquired not only a medical, but also a social aspect.

About 1,5 million people die annually on Earth from diseases caused by smoking. According to the WHO, 90% of all lung cancer cases, 75% of all cases of chronic nephritis and emphysema, and 25% of all cardiovascular diseases are caused by smokers. As a rule, signs of harmful effects on the body appear 10-20 years after the start of smoking, so many smokers initially do not notice changes in their health. Numerous studies show that long-term smoking leads to premature death and shortens life expectancy by 8-10 years.

Smoking is one of the leading risk factors for coronary heart disease and malignant neoplasms of the lungs. Smoking intensifies tissue hypoxia, increases the content of carboxyhemoglobin in the blood, negatively affects the functions of the stomach, endocrine glands, blood vessels, teeth, oral cavity, impairs memory and attention, and reduces mental capacity. A great danger (especially for children, pregnant women) is forced passive smoking while staying in a room polluted by tobacco smoke. Long-term smoking has a detrimental effect on the nervous system. The higher nervous activity changes, it becomes difficult to excite the autonomic nervous system, including due to a violation of the secretion of adrenaline by the adrenal glands. In smokers, attention, memory, work capacity, and

the efficiency of learning new knowledge gradually decrease, therefore smoking is incompatible with mental work and creative activity .

Alcoholism is a chronic disease caused by systematic consumption of alcoholic beverages. Alcoholism is a condition caused by the systematic abuse of alcohol, as a result of the emergence of a pathological craving for it (addiction) and the gradual increase in the phenomena of alcoholic changes in mental activity. According to its chemical composition, alcohol is ethyl alcohol. Its universal property is manifested in the strengthening of positive emotional experiences. Alcohol acts on the central nervous system not as a stimulant, but as a paralytic. When it enters the gastrointestinal tract, it is quickly absorbed into the blood (about 20% is absorbed in the stomach, the rest is absorbed in the intestines), at the same time it is absorbed by the tissues of the brain, but it is most concentrated in the cerebellum, which coordinates the movement of the body. Alcohol:

- worsens the saturation of the lungs, reduces the resistance of lung tissue to pathogenic microorganisms;
- weakens immunity;
- irritates the mucous membrane of the stomach and weakens the effect of gastric juice (gastritis);
- leads to disruption of exchange processes, alcoholic psychosis and degradation of personality.

The use of alcohol during hypothermia is unjustified.

There are 3 clinical stages of alcoholism:

1. **Neurasthenic** - characterized by the disappearance of the protective vomiting reflex when abusing alcohol, loss of control over what is drunk, and an increase in doses. Increased irritability, neurasthenic complaints are observed. The duration of the stage is 3-5 years.

2. **Narcotic** - characterized by the formation of a hangover syndrome with increased tolerance and amnesic forms of intoxication with an angry and irritable affect. Outside of intoxication - sleep disturbance, frivolous attitude to family, work, studies, tendency to lie. Somatovegetative disorders are observed. Duration - 3-10 years.

3. **Encephalopathic** with pronounced hangover syndrome, somatic disorders, reduced tolerance to alcohol, binges and pseudo-binges, with sharply expressed moral and ethical degradation, neurological pathology. It is formed after 10-15 years.

Features of alcoholism in women: long-term concealment of abuse, a relatively low level of tolerance, sharp degradation during the transition

from the 2nd to the 3rd stage with a malignant course of the latter. In addition, under the influence of alcohol, premature births can occur, perinatal mortality increases. An increase in cases of malformations in newborns and developmental disorders of children, fetal alcohol syndrome and encephalopathy is associated with alcohol intoxication of pregnant women.

Meta-alcoholic psychoses may occur in the 2nd and 3rd stages of alcoholism:

- Signs of acute psychosis: alcoholic delirium (white fever, acute alcoholic hallucinosis, acute alcoholic paranoid);
- Signs of prolonged and chronic psychosis: alcoholic delirium, jealousy, Korsak's amnesic polyneurotic psychosis, chronic alcoholic hallucinosis and hemorrhagic polyencephalitis. Alcoholism can also cause depressive states, hysterical reactions, and epileptic seizures.

Alcohol negatively affects all organs and systems of the body: it damages the central nervous system, liver, digestive tract, kidneys, heart and blood vessels, increases hypoxia, inactivates enzymes, distorts the effect of medicines, disrupts metabolic processes, reduces intelligence and work capacity, gradually leading to the degradation of the personality.

Drug addiction and toxic addiction - systematic use of one or more (polydrug addiction) toxic substances with sedative, euphoric and narcotic effects, which leads to psychological and later physical dependence on them. At the same time, the term "drug addiction" is considered not only from a clinical, but also from a social and legal point of view. Drug addictions include the use of substances such as morphine, opiates, synthetic and semi-synthetic analogues of opium alkaloids (ethylmorphine hydrochloride, codeine, promedol, etc.), to toxic addictions - addiction to tranquilizers, antidepressants, stimulants, other medications (lecomania), to systematic inhalation of vapors of gasoline, acetone, ether, etc.

The clinic depends both on the general mechanisms of action of narcotic and toxic substances (euphoric, hypnotic, analgesic), and on the specific effect of individual substances on the central nervous system. Addiction to morphine, cocaine, LSD is formed within several weeks, to marijuana - slowly. With the use of narcotic substances, psychological and later physical dependence first appears, in connection with which, when the drug is withdrawn, an abstinence syndrome occurs. Clinical features of abstinence, the severity and course of the withdrawal syndrome in certain

types of drug addiction and toxic addiction are diverse. Morphine, barbiturates, antiparkinsonian drugs lead to severe withdrawal, abuse of cocaine, hashish - to a relatively mild one. In general, drug addiction disorders are characterized by a weakening of excitement and activity, a narrowing of interests, the development of egocentric tendencies with indifference to others, irritability, memory loss, and loss of natural life drives. As a rule, signs of premature physical aging, hypo- and dystrophy appear quickly.

The method of involvement in drug abusers and the choice of the latter depends on age. For middle-aged people, it is typical to become addicted to one substance, which is used individually for self-medication or for medical purposes and is usually obtained legally. Adolescent-youth addiction arises initially collectively for self-affirmation, satisfaction of curiosity, while medical preparations are used, as well as illegally acquired chemicals and narcotics. Young people most often use so-called "light" drugs, not realizing the significant harm they cause to their own body - changes in mental and psychological activity, negative impact on reproductive function, gastrointestinal tract, respiratory and cardiovascular systems.

Treatment of alcoholism and drug addiction is carried out on an outpatient and inpatient basis in drug addiction institutions according to certain schemes, which include detoxification, strengthening therapy, psychotherapy, and rehabilitation measures.

It is important to prevent harmful habits, which is carried out through the use of measures aimed at the harmonious development of the personality, legal education of young people, as well as clear regulation by doctors of the terms of use of drugs capable of causing drug addiction, restrictions on the sale through the pharmacy network of drugs with analgesic, hypnotic, sedative, and stimulating effects, banning the sale of tobacco and alcohol products to children and adolescents, timely medical assistance to alcohol and drug addicts, control of advertising of tobacco and alcohol products in mass media, etc.

