MINISTRY OF HEALTH PROTECTION OF UKRAINE

Odessa national medical university

Department of Hygiene and Medical Ecology

APPROVE

Acting vice-rector for scientific and pedagogical work

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01 September, 2022

METHODOLOGICAL DEVELOPMENT

TO PRACTICAL LESSONS

Faculty, course MEDICAL, 2-6

Educational discipline HYGIENE

Approved:

The meeting of the department of hygiene and medicine. ecology

Odessa National Medical University

Protocol No. 10 dated June 27, 2022.

head of the department Volodymyr BABIENKO

Developers:
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Seminar lesson No. 1

Topic: Methodological and methodological foundations of studying the impact of a complex of environmental factors on the health of the population.

Purpose: - to acquaint students with the methodological and methodical bases of studying environmental factors and their impact on the health of the population.

Know the methodological and methodological foundations of hygiene, the role of environmental factors in the etiology of diseases, theoretical foundations and the general scheme of studying the influence of a complex of environmental factors on the health of the population; basic concepts and content of the stages of risk assessment methodology, methodical approaches to risk assessment of harmful effects of environmental factors on public health; the main principles and methods of substantiating the hygienic standards of harmful chemicals, the main parameters of toxicometry, the scheme of a toxicological experiment, the peculiarities of the hygienic regulation of xenobiotics in various environmental objects.

Basic concepts: population health as an integral indicator of the state of the environment. Health indicators that characterize it.

Equipment: laptop, projector

1. Questions (test tasks) to check basic knowledge on the topic of the seminar:

1. An elevated level of manganese in atmospheric air, drinking water and food products of agricultural origin was noted on the territory of the city. What is the effect of these factors on the human body?

A.* Complex.

V. Combined.

S. Combined.

D. Synergistic.

E. Separable.

2. In production conditions, high levels of noise and air pollution of the working area with sulfur anhydride are recorded. What kind of harmful effect of these factors on the human body?

A. *Combined.

V. Combined.

S. Complex.

D. Specific.

E. Separable.

3. In a settlement where north and north-west winds prevail (70% of days during the year), and south winds are almost absent, a plot of land is chosen for the construction of a cement plant, which, according to the project documentation, will pollute the air with dust. On which side of the settlement is it most expedient to locate an industrial enterprise?

A. *Southeastern.

V. North-Western.

S. Severnogo.

D. Zahidnyi.

E. Eastern.

4. A chemical plant is located on the northern outskirts of the settlement. During the year, the following recurrence of winds is observed: north 10%, east 20%, south 50%, west 20%. What is the best place to place the land plot of the inpatient medical unit.

A. *South of the chemical plant.

B. To the north of the chemical plant.

S. To the east of the chemical plant.

D. To the west of the chemical plant.

E. On the territory of the chemical plant.

5. Construction of a cement plant is planned in the city of K. According to observations, the direction of winds for the year is: north - 10%, north-east - 12%, north-west - 25%, south - 13%, south-east - 21%, south-west - 19%. Specify the optimal placement of the enterprise in relation to the residential area.

A. * Northern.

B. Northeast.

S. Northwest.

D. Southern.

E. Southeast.

6. The Carpathian region is characterized by constant high (more than 80%) atmospheric air humidity. In the cold period of the year, with moderately low air temperatures, the population of this region feels very cold. This is due to an increase in heat transfer by:

A. *Convection.

B. Radiation.

S. Radiation.

D. Conductions.

E. Evaporation.

7. Increased concentrations of photooxidants were found in the atmospheric air of the settlement. These substances are formed during the transformation of which chemical compound?

A. *Nitrogen dioxide.

B. Sulfur dioxide.

S. Carbon dioxide.

D. carbon monoxide.

E. Sulfuric acid.

8. The industrial enterprise pollutes the atmospheric air of the settlement with sulfur dioxide. What negative impact on the population should be expected first of all?

A. * Irritating.

V. Carcinogenic.

S. Hepatotoxic.

D. Nephrotoxic.

E. Fibrogenic.

2. Discussion of theoretical issues:

Hygiene is a science that studies the regularities of the influence of the environment on population and individual health in order to justify hygienic standards, sanitary rules and preventive measures aimed at ensuring optimal living conditions, strengthening health and preventing diseases. In the activity of a medical doctor, preventive work in the family, territorial or workshop area occupies an important place along with treatment and diagnostic work. The preventive activity of the doctor should be based on the methodological and methodical principles of hygienic diagnostics - a system of thinking and actions, the purpose of which is to study the state of the natural and social environment of life, human health (population) and clarify the cause-and-effect relationships between the influence of environmental factors and possible changes in the state of health of the population. The methodology of hygienic diagnostics uses various (epidemiological, demographic, statistical, clinical, experimental) research methods, the most modern of which is the assessment of the risk of adverse effects of environmental factors on health - determining the probability of development operation and operation of food enterprises and institutions, materials and equipment for them, in the development of recipes and technology of food products, in the production, preservation, transportation, storage and sale of food products, in the implementation of measures to prevent foodborne diseases.