TOPIC 5
**"FOOD SAFETY AS COMPONENT OF SAFE HUMAN
ACTIVITIES"**

1. ACTUALITY OF THE TOPIC

Nutrition is the main controlled factor that ensures the normal growth and development of children, health and quality of human life, working capacity, active longevity, and the creative potential of the nation. In addition, properly organized nutrition plays an important role in reducing the risk of developing chronic non-infectious diseases, especially the so-called diseases of the century: cardiovascular, oncological, diabetes, obesity, osteoporosis, caries, etc.

2. EDUCATIONAL OBJECTIVE

To form the concept of rational nutrition. Learn the basic measures to protect food products from contamination by xenobiotics.

3. LIST OF QUESTIONS ASKED IN THE CLASS

- The impact of nutrition on human life. Classification of dangerous factors of food products.
- Quality and safety indicators of food products.
- Food additives as possible contaminants.
- Pesticides, definition, classification. Consequences of contamination of food products with pesticides.
- Genetically modified products and their danger to human health.
- Radionuclides in food products. Nutrition in conditions of radiation pollution.
- Toxic substances in food products: permissible background residues, maximum permissible level of residues in food products. Methods of reducing the amount of pollutants in food products.

4. PROFESSIONAL COMPETENCES

The student must:

Know:

- Nutritional and biological value of basic food products.
- Sanitary quality indicators of food products.
- Consequences of food contamination with xenobiotics.
- The role of proteins, fats, carbohydrates in reducing the negative impact of external and internal radiation.
- Use of minerals and vitamins in radiation protection nutrition.

Be able:

- Estimate the ecological burden of nitrates (according to situational problems).
- Reduce the amount of pollutants in food products.
- Develop diets aimed at reducing the negative impact of ionizing radiation on the human body.

5. SYNOPSIS OF THE SUBJECT OF THE TOPIC

Rational nutrition is full in quantity and balanced in quality nutrition pattern for normal height, physical and psycho-physiological organism development, its high work capacity, active longevity and adverse environmental natural, man- caused, social environment factors resistance.

Basic principles of rational nutrition:

1. To be full in quantity. The dietary intake food calorific value must correspond to the organism energy consumption including the undigested part of the dietary intake.

2. To supply the dietary intake quality (balance) which means that all nutrients, proteins, fats (including animal), carbohydrates (including polysaccharides, celluloses, dietary fibers), vitamins, macro- and microelements, flavoring substances must be contained in optimal quantities and ratios.

3. The rational dietary pattern must be followed: food intake hours must correspond to the organism biological rhythms: adults must have 3-4 meals a day and children of different ages - 5-6 meals a day. Intervals between food intakes must be 5-6 hours for adults and 3-4 hours for children. The daily intake distribution must correspond to the organism physiological needs: the breakfast and dinner (the organism physical activity period) must contain 30-35% and 45- 50% of the daily intake, the supper (after finishing the active daily period) – 20- 25%.

4. Food must be cooked in accordance to the digestive system enzymeabilities. The perfect taste, good nutrition value, easy gastrointestinal digestion and high level of food absorbency must be reached during the food preparation.

5. Food must not be toxic. Products and ready meals must not contain the toxic substances in harmful to the human organism concentrations.

6. Food must be harmless in epidemiological aspect. Products and ready meals must not contain the etiological agents of infectious foodborne diseases - bacteria, viruses, fungi, protozoa, geo-and biohelminth embryos.

The breach of these principles may cause the decrease of individual or organized collectives' health level, initiation of the diseases of alimentary origin.

Types of diseases associated with a violation of rational nutrition:

- caused by starvation, quality and quantity malnutrition (marasmus, protein starvation, hypovitaminosis, avitaminosis and others);
- caused by the dietary intake irregularity (gastritis, stomach and duodenal ulcers, constipation or coprostasis and others);
- caused by overeating (obesity, gout or podagra, hepatitis, cholecystitis, pancreatitis, gall-stone disease and etc.);
- caused by inadequate culinary processing of the product (also gastritis, ulcers, hypovitaminosis etc.);
- food poisonings: bacterial origin (toxic infection, bacterial toxicosis, mycotoxicosis), non-bacterial origin (poisonous by nature products, products which became toxic after storage conditions disturbance and others); products contaminated by toxic substances (pesticides, heavy metals salts and etc.);
- enteric bacterial, virus, zoonotic infections (typhoid fever, paratyphoid A, B, dysentery; hepatitis A, poliomyelitis, enterovirus diseases; brucellosis, foot-and-mouth diseases, tuberculosis and others); geo- and biohelminthes (ascaris, whipworm, beef, pork tapeworm, trichina, fish tapeworm, flukes and etc.);
- effects, caused by the products, contaminated with mass destruction weapon in modern war – nuclear explosion radioactive products, battle poisonous substances (chemical agents), especially particularly dangerous bacterial agents.

That is why the regular medical control of the nutrition validity and safety of both individuals and organized collectives is necessary.

The following methods of such control may be used:

- the above-mentioned alimentary diseases detection;
- the energy consumption and nutrient requirements determination or calculation;
- the factual nutrition assessment by questioning, budget, gravimetric, laboratory methods, food establishment sanitary inspection methods, and calculative methods of the daily intake energetic and nutritional content assessment.

Vitamins.

Vitamins are an important component of a good diet. Vitamins are essential for the normal growth and development of a multicellular organism. Using the genetic blue print inherited from its parents, a fetus begins to develop, at the moment of conception, from the nutrients it absorbs. It requires certain vitamins and minerals to be present at certain times. These nutrients facilitate the chemical reactions that produce among other things, skin, bone, and muscle. If there is serious deficiency in one or more of these nutrients, a child may develop a deficiency disease. Even minor deficiencies may cause permanent damage.

For the most part, vitamins are obtained with food, but a few are obtained by other means. For example, microorganisms in the intestine — commonly known as “gut flora” — produce vitamin K and biotin, while one form of vitamin D is synthesized in the skin with the help of the natural ultraviolet wavelength of sunlight. Humans can produce some vitamins from precursors they consume. Examples include vitamin A, produced from beta carotene, and niacin, from the amino acid tryptophan.

Once growth and development are completed, vitamins remain essential nutrients for the health maintenance of the cells, tissues, and organs that make up a multicellular organism; they also enable a multicellular life form to efficiently use chemical energy provided by food it eats, and to help process the proteins, carbohydrates, and fats required for respiration.

Deficiencies of vitamins are classified as either primary or secondary. A primary deficiency occurs when an organism does not get enough of the vitamin in its food. A secondary deficiency may be due to an underlying disorder that prevents or limits the absorption or use of the vitamin, due to a “life style factor”, such as smoking, excessive alcohol consumption, or the use of medications that interfere with the absorption or use of the vitamin. People who eat a varied diet are unlikely to develop a severe primary vitamin deficiency. In contrast, restrictive diets have the potential to cause prolonged vitamin deficits, which may result in often painful and potentially deadly diseases.

Well-known human vitamin deficiencies involve thiamine (beriberi), niacin (pellagra), vitamin C (scurvy), and vitamin D (rickets). In much of the developed world, such deficiencies are rare; this is due to an adequate supply of food and the addition of vitamins and minerals to common foods, often called fortification. In addition to these classical vitamin

deficiency diseases, some evidence has also suggested links between vitamin deficiency and a number of different disorders.

Poor dietary intake, stress and certain medical conditions can deplete or destroy the essential layers of vitamin in the body. Destruction of vitamin layer leads to symptoms of vitamin deficiency. The most common signs of vitamin deficiency are fatigue, nausea, pain, headache, immune disorder and nerve diseases, resulting in overall impairment in growth and development.

Vitamin A deficiency leads to night blindness and dry eye. The most common symptoms of vitamin A deficiency include tiredness, hair loss, joint pain, weakened muscle, swelling, fatigue, weight loss and memory loss.

Vitamin B deficiency is most common in all age groups as this group of vitamins regulate all the vital functions of human body. Signs of vitamin B deficiency include stress, frustrations, depression and loss of memory. It greatly affects the functioning of nervous system, associated with improper nerve transmission and brain functions.

Many people are also affected by the deficiency symptoms of vitamin C. This deficiency leads to a disease called scurvy. The most common symptoms include inflammation and bleeding of gums. It can also lead to joint pains, damaged hair and dry skin.

Deficiency of vitamin D results in growth retardation and skeletal deformities. It hampers the absorption of calcium in the body and eventually leads to rickets in children and osteoporosis in adults.

Vitamin K and vitamin E don't show much of vitamin deficiencies symptoms. Yet, they affect the normal body functions in case of prolonged deficiencies. Symptoms of vitamin K deficiency include heavy menstrual bleeding, gastrointestinal bleeding, nosebleeds, anemia, gum bleeding, prolonged clotting time and liver cancer. Vitamin K deficiency symptoms can be treated by taking vitamin supplements or by adding more of leafy vegetables, tomatoes, honey, egg yolk and wheat gram in your daily diet.

Symptoms of vitamin E deficiency include a decline in cognitive function, loss of deep tendon reflexes, muscle weakness and loss of vibration. This deficiency usually occurs in developing countries due to poor dietary intake. Vitamin E deficiency symptoms can be curbed by consuming food stuff such as vegetableoil, wheat germ oil and egg yolk.

Vitamin deficiency signs can be well curbed by consuming adequate amount of vitamin enriched foods. Well balanced and nutritious diet can

help fight all the health ailments and provide a healthy body and mind. In case of prolonged deficiency, use of vitamin supplements can also work wonders for treating any vitamin deficiency symptom. Side-effect sandover dose. In large doses, some vitamins have documented side-effects that tend to be more severe with a larger dosage. The likelihood of consuming too much of any vitamin from food is remote, but overdosing (vitamin poisoning) from vitamin supplementation does occur. At high enough dosages, some vitamins cause side-effects such as nausea, diarrhea, and vomiting. When side-effects emerge, recovery is often accomplished by reducing the dosage. The doses of vitamins differ because individual tolerances can vary widely and appear to be related to age and state of health. In 2008, overdose exposure to all formulations of vitamins and multivitamin- mineral formulations was reported by 68,911 individuals to the American Association of Poison Control Centers (nearly 80% of these exposures were in children under the age of 6), leading to 8 “major” life-threatening outcomes and 0 deaths.

Food safe tyaspart of safe life style.

Food borne illnesses are a burden on public health and contribute significantly to the cost of health care. The good news is that they are preventable! Food safety is a shared responsibility of every body involved with food, from governments, food producers, retailers and consumers. All along the food chain, legislation and controls are implemented to minimize the risk of contamination and ensure that the food which reaches the consumer's table is safe.

The best way to stay healthy at home remains to be well informed about the basic principles of food production and safe food handling. Food is any substance consumed to provide nutritional support for the body. It is usually of plant or animal origin, and contains essential nutrients, such as carbohydrates, fats, proteins, vitamins, or minerals. The substance is ingested by an organism and assimilated by the organism's cells to provide energy, maintain life, or stimulate growth. Food borne illness in the United States is a major cause of personal distress, preventable illness and death, and avoidable economic burden. Food borne diseases cause approximately 48 million illnesses, 128,000 hospitalizations, and 3,000 deaths in the United States each year. The occurrence of approximately 1,000 reported disease outbreaks (local, regional, and national) each year highlights the challenges of preventing these infections.

Food function and factors that provide them:

1. **Energy function** lies in discharge of the energy in the process of metabolism (major suppliers of energy are carbohydrates (1g - 4 kcal), fat (1 g - 9 calories) and protein (1g - 4 kcal);

2. **Plastic function** lies in building cells, tissues and organs. Basic plastic properties primarily have proteins. The refore plastic food function is provided mainly by meat, fish and dairy products, eggs;

3. **Bioregulatory function** lies in regulation of metabolic processes. The food contains substances, which create enzymes and hormones - biological regulators of metabolism in tissues. Proteins, vitamins and minerals play a big role in the formation of enzymes and hormones. Expressed bioregulatory properties have vegetables, fruit, berries, eggs;

4. **Adaptive-regulatory function** consists in regulation of functional systems. In particular, dietary fiber (fiber and pectin) is involved in the formation of feces and regulation of motor bowel function, promotes excretion of toxins, radionuclides, metabolic products. Rye and wheat bread from wheat milling, potatoes, vegetables, fruit are rich in dietary fiber;

5. **Immunity regulatory function** effects on the immune status of the organism. Ability to resist to the damaging factors action (biological, chemical and physical) depends on the food quality, especially of its protein, vitamin and mineral composition, the content of polyunsaturated fatty acids (omega-3and-6), microelements (zinc, iron, iodine, selenium etc);

6. **Rehabilitation function** lies in balanced diet, which plays an important role in the patients rehabilitation after diseases, helps to improve recovery and prevent recurrence. To enhance the rehabilitative function there is used different groups of dietary food products (low-sodium, low-fat, high energy value, etc.);

7. **Motivational-alarm function** is associated with the delivery of flavoring substances in the body that contributes to keep food motivation at the proper level (appetite). In addition to spice (vinegar, mustard, salt), flavoring substances include also onions, garlic, dill, parsley, bay leaf. Anthropogenic pollution has led to a systematic environmental income into body of toxic substances, heavy metals, radionuclides, causing reduction of individual and population health, reduce of lifetime, increase of the number of children with malformations, malignancies, imunopathologies, heart vascular diseases. About 80% of harmful

substances entering the body, are contained in foods and drinks.

The classification of dangerous food products:

1) biological:

- bacteria (Salmonella, Escherichia, Staphylococcus, Clostridium, etc.);
- viruses (enteroviruses, rotavirus, hepatitis A virus, etc.);
- microscopic fungi (Aspergillus flavus, Fusarium graminearum, etc.);
- parasites (nematodes, cestodes).

2) chemical - linked with possible presence of detergents and disinfectants residues, pesticides, fertilizers, growth stimulants animals and plants, chemical food additives and environmental pollutants (toxic metals, poly chlorinated biphenyls, dioxins, radionuclides, etc.) and toxic substances that migrate from equipment, containers, packages in food.

3) physical – include physical objects that normally should not be in the food. May cause harm to the consumer availability of glass, sand, metal products (buttons, clips) and others in food.

Indicators of food quality and safety.