3. Topics of reports, essays.
1. Human health and its dependence on natural, industrial environmental factors and socio-economic living conditions.
2. Prevention is the most important branch of medical activity in the field of preserving the health of the population. The role of hygiene, sanitation, epidemiology as components of this field.
3. Scientific and technical progress, its impact on the socio-economic and hygienic living and working conditions of the population.
4. Urbanization and diseases of civilization, hygienic problems of their prevention.
5. History of hygiene development. Outstanding scientists of the empirical and experimental periods. Hippocrates, Avicenna, Ramazzini, M. Pettenkofer, F.F. Erisman, O.P. Dobroslavin, V.A. Subotin and others, their contribution to the development of hygienic knowledge.
6. The emergence and development of hygienic science and sanitary-epidemiological service in Ukraine (D. Samoilovych, P. Mohyla, O. M. Marzeev, V. A. Subotin, O. V. Korchak-Chepurkovskyi, V. D. Orlov, L .I. Medved, G. Kh. Shahbazyan, V. Z. Martynyuk, V. M. Zhabotynskyi, D. M. Kalyuzhny, R. D. Gabovych, E. G. Honcharuk and others).
7. Health, philosophical, biological and ethical definition. Definition of health by WHO experts.
8. Modern ideas about the biosphere and its hygienic significance. V.I. Vernadskyi and his contribution to the development of these ideas.

4. Summary:
To learn the theoretical foundations of hygiene, their essence, the contribution of domestic scientists-hygienists for their scientific justification and practical use. Concept of hygiene methodology. Basics of hygiene methodology: generally philosophical laws and categories, their use in hygiene. Subject methodology of hygiene. Methods and techniques of hygienic research, their classification. Specific methods of hygienic research. Methods of studying the state of the environment and its hygienic assessment. Methodology of qualitative (conceptual) analysis of the state of the environment and "normalized" forecasting of changes in the level of health of the population based on the state of atmospheric air, water, and soil pollution. Methods of quantitative analysis of the state of the environment. Methods of studying the influence of the environment on human health. Population health as an integral criterion for assessing the state of the environment. General scheme for studying the impact of a complex of environmental factors on the health of the population. General scheme for studying and evaluating the interrelationships between environmental factors and population health

Main:

1. Hygiene and ecology // textbook for students of higher medical educational institutions in English. /edited by V.G. Bardova – Vinnytsia: NovaKnyga, 2018.

2. Environmental Health: from Global to Local \ Under Howard Frumkin edition – Third edition. - San Francisco, 2016

Additional:

3. General hygiene. Hygiene propaedeutics/Textbook for foreign students. / E.I. Honcharuk, Yu.I. Kundiev, V.G. bardo otter - K.: Higher school, 2000.

4. Korobchanskiy V.A. Hygiene and Ecology \ Korobchanskiy V.A., Vorontsov V.P., Musulbas A.A. - Kharkov, 2006

Seminar session No. 2
Topic: Hygienic assessment of the impact of natural and anthropogenic components of the biosphere on human and population health.
Purpose: To get acquainted with the natural and anthropogenic factors of the environment that affect the human body and working capacity.

Basic concepts: Physiology of human thermoregulation and adaptation. The weather. Biosphere
Equipment: laptop, projector

1Questions (test tasks) to check basic knowledge on the topic of the seminar:

1. During 5 days, inter-day fluctuations of air temperature were 60C, barometric pressure – 10 mb, air velocity at the time of observation – 6 m/s. What type of weather are characterized by such indicators?
A.*Acute.
B. Optimal.
C. Irritable.
D. Hypotensive.
E. Hypoxic.

2. According to the data of the Hydrometeorological Service, the weather situation in Kyiv was characterized by the following data: for 10 days from November 1 to 10, cloudy, anticyclonic weather was observed, without precipitation. An anticyclone is slow moving, without atmospheric fronts. Atmospheric pressure - 760 mm Hg. The air temperature is +120C, the relative humidity is 60%. The speed of air movement is 2 m/s. Determine the type of the given weather according to the medical classification of the weather.
A.*The stand is indifferent.
B. Weather of the "hypoxic" type.
C. Weather of the "spastic" type.
D. Cloudy.
E. Irritating.

3. In the territory of the city of Kharkiv, during the day, an increase in the frequency of exacerbation of coronary heart disease was observed when the weather situation changed (a drop in atmospheric pressure by 12 mm Hg, an increase in air temperature by 80C, a decrease in the oxygen content in the air by 14.0 g/m3). Determine the type of weather.
A.* "Hypoxic".
B. Windy.
C. Cloudy.
D. Indifferent.
E. "Spastic".

4. In the second decade of May, the weather in Kyiv was observed, which is characterized by the following indicators: inter-day fluctuations of air temperature - 20C, barometric pressure - 7 mb, air movement speed at the time of observation - 6 m/s. What type of weather are characterized by such indicators?
A.* Irritable.
B. Optimal.
C. Acute.
D. Hypotensive.
E. Hypoxic.