Food quality - a set of properties that determine the suitability of products to nutrition. Also it's the distinctive trait, characteristic, capacity or virtue of a product that sets it apart from all others. This definition includes:

- Organoleptic properties (color, smell, taste)
- Physico-chemical properties (moisture, acidity, the presence of impurities)
- Nutritional value,
- Biological value

When we eat food, the nutrients present in it, are released by the process of digestion. Digestion starts in the mouth, where the food is broken into small bits, and mixed with saliva. The food is then sent to the stomach and the duodenum where it is further broken down by chemical action. The food is then sent to the small intestine where the process of absorption of nutrients begins.

These simple molecules are absorbed by the walls of the small intestine. They then enter the bloodstream and are then transported to the various parts of the body. These simple molecules are then burnt by the cells to provide energy.

Food contains a number of basic elements such as carbohydrates, proteins, fats and alcohol. These elements all produced different quantities of

energy when burnt. The amount of energy produced when one gram of any of these elements is burnt is known as its calorific value (table 1).

Table 1

Average Energy Content of Nutrients [3]

Nutrient	Ccal/g	kJ/g
Protein	4	17
Fat	9	37
Carbohydrate	4	17
Alcohol	7	29

To convert kilocalories to kilojoules, use the following formula:

1 kilocalorie (Ccal) = 4.184 kilojoules (Kj)

Carbohydrates. Carbohydrates are the main source of energy for the human body. When they are broken down they form glucose. Glucose is essential as a source of energy and is also important for maintaining tissue protein. The brain and central nervous system depend solely on glucose for their energy requirements.

Carbohydrates are obtained from food such as whole-grain cereals and breads, pasta, corn, beans, peas, potatoes, fruit, vegetables, and milk products. These food groups together normally constitute more than 50 per cent of the calorie requirement of the human body. It is recommended that carbohydrates should contribute 60-70 per cent of the total calories in a day's diet.

The carbohydrates that are found in such foods are called complex carbohydrates. They are slowly broken down into glucose and absorbed by the body. This ensures that healthy levels of glucose are always maintained in the body.

Simple sugars are carbohydrates that are obtained by refining naturally occurring sugars. These simple sugars are found in processed foods. Simple sugars are readily absorbed by the body. The body's glucose requirement is usually exceeded and the supply of glucose does not last

over a period of time. Processed foods are also devoid of minerals and other nutrients that are required by the body. They are also deficient in dietary fibers that are required by the body to aid the process of digestion. Soluble fibers are found in food such as oats, barley, beans, peas, apples, strawberries and citrus fruits. These fibers aid the body by slowing down the process of absorption of glucose, thereby lowering the cholesterol levels.

Consume dietary antioxidants with food. Vitamin C and certain vitamins can reduce the conversion of nitrates and nitrites to nitrosamines. Consume dietary antioxidants with food. Insoluble fibers are found in vegetables, whole-grain products and bran. These fibers speed up the process of elimination of the feces and help prevent constipation.

Proteins. Proteins are complex nitrogen-containing compounds that build and repair body tissue. They also form antibodies, hemoglobin, enzymes, and hormones. The protein that is absorbed through food is used to perform these vital functions, though it may also be used to provide energy to the body, in the absence of sufficient carbohydrates and fats.

Proteins are made up of amino acids. Most of these amino acids are not synthesized by the body, but must be obtained from food. These essential amino acids are obtained from eggs, milk, meat, fish and poultry. Plants, by themselves, do not provide all the essential amino acids, but they may do so in combination with other vegetarian sources of food. For example, when cereals are combined with pulses, they provide most of the essential amino acids. Vegetarians must take especial care to ensure that their body's requirement of protein is sufficiently met by their diet.

The body's daily requirement of protein is between ten to fifteen per cent of the daily calorie requirement. A deficiency in the intake of protein can retard growth and development and inhibit the body's ability to fight infection. An excess of protein puts an additional burden on the kidneys to eliminate the excessive waste products, and should also be avoided.

The body's protein requirement varies with factors such as age, physiology and stress. Pregnancy greatly increases the protein requirement of the body, as does infection. These additional requirements are normally accomplished by the intake of protein supplements.

Fats. Fats are the most concentrated source of energy in our diet. They also impart flavor to the food, which is why low-fat foods are never as tasty as foods that are high in fat. Fat plays several important roles in diet. It is important for the absorption of fat-soluble vitamins such as

vitamin A, D, E and K. Fats also provide essential fatty acids, which are important for the structure and function of cells. Fat also cushions the vital organs and protects the body from extremes of cold and heat.

Food contains two types of fat: visible fats, and invisible fats. Visible fats are derived from coconut, ground nut, mustard, cotton seed, soy bean, sesame, butter, and cod-liver oil. Invisible fats are derived from a variety of food sources such as cereals, pulses, vegetables, spices, nuts, tubers, fruit, milk products, and meat.

Fats can also be classified as saturated, mono unsaturated, and polyunsaturated fat. Saturated fat is obtained from eggs, dairy products, and meat. A high intake of these can be unhealthy. Mono unsaturated and polyunsaturated fats are obtained from vegetable oils, nuts, olives, and avocados.

Saturated fats also contain cholesterol. Cholesterol is used to build cell membranes, protect nerve fibers, and produce vitamin D. Cholesterol is manufactured by the liver and small intestine to satisfy this requirement. Hence, the body does not require cholesterol from food sources. When we eat foods with saturated fats, we increase the level of a cholesterol carrying substance called lipoprotein in our blood stream. These low density lipoproteins (LDL) leave a coating of cholesterol in the artery walls and slowly clog the arteries. Due to the narrowing of the arteries, the heart has to pump harder, and parts of the body do not get a sufficient blood supply. This leads to various diseases including obesity, hypertension, cancer, and heart disease.

There is another type of lipoprotein that is good for the body. High density lipoproteins (HDL) remove cholesterol from the wall of the arteries and return it to the liver, where the cholesterol is excreted as bile. High density lipoproteins are found in monounsaturated and polyunsaturated fats.

The body requires approximately forty grams of fat in a day. Half of this requirement is met by invisible fats. Therefore, we need to consume only twenty grams of visible fat in a day. Vegetable oils which can help the body complete its fat requirement include soybean oil and mustard oil with groundnut or sesame oil. It may also be obtained by eating hundred to two hundred grams of fish twice a week.

Alcohol. Alcohol provides higher calories than carbohydrates and proteins. Unfortunately, these calories are devoid of the essential vitamins, minerals and proteins that enable the body to use these calories as energy.

These calories instead, are converted into fat and stored by the body, contributing to obesity.

Alcohol in moderate amounts may be beneficial as it increases the level of high density lipoproteins in the body. However, excessive consumption of alcohol results in a variety of ailments such as cirrhosis of the liver, damage to the brain and peripheral nerves, and weakening of the heart muscle. It can also lead to nutritional deficiencies and an increased risk of cancer.

Biological value is characterized by the content in food all essential nutrient, essential amino acids, poly unsaturated fatty acids (PUFAs), vitamins, macro- and microelements.

Nutritional value describes the properties of consumer product, its organoleptic properties, the possible range of dishes from it and the level of components assimilation.

According to the Law of Ukraine “On the safety and quality of food” safe food product is a food product that hasn’t got any harmful effects on human health, directly or indirectly, by the conditions of production and circulation in compliance with sanitation and consumption (use) by purpose.

The products, which are allowed to supply the population, must meet the standards and the following requirements:

- have satisfactory organoleptic properties;
- have a nutritional value that is determined by the presence of digestible nutrients and qualitative composition
- have the necessary cash data;
- be epidemically safe (epidemiological security - the absence or limitation of levels of contamination of food with pathogenic and potentially pathogenic microorganisms, lack of worms and their larvae, bacterial and fungal toxins) ;
- be toxicologically safe (absence or restriction of food contamination by pesticides, veterinary drugs, feed additives or other chemicals that are used in the production, storage, transportation, food).

Nutritional supplement sasossible contaminants.

Food additives are substances added to food to preserve flavor or enhance its taste and appearance. Some additives have been used for centuries; for example, preserving food by pickling (with vinegar), salting, as with bacon, preserving sweets or using sulfur dioxide as with wines. With the advent of processed foods in the second half of the twentieth

century, many more additives have been introduced, of both natural and artificial origin.

Scientific evidence shows that some dietary supplements are beneficial for overall health and for managing some health conditions. For example, calcium and vitamin D are important for keeping bones strong and reducing bone loss; folic acid decreases the risk of certain birth defects; and omega-3 fatty acids from fish oils might help some people with heart disease. Other supplements need more study to determine their value. The U.S. Food and Drug Administration (FDA) does not determine whether dietary supplements are effective before they are marketed.

Many supplements contain active ingredients that can have strong effects in the body. Always be alert to the possibility of unexpected side effects, especially when taking a new product. Supplements are most likely to cause side effects or harm when people take them instead of prescribed medicines or when people take many supplements in combination.

Dietary supplements can also interact with certain prescription drugs in ways that might cause problems. Here are just a few examples:

- keep in mind that some ingredients found in dietary supplements are added to a growing number of foods, including breakfast cereals and beverages. As a result, you may be getting more of these ingredients than you think, and more might not be better. Taking more than you need is always more expensive and can also raise your risk of experiencing side effects. For example, getting too much vitamin A can cause head aches and liver damage, reduce bone strength, and cause birth defects. Excess iron causes nausea and vomiting and may damage the liver and other organs;

- be cautious about taking dietary supplements if you are pregnant or nursing. Also, be careful about giving them (beyond a basic multivitamin/mineral product) to a child. Most dietary supplements have not been well tested for safety in pregnant women, nursing mothers, or children;

- if you suspect that you have had a serious reaction from a dietary supplement, let your health care provider know. He or she may report your experience to the FDA. You may also submit a report to the FDA by calling 800-FDA-1088 or completing a form online external link disclaimer. In addition, report your reaction to the dietary supplement company by using the contact information on the product label.

According to the WHO definition, “**a food additive**” is a substance that is not used for food in a pure form and is not a typical ingredient for food whether the stuff is of nutritional value or not, and who intentionally introduced into food from technological purpose, during their processing , manufacturing, packaging, transport or storage”.

To regulate these additives, and inform consumers, each additive is assigned a unique number, termed as “E numbers”, which is used in Europe for all approved additives. This numbering scheme has now been adopted and extended by the Codex Alimentarius Commission to internationally identify all additives, regardless of whether they are approved for use.

“E numbers” are all prefixed by "E", but countries out side Europe use only the number, whe ther the additive is approved in Europe or not. For example, acetic acid is written as E-260 on products sold in Europe, but is simply known as additive 260 in some countries. Additive 103, alkanet, is not approved for use in Europe so it does not have an E number, although it is approved for use in Australia and New Zealand. Since 1987, Australia has had an approved system of labeling for additives in packaged foods. Each food additive has to be named or numbered. The numbers are the same as in Europe, but without the prefix “E”.

Most chemicals characterized by its negative effects on human health. The refore, before deciding on the using of additives research degree of hazard is performed.

Food producers must provide accessible, continuous and timely information about actual chemical composition of harmful substances in food, the terms of their suitability for use and the degree of security.

With the increasing use of processed foods since the 19th century, food additives are more widely used. Many countries regulate their use. For example, boric acid was widely use das afoodpreservative from the 1870s to the 1920s, but was banned after World War I due to its toxicity, as demonstrated in animal and human studies. During World War II, the urgent need for cheap, available food preservatives led to it being used again, but it was finally banned in the 1950s. Such cases led to a general mistrust of food additives, and an application of the precautionary principle led to the conclusion that only additives that are known to be safe should be used in foods. In the United States, this led to the adoption of the Delaney clause, an amendment to the Federal Food, Drug, and Cosmetic Act of 1938, stating that no carcinogenic substances may be used as food

additives. There has been significant controversy associated with the risks and benefits of food additives (table 2).

Table 2

Classification of food additives and it's possible violations of health

Designation (code) of food additives	Type of possible violations of health
E-221...E-226	Disorders of the gastrointestinal tract
E-250,E-251	Contraindicated for hypertension
E-311,E-312	Causes rash
E-320,E-321	Increased level of the cholesterol
E-102,E-110,E-120E-124, E-127	Dangerous for life
E-103,E-106,E-111,E-121, E-125,E-126,E-131,E-152, E-181	It is forbidden to eat
E-210...E-217	May cause carcinogenesis

The consequences of food contamination by pesticides.

Pesticides - chemicals that are used to control pests (organisms of plant and animal origin), of adjustment of the intensity of biological processes. They can get into food by direct application to solve technological problems (soil cultivation, regulating the intensity of biochemical reactions in plants and animals, etc.) and indirectly, such as sanitary and hygienic processing facilities, plants and animals (table 3).

The longer a person is exposed to a particular pesticide, the greater the potential exists for harm. The three most common ways people are exposed to pesticides is through breathing and inhalation, getting it into the mouth or digestive tract, or it coming into contact with the skin or eyes.

The determination of pesticide residues in food products is important especially for infants and children, as the quantity of food they ingest per kilogram of body weight is relatively high. Some pesticides are known or suspected endocrine disrupting chemicals (EDCs), so the potential for interference with the function of the naturally occurring hormones can severely impact a growing child, even at low concentrations.

Table 3

Pesticides classification

Name	Scope of usage
Acaricides	Toxic chemical that are used to kill mites
Algicide	Chemical substances used to destroy algae
Attractants	Chemical substances used for insects attraction +
Herbicides	Chemical substances that kill weeds
Defoliant Desiccant	Chemical that caused defoliation of plants
Insecticides	Toxic chemical substances which are used to kill insects
Fungicides	Chemical are used to control fungi and bacteria which are plant parasites

Pesticides are the only toxic substances released intentionally into our environment to kill living things. Pesticides can cause many types of cancer in humans. Some of the most prevalent forms include leukemia, non-Hodgkins lymphoma, brain, bone, breast, ovarian, prostate, testicular and liver cancers. In February 2009, the Agency for Toxic Substances and Disease Registry published a study that found that children who live in homes where their parents use pesticides are twice as likely to develop brain cancer versus those that live in residences in which no pesticides are used.