5. On May 25, the Ukrainian Weather Bureau reported that a deep cyclone with a warm front and a warm-type occlusion front was approaching the territory of Ukraine from Western Europe. On May 25, the center of the cyclone was over the city of Lviv. The Lviv hydrometeorological station registered the following meteorological indicators: atmospheric pressure - 960 mb, air temperature - +110C, relative air humidity - 98%, oxygen content - 270.1 g/m3. What medical characteristic of

the weather was observed on May 22 over the city of Lviv?
A.* Unstable "spastic" type weather with elements of "hypoxic" type weather.
B. Weather of the "hypoxic" type.
C. Weather of the "spastic" type.
D. The rack is indifferent.
E. Irritating.

6. In November, there was fog over the city of Dniprodzerzhinsk for 7 days. About 150 patients with pulmonary and cardiovascular diseases were hospitalized for 4-5 days with the help of the emergency medical service. This is 10-12 times more than in previous days. What is the name of such a weather-synoptic situation?
A.*Toxic smog ("London Smog").
B. Ice.
C. Photochemical smog ("Los Angeles smog").
D. Blizzard.
E. Geomagnetic storm.

7. For 12 days in September, an anticyclone was stationed over Ukraine. The weather was sunny during the day, there was no wind during the day, it was calm. The maximum air temperature reached 300C during the day and 200C at night. A situation has developed over the highways of the city of Kyiv and in the areas of traffic junctions, which is characterized by a high content of smoke, soot and other components of car exhaust gases in the air. In this situation, patients with lung and cardiovascular diseases felt bad. What is the name of such a weather-synoptic situation?
A.*Photochemical smog ("Los Angeles smog").
B. Magnetic storm.
C. Toxic fog.
D. Increased solar activity.
E. Bureviy.

8. A cardiologist in Chernihiv received an urgent message from the weather bureau. As a result of the chromospheric flare on the Sun, a large geomagnetic storm is expected. Give recommendations for changes in the treatment regimen for patients with chronic coronary heart disease in a hospital.
A.*Strengthen antispasmodic and anticoagulant therapy.
B. Prescribe hypotensive drugs.
C. Prescribe bed rest.
D. Continue previously prescribed treatment.
E. To prescribe new effective medical and diagnostic procedures.

9. A resident of the city of Odessa, 63 years old, has a diagnosis of "Chronic coronary heart disease with heart failure of the III degree". He receives the necessary chemotherapy and physiotherapy. I turned to the doctor for advice because I heard the weather forecast on the radio that a cyclone was expected to approach and the next day there would be a significant drop in atmospheric pressure and air temperature. Give recommendations to the patient.
A.* Gentle regime and treatment according to the usual scheme.
B. Carry out measures aimed at increasing non-specific resistance of the body.
C. Carry out vitamin therapy.
D. To observe the usual domestic and labor regime.
E. Hospitalize in the "Biotron" ward.

10. In a 67-year-old woman who a patient with non-specific polyarthritis, on the eve of a sudden change in the weather in the hospital, additional complaints of shortness of breath, swelling of the joints, headache and heart pain, skin rash, protein and blood in the urine, increased body temperature appeared. Which clinical symptom, apart from shortness of breath, heartache and headache, is the most weather-dependent?
A.*Swelling of the joints.
B. Increase in body temperature.
C. Skin rash.

D. Hematuria.
E. Protein in the urine

11. A resident of Cherkasy, 68 years old, has a diagnosis of "Chronic ischemic heart disease with III degree heart failure". He receives the necessary permanent chemotherapy and physiotherapy. I turned to the doctor for advice because I heard the weather forecast on television: "Tomorrow a cyclone is expected to approach and the atmospheric pressure will drop significantly during the day." Give recommendations to the patient.
A.* Add antispasmodic and anticoagulant drugs to the usual treatment regimen.
B. Treatment according to the usual scheme.
C. Hospitalize in the "Biotron" ward.
D. Implement measures aimed at increasing non-specific resistance of the organism.
E. To observe the usual domestic and labor regime.

12. A cardiologist from Cherkas received an urgent warning from the weather bureau. A large magnetic storm due to a chromospheric flare on the Sun is expected the next day. Give recommendations for changes in the treatment regimen for patients with arterial hypertension in a hospital.
A.*Additionally prescribe hypotensive drugs and anticoagulant therapy.
B. Strengthen antispasmodic therapy.
C. Prescribe bed rest.
D. Continue the previously prescribed treatment.

2. Discussion of theoretical issues:
Adverse natural factors as one of the components of the natural environment
Natural factors are any element of the environment that directly or indirectly affects living organisms during at least one of the phases of their development.

Wednesday is one of the basic concepts of ecology. The environment refers to a complex of natural bodies and phenomena with which the organism is in direct or indirect relations. The concept of the environment is identical to the general concept, but implies direct contact of the organism with subjects or objects.

They distinguish the natural environment (a set of natural and anthropogenic factors of living and non-living nature that manifest the effect of influence on living organisms); abiotic environment (all forces and phenomena of nature, the origin of which is not directly related to the life activity of currently living organisms); biotic environment (forces and phenomena of nature, which owe their origin to the vital activity of currently living organisms). A more specific spatial understanding of the environment is the habitat.
The concept of environment is not the same as the concept of "conditions of existence". Conditions of existence represent the sum of vital environmental factors without which living organisms cannot exist.