The use of toxic pesticides to manage pest problems has become a common practice around the world. Pesticides are used almost everywhere - not only in agricultural fields, but also in homes, parks, schools, buildings, forests, and roads. It is difficult to find somewhere where pesticides aren't used - from the can of bug spray under the kitchen sink to the air plane crop dusting acres of farmland, our world is filled with pesticides. In addition, pesticides can be found in the air we breathe, the food we eat, and the water we drink.

Radionuclides in food.

Radioactive isotopes of elements (radionuclides) are naturally present in the environment, and that includes our bodies and our food and water. We are exposed to radiation (also known as background radiation) from these radionuclides on a daily basis. Radiation comes from space (i. e., cosmic rays) as well as from naturally-occurring radioactive materials (radionuclides) found in the soil, water and air. Radioactivity can be detected in food and water and the concentration of naturally-occurring radionuclides varies depending on several factors such as local geology, climate and agricultural practices.

People can also be exposed to radiation from man-made activities, including medical diagnostic intervention. Radioactivity can contaminate food after it has been discharged into the environment from industries that concentrate natural radionuclides and from civil or military nuclear operations. Whether, man-made or natural in origin, radioactive material passes through the food chain in the same way as non-radioactive material. The degree of harm to human health depends on the type of radionuclides and the length of time people are exposed to it. The amount of radiation people are exposed to varies from place to place and among individuals.

In the event of releases of radioactivity following an emergency at a nuclear power plant, land, rivers, sea and structures in the vicinity of the power plant can become contaminated with a mixture of radionuclides generated inside the reactor, also known as “nuclear fission products”. Individuals can therefore become exposed to radiation from these fission products.

The largest-scale environmental pollution accident was held on 26 April 1986 at the Chernobyl Nuclear Power Plant.

According to international recommendations and Radiation Safety Standards of Ukraine-97 (NRBU- 97), post-accident period is divided into three stages or phases:

1) early stage – acute phase (lasting several months; radioactive dust represented the greatest danger to people first days after the accident, the main dose-forming factor was radioactive iodine-131. Due to the short half-life of the radioisotope (8 days) at 3 months after the accident, it is almost gone from the environment);

2) secondary phase or stabilization phase (duration over a year), the main factor is the dose forming short-lived gamma emitters, which are in the environment - strontium-89, radon-108, etc., which can generate

significant external radiation dose;

3) late phase or recovery phase – its feature is the creation of the largest internal exposure doses due to ingestion of long-lived radionuclides through the food chain. The main source of exposure “accidental origin” is cesium-137.

Now Ukraine is precisely in the late post-accident phase and the main factor of internal exposure on the population is oral intake of cesium-137 and strontium-90. Now Ukraine is precisely in the late post-accident phase and the main factor of internal exposure on the population is oral intake of cesium-137 and strontium-90.

Genetically modified organisms.

Genetically modified organism (GMO), organism whose genome has been engineered in the laboratory in order to favour the expression of desired physiological traits or the production of desired biological products. In conventional livestock production, crop farming, and even pet breeding, it has long been the practice to breed select individuals of a species in order to produce offspring that have desirable traits. In genetic modification, however, recombinant genetic technologies are employed to produce organisms whose genomes have been precisely altered at the molecular level, usually by the inclusion of genes from an unrelated species of organisms that code for traits that would not be obtained easily through conventional selective breeding. Genetically modified (GM) foods were first approved for human consumption in the United States in 1994, and by 2014–15 about 90 percent of the corn, cotton, and soybeans planted in the United States were GM.

Plants and animals obtained by genetic engineering, are called genetically modified and their products - transgenic or genetically modified food (GMO or TMF). Genetically modified ingredients (GMI) is often used in food technology. Another example of a GM crop is “golden” rice, which originally was intended for Asia and was genetically modified to produce almost 20 times the beta-carotene of previous varieties. GMO products are not different from the usual organoleptic properties. They are used in the production of sausages, dumplings, mayonnaise, cheese, canned food, oils, sweets and more.

Benefits of genetic engineering:

- ✓ Creating plants better resistant to weeds, pest and other diseases; such as corn
- ✓ Bigger yields to create more efficient use of land, less uses of

herbicides and other pesticides.

- ✓ Foods with better texture, flavor and nutritional value.
- ✓ Foods with longer shelf life or easier shipping.
- ✓ Finally, GM food can create an essential sustainable way to feed the world.

Using of genetically modified components (GMC) is growing in the world of speed. Over the past 10 years, the area planted with transgenic, increased 40 times. Among GM-plants that are growing in the world - soybeans, corn, cotton, canola, tomatoes, potatoes, rice and so on.

The negative impact of GMOs on human health, the environment and food:

1. It has associated consequences and possible reversible effects.
2. Increased food supply can lead to adverse effects.

Genetically modified wild rice is added with better carotene, which is needed by the human body to make vitamin A. This provides a perfect solution for vitamin A deficiency. Unfortunately, there are worries that GM organisms might actually be harmful to people. The added beta carotene levels aren't high enough to even make a difference as well. Herbicide resistant crops, on the other hand, may reduce the quantity of herbicide requirements, but it can lead to the growth of weeds that are resistant to herbicide and the loss of weed species that are essential to animal food and shelter. Suffice to say that modifying genes can have uncertain effects on humans and the environment.

3. The rare risks in the method.

In the case of transgenic biotechnology, blending animal and human DNA can have uncertain effects, including the creation of entities that possess degrees of intelligence or sentience atypical in non-human animals. Many also believe that there are health risks associated with genetically modified foods as well as in the experimental use of animals, long-term environmental impact, increased suffering of transgenic organisms, and possible creation of new diseases.

In the world differently treat problems of GMOs. There are countries, where use and actively cultivate GM crops, particularly in China, India, Japan, Latin America and especially in the US. However, from GM - products declined more than 130 countries.

Some of the most exciting advances in genetically altered plants are for non- food sources. Edible vaccinations are one such area.

The genetic engineering of plants has the potential to provide edible plant vaccines that could be used to immunize individuals against a wide variety of infectious diseases ranging from cholera to potentially AIDS.

One such example: the transgenic potato plants that have been produced and tested successfully by utilizing a genetically engineered food to deliver a pharmaceutical immunization against diarrhea.

Toxic substances in food, background allow ableresidues.

A xenobiotic is a foreign chemical substance found within an organism that is not normally naturally produced by or expected to be present within. It can also cover substances that are present in much higher concentrations than are usual. Specifically, drugs such as antibiotics are xenobiotics in humans because the human body does not produce them itself, nor are they part of a normal food.

Xenobiotics can be natural substances occurring in plants, other animals, or the environment. They also can be man-made. The sad part is that most of xenobiotic contamination is produced by man: it is us doing it to ourselves. Chemical substances are either inherently toxic to our bodies, or become toxic due to their excessive accumulation. They accumulate in our tissues, damage our enzymes, mimic our hormones and deplete the body of nutrients it needs for detoxication, making it ever more vulnerable.

The final nail to the coffin of our health, suffering from all kinds of diseases due to toxic chemical exposures, as well as poor dietary and life style choices are conventional medical treatments which not only ignore the cause of your illness, but add more toxins to your body, in the form of pharmaceutical drugs.

Pesticide residue refers to the pesticides that may remain on or in food after the yare applied to food crops. The maximum allow able levels of these residues in foods are often stipulated by regulatory bodies in many countries. Exposure of the general population to these residues most commonly occurs through consumption of treated food sources, or being in close contact to areas treated with pesticides such as farms or lawns.