Environmental factors are understood as all elements of the environment that affect the existence and development of organisms, and to which organisms respond with adaptation reactions. They are divided into three groups of environmental factors:
• abiotic (these are inorganic conditions - physical and chemical, such as light, temperature, chemical composition of water, etc.);
• biotic - forms of interaction between organisms (phytogenic, zoogenic, microbiogenic);
• anthropogenic - factors related to human activity

The natural environment is the resources of nature itself, which are necessary for marketing activity or have an impact on it.
Natural environment in the form of geographical and landscape (G-L), geophysical (G), climatic (K) elements; natural disasters (SB), including fires from lightning and other natural sources; natural processes (PP) in the form of gas emissions from rocks, etc. can be manifested both in the non-production sphere and in the production sphere, especially in such branches of the

national economy as construction, mining, geology, geodesy, and others. The list of actually active negative factors is considerable and includes more than 100 types.

Harmful factors: dustiness and gassiness of the air, noise; vibrations; electromagnetic fields; ionizing radiation; increased and decreased atmospheric parameters (temperature, humidity, air mobility, pressure); insufficient and incorrect lighting; monotony of activity; hard physical work; toxic substances; contaminated water and food, etc

The human body is influenced by the following factors: physical, biological, natural, socio-economic, level of health care, environmental conditions. These factors affect people's lifestyle. Some scientists believe that up to 40% of deaths in the world are caused by food shortages and environmental pollution. Emissions of polluting substances into the atmosphere have a great influence on the ecological situation in the region. Thus, the volume of emissions in 2003 amounted to 813,000 tons, of which 61% was accounted for by the enterprises of the oil and gas complex. The imperfection of the oil extraction technology determines the burning of a colossal amount of gas at flare installations, which number more than 1,000 units. The volume of burned gas is 200 In the 3rd year, it amounted to more than 4 billion m3. the issue of equipping emission sources with gas cleaning equipment has not been fully resolved. Out of 22.5 thousand operating organized emission sources, not much more than 100 units are equipped with gas cleaning equipment.

Weather - the state of the air environment, which is formed under the influence of circulating processes in the atmosphere, sunlight and the litter of the earth's surface at each specific moment of time. Changes in the weather do not affect the well-being of different people in the same way. In a healthy person, when the weather changes, there is a timely adjustment of physiological processes in the body to environmental conditions. As a result, the protective reaction is strengthened, and healthy people practically do not feel the negative effects of the weather. In a sick person, adaptive reactions are weakened, so the body loses the ability to quickly adapt. The influence of weather conditions on a person's well-being is also related to the age and individual susceptibility of the body

Climate is a long-term weather pattern in this area. Changes in the climate combined with its variability can have various effects on the health of the population. Each climate has its own special properties, but in any climate it is possible to effectively use certain climatic factors for therapeutic and preventive purposes. In the past, climatotherapy involved only the patient staying in a climate that was considered to be specifically therapeutic for him. For the treatment of tuberculosis, for example, the climate of the mountain heights was recognized as healing, but in the future the climate of the sea, then the climate of forests (especially conifers), and finally the climate of the steppes turned out to be just as favorable.

Climatic factors have become widespread in the prevention and treatment of diseases of the cardiovascular system not only in the southern, but also in the middle and northern regions of the country. Thalassotherapy (from the Greek "Talassa" - sea) summarizes the entire complex of medical procedures.

Microclimate - the state of the air environment in a closed room or in a huge space. Climate prevention uses: temperature, humidity, pressure, air mobility, chemical properties (oxygenation).

Unfavorable environmental factors in combination with the social and economic disadvantage of the society in recent years led to persistent negative trends in the health of the population, primarily children and pregnant women.

Adverse environmental factors

A. Climatic conditions. Adverse climatic conditions include high humidity, sharp changes in temperature and atmospheric pressure. Despite the fact that the sensitivity to these factors is individual, adverse climatic conditions in general negatively affect the course of allergic diseases, especially bronchial asthma.

B. Air pollution

1. Smog is formed during the combustion of liquid and solid natural fuels. The degree of air pollution by industrial smog is assessed by the content of carbon monoxide, suspended particles and sulfur dioxide. With severe air pollution, attacks of bronchial asthma become more frequent. This is due to the joint action of all components of industrial smog.

and. Carbon monoxide, even at the maximum concentration (about 120 mg/m3), registered in the city during peak hours, does not impair the indicators of the function of external breathing in both healthy and bronchial asthma patients.