There are used required chemical safety parameters scientifically justified and approved in accordance with law parameters (sanitary regulations), including maximum residue limits (MRL), the maximum level (ML), the permissible daily dose (PDD), failure of which can cause food to harmful effects on human health.

An maximum residue limits (MRL) is the highest concentration of a chemical residue that is legally permitted or accepted in a food and is

based on good agricultural and chemical use practices. For example MRLs for all foods sold in Australia are listed in Schedule 20 of the Food Standards Code. MRLs are regulatory standards that help to monitor whether an agricultural or veterinary chemical (agvet chemical) has been used as directed on an approved label. If an MRL is exceeded it usually indicates a misuse of the chemical but does not normally mean there is a public health or safety concern.

Maximum level - a maximum content (concentration) contaminants in food or animals feed, which is valid for this product. The maximum permissible level usually means a combination of time and concentration, beyond which any exposure of humans to a chemical or physical agent in their immediate environment is unsafe. Maximum levels are established in an effort to reduce exposure to a particular contaminant. Exposure is affected by the concentration of the chemical in food and the amount of the food consumed. The refore, both the concentration and the amount of food normally consumed must be considered when developing an ML. As a result, MLs for a particular chemical may differ depending on the food.

Methods of reducing the amount of pollutantin food.

If a nuclear power plant does not function properly, radioactivity may be released into the surrounding area by a mixture of products generated inside the reactor. The main radionuclides representing health risk are radioactive cesium and radioactive iodine. The invisible radioactive material would behave in a way similar to a plumeor cloud of smoke dispersing into the atmosphere, with some of its contents deposited into the ground. The concentration of radioactive materials in the plume decreases as they move further away from the relevant site. Hong Kong is 3000 km from Japan. The plume will be much diluted when it reaches Hong Kong. Possible residual surface radioactive contamination on food may be reduced by suitable food preparation such as washing, brushing, scrubbing, or peeling. It is also possible to sko recontaminated food for prolonged times toall of radioactive decay of short-lived radionuclides. On the contrary, cookingin general cannot reduce the level of radioactive contamination in food.

Pesticide residues tend to decline as the pesticide breaks down over time, and diminish as the commodities are washed and processed prior to sale. By the time food reaches your grocery store, pesticide residues are generally far belowthe legal limits. Pesticides can be partially reduced during fruits and vegetables washing. However, many pesticide remains in

the skin of apples and grapes, as they penetrate the cuticle.

Nitrate and nitrites content in food.

Nitrates and nitrites are both naturally occurring chemical compounds found in soil, water, plants, and even our own bodies. One of the most common forms is a natural salt called sodium nitrate, which is exceptionally good at preserving meats and has been used for this purpose for generations.

Conventional clean-eating wisdom has it that nitrates and nitrites are bad— really bad. Both are food preservatives added to processed meats like bacon that have been linked to gastrointestinal cancer and heart disease. The Environmental Working Group even listed them on its “Dirty Dozen” list of dangerous food additives last year. That's why so many natural meat products proudly display "nitrate-free" and “nitrite-free” claims on packaging.

The main source of nitrate to humans are vegetables - beets, potatoes, carrots and cabbage, less - radishes, sorrel, dill, parsley, etc. (especially - early and grown in greenhouses) which the body gets about 70%, near 5 - 10% for melons, fruits, berries, dairy products, about 20% of nitrates comes from drinking water.

Clinical signs of acute poisoning by nitrates from food, appear after 4-6 hours after admission. There are cyanosis of the lips, mucous membranes, then joined nausea, increased salivation, epigastric pain and vomiting, diarrhea. Also, symptoms of the central nervous system damage and infarction: blood pressure drops, also shortness of breath.

Keep in mind that there's a difference between the nitrates that are added to foods and those that occur naturally in produce such as spinach and celery. The naturally occurring nitrates in food come with vitamin C and other compounds that inhibit conversion into nitrosamines. There is no data to suggest that naturally occurring nitrates are harmful, so keep on eating those healthful foods.

Recommendations for reducing nitrates and nitrites in food:

1. Minimize your consumption of processed food and cured meat products such as hot dogs, sausage and cold cuts.
2. Check labels carefully and avoid products that list sodium or potassium nitrates and nitrites. In addition to lunch meat, some canned bean and vegetables with bacon, and even packaged seafood, may contain these added chemicals.
3. Eat organic food. Synthetic nitrates and nitrites are

not allowed as preservatives in organic packaged foods and meats.

4. Find out if your water contains nitrates or nitrites. Drinking water utilities test for these compounds and must make their results public. If you drink well water, your local health department can help you find out if this is a problem in your area. Use a reverse osmosis filter or an anion exchange filter to remove any fertilizer nitrates from the groundwater.

5. Consume dietary antioxidants with food. Vitamin C and certain vitamins can reduce the conversion of nitrates and nitrites to nitrosamines.

TEST TASKS

TO TOPIC 1

1. Danger is:

- A. A condition or situation that occurs in the environment and is capable of causing harm to people, the natural environment, and material values.
- B. Violation of the balanced state of a person
- C. The level of social development
- D. A single natural complex of the physical environment and living organisms

2. According to the origin of danger, they are divided into:

- A. Natural, man-made, social, political
- B. Social, technical, environmental
- C. Household, industrial, sports, road and transport
- D. Simple, complex, derivatives

3. The acceptable level of risk in world practice is (normalized value):

- A. 10^{-4}
- B. 10^{-3}
- C. 10^4
- D. 10^6

4. The essence of the concept of acceptable risk is:

- A. Striving to create the minimum level of security that society currently accepts
- B. Risk assessments
- C. Resistance to the action of damaging factors
- D. Availability of reserve capabilities of the body

5. Axiom about potential danger:

- A. Any human activity is potentially dangerous
- B. This is a level of danger that can be neglected
- C. This is a hidden danger that can manifest itself under certain circumstances
- D. This is the state of the natural ecosystem

6. A space in which dangers constantly exist or periodically arise is:

- A. Noxosphere
- B. Homosphere
- C. Thermosphere
- D. Noosphere

7. The security method (B) consists of:

- A. exclusion of dangers
- B. temporary division of the zones of the homosphere and the noxosphere
- C. professional training
- D. application of personal protective equipment

8. What is the maximum permissible risk?

- A. the maximum risk that should not be exceeded regardless of the result;
- B.. this the average risk established for this type of production;
- C. a minimum risk that should never be exceeded;
- D. risk that is within the acceptable level.