b. Solid particles, such as dust, smoke, soot, can cause coughing and bronchospasm when inhaled. In the presence of solid particles, the adverse effect on the respiratory organs of other substances that pollute the air increases.
in. The level of sulfur dioxide in atmospheric air usually does not exceed 1.95 mg / m 3. It has been experimentally established that inhalation of air with a high concentration of sulfur dioxide (22-65 mg / m 3) causes bronchospasm and a decrease in the activity of the ciliated epithelium of the bronchi.
2. Photochemical smog consists of ozone (its content in photochemical smog usually exceeds 90%), nitrogen dioxide and other oxidants and is formed under the action of ultraviolet radiation from hydrocarbons contained in exhaust gases. At a low concentration, photochemical smog irritates the mucous membranes of the eyes and respiratory tract, at a high concentration, it leads to a decrease in VLDL, FEV1 and impaired gas exchange. Nitrogen dioxide has a toxic effect on the lungs, and in smokers it can lead to irreversible changes in the lungs.
B. Indoor air pollution. In houses with closed ventilation systems, there is no inflow of outside air, which leads to an increase in the concentration of pollutants in the air - smoke from coal and gas heaters of central air heating systems, fireplaces, household kerosene and electric heaters, as well as solvent vapors, for example, formaldehyde, which is included in the composition of the glue for floor coverings. Passively inhaled tobacco smoke causes breathing disorders, especially in younger children, that are much more pronounced than previously expected.
D. Viruses and bacteria. There is no evidence that viruses and bacteria can cause allergic reactions. However, it is well known that they favor the development of allergic diseases and complicate their course. So, sinusitis can provoke bronchial asthma and at the same time become its complication.
There are various types of anthropogenic pollution of the natural environment as a result of human economic activity. They cause chemical, physical, mechanical, acoustic, thermal, aromatic and visual changes in the quality of the natural environment that exceed the established standards of harmful effects. As a result, there is a threat to the health of the population, as well as the state of the flora and fauna and accumulated material values.
Numerous anthropogenic environmental pollutants are always potentially dangerous for humans. Experimental and natural studies have established that ecopathogenic influence depends on the level and quality of the pollutant, its exposure - the so-called "dose - substance - time" effect. Changes in the state of health depend on the age of people, their professional activity, initial level of health, as well as on individual behavioral orientation and social and hygienic living conditions.
Serious attention is paid to the influence of environmental factors on heredity. The formation of children's health disorders in the perinatal period is mainly related to the conditions that arise in the mother during pregnancy, and is caused by the influence of the mother's body on the fetus and environmental pollution. It was established that the placentas of women living in conditions of increased atmospheric pollution have various signs of suppression of compensatory and adaptive mechanisms. More than 600 chemicals are known that can penetrate from the mother to the fetus through the placenta and negatively affect its development to one degree or another. Therefore, disorders of embryonic development are closely related to this ability of xenobiotics, due to which the development of the embryo takes place in conditions of chemicalization of its internal environment.
Consequences of anthropogenic impact on the environment
Greenhouse effect. Throughout the entire historical period of the planet, its climate has repeatedly changed. However, these changes, as evidenced by research, took place gradually. Recently, as a result of the rapid growth of the planet's population and its needs, there has been an intensive development of industry and energy. All this led to the formation and release into the atmosphere of a huge amount of pollution and unused heat.
According to estimates, as a result of burning a significant amount of fuel, more than 3-10 m MJ of heat is released into the atmosphere, which is dissipated in the environment. The warming of the planet occurs mainly due to the pollution of the atmosphere by greenhouse gases - mainly carbon dioxide and to a lesser extent methane, nitrogen oxides, etc. In the Earth's atmosphere, carbon dioxide (IV) and some other gases act like glass in a greenhouse: they let sunlight through, but retain the heat of the Earth's surface heated by the sun, which causes the planet's surface to heat up. This phenomenon was called the "greenhouse effect". Nitrous oxide N20, methane CH4, water vapor H2O, fluorochloromethanes — freons (СРСИ3, СР2СИ2, etc.) also contribute to the appearance of the "greenhouse effect". The total content of "greenhouse" gases in the atmosphere is:

parts per million: carbon dioxide — 355; methane — 1.75; nitrogen oxides — 0.31; fluorocarbons — 0.001. The annual increase in the concentration of these gases in atmospheric air is (%): carbon monoxide (IV) — 0.5, nitrogen oxides — 1.0, methane — 0.7, chlorofluorocarbons — 0.3. Over the past 40 years, the amount of carbon monoxide (IV) emissions has increased by 35%. An increase in the content of carbon dioxide in the atmosphere also causes intensive deforestation. They believe that in the second half of the 20th century the Earth's temperature increased by 0.3°C every 10 years. According to UN calculations, by 2100 the temperature will rise by 3°C. This can lead to the melting of Antarctic, Arctic and mountain glaciers, which will cause the level of the World Ocean to rise by 2-3 meters and flood many coastal areas. Densely populated cities and even entire countries can disappear under water.

Warming will cause a significant change in the climate on almost the entire planet, which can have negative and even catastrophic consequences. The main climatic zones will shift to the north by 400 km. Warming will occur in the tundra areas, aridity will increase in the middle latitudes, where grain agriculture is developed (some US states, Ukraine). The climate here will become semi-desert, which will lead to a significant decrease in harvests.

Types of human activity that cause climate change have different consequences. Accurately predicting future changes requires well-established monitoring.

The climate of Ukraine, according to the studies of domestic scientists, is largely formed under the influence of the global climate, which is confirmed by the simultaneity of the multi-year course of global and regional air temperature anomalies in Ukraine during the 20th century (National report on the state of the natural environment in Ukraine, 2001)

Statistical analysis of studies of the structural relationship between regional and global air temperature methods, makes it possible to predict the most likely changes in the regional climate of the XXI century. Thus, with the further development of global warming in the first two decades of the XXI century. an increase in temperature is expected in all months and seasons of the year. The amplitude of air temperature will decrease between seasons, especially in the eastern and southeastern regions of Ukraine.

Acid rains. Sulfur and nitrogen oxides that have entered the atmosphere are oxidized and, combining with water, form fog-like drops of sulfuric and nitric acids. Carried by the winds to considerable distances, they later fall together with rain, which has an acidic reaction.

Any precipitation in general - rain, snow, fog - is called acidic if its pH value is less than 7.0. Acid rain has a pH value more often in the range of 4.1-2.1, and in some cases even less than 2.1. Observations show that even 100 years ago rainwater had a pH of 7.0, i.e. the sediments were neutral. For the first time, acid rain was registered in England in 1972, it was the result of sulfur and nitrogen oxides entering the atmosphere.

Gradually, industrialization covered an increasing number of countries, and the supply of sulfur and nitrogen oxides continuously increased, acquiring particularly threatening proportions in our time. Therefore, acid precipitation falls everywhere. In Ukraine, acid rain often falls in the Sumy, Cherkasy and Rivne regions, where a significant amount of sulfur and nitrogen oxides are emitted into the air. Ukraine is also polluted due to the cross-border transfer of these oxides from the countries of Western Europe. Under the influence of acid rain, there is acidification of water bodies and soils, leaching of potassium, magnesium and calcium from the soil, and a decrease in the yield of agricultural crops by 3-8%, degradation of flora and fauna. Fish and many types of insects die in acidified water bodies. As a result of acid rain, forests die, especially beech, yew and cedar. The loss of forests causes landslides and landslides. Acid precipitation accelerates the destruction of residential buildings and architectural monuments decorated with marble and limestone. Acidic snow causes even more damage than rain, as it can accumulate over a long period of time, which leads to significant soil acidification during snow melting in the spring. The acidity of melt water is ten times higher than the acidity of rainwater.

In many countries, acid rain causes significant damage. Thus, in Switzerland, one third of forests die from acid rain, in Great Britain 69% of beech and yew forests are drying up. Closed bodies of water - lakes and ponds - are especially affected by acid precipitation. In Sweden, fish have completely disappeared from 4,000 lakes. In Ukraine, the area of acidic soils has increased by 33% over the past 35 years. Acidic soils require liming, which increases the cost of agricultural products.

Characteristics of anthropogenic factors affecting the environment

Anthropogenic factors are fundamentally different from natural factors. Anthropogenic factors are the consequences of society's production activities, and only sometimes they are produced with the

special aim of directing the elements of nature in the desired direction (plantation of forests, creation of reservoirs, destruction of harmful organisms, etc.).
Certain "events" in the biosphere, caused by anthropogenic factors, develop according to the principle of a chain reaction, causing a change in the main elements of the biosphere and causing reverse negative reactions.
All anthropogenic factors operating in nature can be grouped into four groups:
 factors-bodies (relief, reservoirs, canals, cultivated soils, structures and buildings, introduced organisms, etc.) have spatial specificity and long-term effects;
 factors-substances (ordinary and radioactive chemicals, artificial chemical compounds and elements (xenobiotics), aerosols, sewage and ventilation emissions, etc.) when entering nature have no spatial certainty, constantly change their concentration and migrate in the environment, change the degree of influence on the elements of nature due to the dynamics of concentration in the environment. Some of them are unstable and quickly destroy, others can be stored unchanged for a long time, accumulate in the environment;
 factors-processes (various human activities in nature, impact on the nature of domestic animals and cultivated plants, destruction of harmful and reproduction of useful organisms, collection of wild plants, extraction of minerals in nature, anthropogenic soil erosion, anthropogenic cycle of substances, etc.) often are associated with limited territories, but can also cover large spaces. Processes are highly dynamic and sometimes unidirectional;
 factors-phenomena (heat, light, radio waves, electric current, electromagnetic fields, noise, sound waves, ionizing radiation, pressure, dustiness of the atmosphere, etc.) have exact parameters and change according to a strict gradient from the source of formation.
Currently, extremely diverse anthropogenic factors are operating on the planet. In a number of regions, they can prevail over natural ones by their effect, determining the nature of the development of the entire geographic envelope.
With scientific and practical m This created a classification of anthropogenic factors according to various characteristics.
Classification of anthropogenic factors according to their nature:
-Mechanical: pressure by wheels and tracks, suspended substances in air and water, currents, deforestation, catching animals, collecting wild plants, obstacles to animal migrations, overturning of soil layers, etc.
-Physical: heat, light, electromagnetic field, radio waves, infrared and ultrasound, noise, ionizing radiation, color, transfer of matter from one state to another, change in humidity.
-Chemical: chemical elements and their compounds.
-Biological: influence of introduced organisms, anthropogenic natural selection, artificial selection in populations of wild organisms, forest plantations.
-Landscape: artificial reservoirs, terrain, reclaimed areas, canals, artificial forests and meadows.
Classification of anthropogenic factors according to their general features:
Primary ones are those that are directly produced by man.
Secondary - those that appeared in nature under the influence of primary factors and due to their interaction with natural factors (decomposition products of pesticides, rivers that became shallow after deforestation, etc.).
Classification of anthropogenic factors by time of origin and action:
1. Carried out in the past:
a) those that have ceased to operate, but their consequences are felt even now (extermination, grazing, burning, etc.);
b) those that continue to operate today (artificial relief, canal, reservoir, planted forest, introduced species, etc.).
2. Currently implemented:
a) those that operate at the time of production (sound vibrations, electromagnetic waves, etc.);
b) those that operate for a certain time after the end of production (persistent chemical pollutants, cut down forest, changed terrain, etc.).
Classification of anthropogenic factors according to the duration of action when production is stopped:
1. Those that act only at the time of their production (electromagnetic field, sound waves, light rays, etc.).
2. Short-term action (sprinkling, irrigation, pollution with substances that evaporate quickly, etc.).