9. A person died as a result of a road accident. Select the type of hazard severity category:

- A. catastrophic
- B. marginal;
- C. inadmissible;
- D.. critical;

10. The most general definitions of risk are: Risk is

- A. quantitative;
- B. total;
- C. qualitative;
- D. is not defined

TO TOPIC 2

1. The main process of higher nervous activity, which ensures the correct reaction and establishes the balance of the organism in the ecosystem is:

- A. The process of excitement
- B. Inhibition process
- C. Homeostasis
- D. Reflex

2. The Weber-Fechner law reads as follows:

- A. The intensity of sensations is directly proportional the logarithm of the stimulus intensity
- B. The intensity of feelings is directly proportional stimulus intensity
- C. Intensity of sensations and intensity of the stimulus are not related to each other
- D. The intensity of sensations is inversely proportional stimulus intensity

3. Humans have the following types of analyzers

- A. Visual, auditory, olfactory, gustatory, tactile, visceral, vestibular
- B. Visual, cerebral, auditory, olfactory, taste, tactile, visceral, vestibular
- C. Visual, emotional, auditory, olfactory, taste, tactile, visceral, vestibular
- D. Mechanoreceptors, chemoreceptors, thermoreceptors, osmoreceptors, photoreceptors

4. The latent period is:

- A. The interval between the moment of stimulus action on the receptor and at the moment of sensation
- B. Embryonic period
- C. Critical period
- D. The period after the action of the excitation factor

5. From the visible part of the spectrum, the longest are:

- A. red
- B. violet
- C. blue
- D. infrared

6. The permissible level of noise in the environment is:

- A. 120 dB
- B. 50 dB
- C. 1200 dB
- D. 120 Hz

7. What system ensures the connection of a person with the outside world:

- A. Nervous
- B. Mental
- C. Social
- D. Physical

8. The protective reaction of the analyzers is manifested through: (indicate the wrong answer):

- A. Synergism
- B. Overexcitation of central nervous system centers
- C. Adaptation
- D. Immune protection

9. Human perception of the external world occurs through:

- A. Analyzer system
- B. Mass media
- C. Technical means of control
- D. Pain sensations

10. Each person is characterized by the level of development of the following systems: (indicate the wrong answer)

- A. Biological
- B. Social
- C. Mental
- D. Political

TO TOPIC 3

1. Which of the named factors do not apply to environmental factors:

- A. Genetic (chromosomal)
- B). Biological
- C. Chemical,
- D. Physical (energy)

2. Define the concept "denatured environment":

- A. Contaminated natural environment
- B. Noosphere
- C. Production environment
- D. Habitat

3. Define the term "biosphere":

- A. Part of the atmosphere, hydrosphere and lithosphere, in which the vital activity of organisms is observed
- B Part of the lithosphere and stratosphere
- C. Part of outer space
- D. Stratosphere and noosphere

4. Name which of the listed factors are biotic:

- A. Anthropogenic
- B. Climatic
- C. Energetic
- D. Production

5. Name the abiotic factors of the environment, affecting human health:

- A. Climatic
- B. Zoogenic
- C. phytogenic,
- D. Anthropogenic

6. Name which hygienic standards should be substantiated using the laboratory hygienic experiment method:

- A. The maximum permissible dose
- B. Average dose
- C. Maximum dose
- D. Minimum dose

7. Name the main recovery measures environment after pollution:

- A. Engineering and technical
- B. Descriptive
- C. Visual
- D. Comparative

8. In the industrial area, there was an increase in children of preschool age chronic bronchitis. Which of the persistent pollutants air could be their cause?

- A. Sulfur dioxide
- B. Carbon monoxide
- C. Lead
- D. Nitrogen oxides

9. What is the specific weight of the influence of the environment in shaping the health of the population?

- A. 20%
- B. 5%
- C. 50%
- D. 75%

10. What does medical ecology study?

- A. The relationship between man and the environment
- B. The relationship between man and the animal world
- C. The relationship between man and the cosmos
- D. The relationship between man and machines

TO TOPIC 4

1. Three main groups of health indicators are used to characterize health:

- A. Way of life; level of medical care; social and hygienic indicators
- B. Morbidity; physical development; level of medical care
- C. Demographic situation; condition of environment; invalidity
- D. General endurance, lifestyle, level of medical care

2. The main indicators of the individual level of health include:

- A. Heart rate, blood pressure, height-weight index, physical training
- B. General endurance, lifestyle, level of medical care
- C. Rest, social protection, security of existence
- D. Individual features of the anatomical structure of the body, blood pressure

3. Health according to WHO definition is:

- A. The state of complete physical, spiritual and social well-being of a person
- B. The reserve of the body's strength to resist the disease
- C. Absence of diseases or physical defects
- D. Philosophical category related to human activity

4. The basis of a healthy family is:

- A. Compatibility of partners by blood type
- B. Presence of a marriage contract
- C. Commonality of purpose, interests, moral responsibility
- D. Common ethnic characteristics

5. Smoking leads to the development of diseases:

- A. Cardiovascular system.
- B. Pneumosclerosis
- C. Gastritis
- D. Locomotor apparatus

6. Spiritual health depends on:

- A. Education, science, morals, ethics
- B. Socio-economic factors
- C. Level of social life
- D. Social protection

7. The sphere of physical health includes the following factors:

- A. Individual characteristics, heredity
- B. State of the environment, material conditions
- C. Human consciousness
- D. Social protection

8. Do the achievements of scientific and technical progress affect human health?

- A. The influence is ambiguous, there is positive and negative
- B. They have an exclusively negative effect
- C. They do not affect
- D. Influence only positively

9. Bad habits do not include:

- A. Vegetarianism
- B. Drug addiction
- C. Alcoholism
- D. Drug addiction

10. Mark the factor that has the least impact on human health in Ukraine:

- A. State of medical care
- B. State of the environment
- C. Way of life
- D. Heredity

TO TOPIC 5

1. Biologically dangerous factors of food products include:

- A. Bacteria, viruses, algae
- B. Polychlorobiphenols
- C. Pesticides, escherichia
- D. Dioxins, staphylococci

2. Chemical dangerous factors of food products include:

- A. Growth stimulants, pesticides, polychlorobiphenols
- B. Listeria, bacteria, viruses
- C. Acaricides, salmonella
- D. Clostridia, fungi

3. Physically dangerous factors of food products include:

- A. Radionuclides, toxic metals
- B. Pesticides
- C. Bacteria
- D. Food supplements

4. The energy value of food products is determined by the content of:

- A. Proteins, fats and carbohydrates
- B. Essential nutrients
- C. Vitamins, macro- and microelements
- D. Food supplements, amino acids

5. Food additives include:

- A. Dyes, preservatives, sweeteners
- B. Proteins, fats
- C. Antioxidants, trace elements
- D. Buffers, carbohydrates

6. Pesticides are used for the purpose of:

- A. Fights against pests, weeds, mushrooms
- B. Improving the taste qualities of products
- C. Plant nutrition
- D. Improvement of product production technology

7. An effective protector of Sr90 entering the human body is:

- A. Calcium-containing products
- B. Potassium-containing products
- C. Protein products
- D. Liquid fats

8. An effective method of reducing pesticides in plant products is:

- A. Soaking in water, boiling
- B. Soaking in a solution of table salt.
- C. Drying.
- D. Filtration through paper filters

9. From the point of view of chemical safety, promising pesticides include the following drugs:

- A. With low toxicity, weak cumulation.
- B. Low solubility
- C. High toxicity
- D. At a low price

10. The half-life of radionuclides Sr90 and Cs137, which were formed as a result of the accident at the Chernobyl nuclear power plant, is:

- A. tens of years
- B. several years
- C. several hours
- D. hundreds of years

NOTE: IN ALL TEST QUESTIONS, THE CORRECT ANSWER IS THE FIRST (A)

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