3. Long-term action (radioactive pollution, artificial relief, introduced species, etc.).
Classification of anthropogenic factors according to their ability to accumulate in the environment:
1. They are not capable of accumulation, the parameters of which depend on the volume and intensity of their generation (sound stimuli, electromagnetic fields, vibration, etc.).
2. Capable of short-term accumulation with subsequent strengthening of their influence (pesticides in the soil, unstable chemical compounds in water and air, atmospheric pollination, etc.).
3. Capable of continuous and indefinitely long accumulation (radioactive substances with a long half-life, stable chemical compounds, extraction of minerals, significant changes in terrain, reservoirs, etc.).
Classification of anthropogenic factors according to their ability to migrate:
1. Migratory, those that act in the place of production and at some distance from it (relief, vibration, electromagnetic field, sound vibrations, light, etc.).
2. Migrating with water and air flows (dust, heat, chemicals, gases, aerosols, etc.).
3. Migrants with means of their production (vessels, means of automobile and railway transport, etc.). This includes various factors, including some of groups 1 and 2.
4. Migrating on their own (introduced species of animals, feral domestic animals).
Classification of anthropogenic factors by the volume of the covered space:
1. Act only at the place of production (death of animals under the wheels of cars, etc.).
2. Act in the place of their production and at a certain distance from it (organic substances in water, atmospheric dust, etc.).
3. The action spreads over huge distances, and sometimes over the entire planet with fairly high production volumes (persistent chemicals in water and the atmosphere, radioactive substances with a long half-life, etc.).
Classification of anthropogenic factors according to the stability of changes in the environment caused by them:
1. They cause temporary adverse changes (any temporary impact on the environment that does not lead to the complete destruction of species; water pollution by unstable substances, etc.).
2. Cause relative irreversible changes (individual cases of introduction of species, creation of reservoirs, destruction of reservoirs, etc.).
3. They cause absolutely irreversible changes in the environment (complete destruction of species, extraction of minerals, etc.).

Classification of anthropogenic factors by types of human activity:
1. Individual impact (poaching, tourism, etc.).
2. Collective influence in the process of organized production activity:
Extraction of minerals:
a) from the atmosphere;
b) from the hydrosphere;
c) from the lithosphere.
Energy industry:
a) thermal power engineering;
b) hydropower;
c) nuclear energy, etc.
Manufacturing industry:
a) metallurgical;
b) chemical;
c) metalworking;
d) textile;
e) food, etc.
Transport, construction industry.
Forest industry.
Agriculture:
a) crop production;
b) animal husbandry.
Health care (creation of recreation areas, resorts).
Nature protection (creation of nature reserves, because dealing with soil erosion, weather management, decommissioning, reclamation of landscapes, treatment of wastewater and emissions

into the atmosphere, breeding in the wild, biotechnical measures, reproduction, etc.).
According to O. Tetior's more simplified classification, anthropogenic influences include all types that suppress nature and are created by technology or directly by humans. Anthropogenic influences are divided into:
• technical transformations and destruction of natural systems and landscapes — in the process of extracting natural resources, during agricultural works, construction, etc.;
• depletion of natural resources (minerals, water, biological components of ecosystems);
• global climate impacts (climate changes due to human economic activity);
• aesthetic violations (change of natural forms, destruction of historical and cultural values, etc.);
• environmental pollution.
3. Topics of reports/abstracts:
1. Chemical, physical, biological factors of the environment.
2. The concept of "hygienic standard".
3. The main objects of hygienic regulation.
4. The concept of "combined, complex, combined effect of environmental factors on human health."
5. Chemical hazard classes by toxicity groups.
6. The main classes of chemical, physical and biological mutagens.
7. Formulas for calculating complex indicators in observation areas, the state of atmospheric air, noise regime, living conditions of the population, assessment of the state of the environment.

4. Summary:
Natural and social factors of the environment affect the human body and working capacity. In this regard, among the actual problems studied by hygienic science, the leading place is occupied by the assessment of the relationship between man and environmental factors.

Literature

Main:

1. Hygiene and ecology // textbook for students of higher medical educational institutions in English. /edited by V.G. Bardova – Vinnytsia: NovaKnyga, 2018.

2. Environmental Health: from Global to Local \ Under Howard Frumkin edition – Third edition. - San Francisco, 2016

Additional:

3. General hygiene. Hygiene propaedeutics/Textbook for foreign students. / E.I. Honcharuk, Yu.I. Kundiev, V.G. bardo otter - K.: Higher school, 2000.

4. Korobchanskiy V.A. Hygiene and Ecology \ Korobchanskiy V.A., Vorontsov V.P., Musulbas A.A. - Kharkov, 2006

Seminar lesson No. 3

Topic: Hygienic basics of water supply. The method of hygienic assessment of the quality of drinking water based on the data of sanitary inspection of water supply systems and the results of laboratory analysis of samples.

Purpose: To learn the method of hygienic assessment of the quality of drinking water based on the data of sanitary inspection of water supply systems and the results of laboratory analysis of samples.

Basic concepts: coli titer, coli index, total microbial count, endemic diseases.

Equipment: laptop, projector

Plan:

1. Questions (test tasks) to check basic knowledge on the topic of the seminar:

1. The main factors determining the choice and possibility of using a water supply source, all except:

A. * Convenience of transport routes

B. Availability of water source

C. water reservoirs

D. The degree of susceptibility of the water source to the influence of environmental factors

E. The degree of reliability of the water source in terms of sanitation and hygiene

2. Specify the main types of water supply sources:

A. * Groundwater, surface water bodies, atmospheric water

B. Sea water, Ocean water

C. Surface water bodies, atmospheric water, melt water

D. Groundwater, mineral water

E. Distilled water and infiltration water

3. Different types of groundwater include all types, except:

A. * Interlayer mixed waters

B. Verkhovodka

C. groundwater

D. Interlayer pressure waters

E. Interlayer pressureless waters

4. Name how many classes surface sources are divided into depending on water quality and water treatment methods:

A. * In the 3rd grade

B. On the 2nd grade

C. In the 4th grade

D. For 10 classes

E. For 8th grade

5. What is meant by the definition of "debit" of the source:

A. * Power (l / h)

B. Volume of water (m3)

C. Depth (m, km)

D. Current speed (km/h)

E. Stream width

6. Which waters are the least mineralized?

A. * atmospheric

B. superficial

C. underground rootstocks

D. underground interlayers

E. underground artesian

7. Which waters are the most mineralized?

A. * underground artesian

B. atmospheric

C. superficial

D. underground watercourses

E. summer surface

8. Which waters are the most polluted by municipal and industrial emissions?

A. * atmospheric, surface

B. surface and underground watercourses

C. underground interlayers

D. underground, surface artesian

E. underground, surface artesian

9. Which water source is the most accessible to the water user?

A. * superficial

B. atmospheric

C. underground rootstocks

D. underground interlayers

E. underground artesian

10. What type of water sources, from a hygienic point of view, should be preferred when choosing a water supply source?

A. * underground inter-layer, underground artesian

B. atmospheric

C. surface reservoirs and groundwater

D. underground watercourses

E. lake and river

11. What water is called artesian?

A. * pressure interlayer

B. clean

C. interlayer mixed

D. mineralized

E. salt

12. What zone is organized directly at the place of water intake from open water bodies?

A. * strict regime

B. communal

C. examinations

D. restrictions

E. observations

13. What objects can be located in the immediate vicinity of the place of water intake?

A. * water intake facilities

B. none

C. objects that do not pollute the environment

D. water intake facilities and those that do not pollute the environment

E. water intake facilities and housing for water intake workers.

14. On the territory of the private plot, 20 m from the residential building, there is a mine well, 10 m from the toilet, 15 m from the neighbor's house. According to sanitary standards, what is the smallest distance between the well and the source of possible water pollution?

A. * 30 m

B. 25 m

C. 20 m

D. 15 m

E. 10 m

15. When justifying the size of the 2nd belt of the zone of sanitary protection of water supply sources, the duration of the release of water from bacterial contamination is taken into account. During what period is underground water freed from bacterial contamination?

A. * 200 days

B. 3 days

C. 5 days

D. 50 days

E. 400 days

16. The main task of the sanitary and topographic survey of the water source ???

A. * clarification of possible sources of water pollution

B. a map-diagram of the location of water sources and polluting objects is drawn up

C. the condition of the technical equipment of the water source

D. availability of entrances and means of water intake from surface water bodies

E. determine the chloride content in the water source

17. Class 1 waters meet the following requirements:

A. * surface reservoirs with low-turbidity and low-colored water that has no odor, contains a small amount of easily oxidized, including organic substances, that has a small surface area

B. springs with more cloudy and colored water, which has a noticeable natural smell, contains a small amount of easily oxidized, especially organic substances

C. surface sources whose water quality cannot be brought up to the requirements of GOST 2874-82

D. contains a lot of easily oxidized, especially organic substances, a significant iron content, a high level of bacterial contamination and contains a lot of plankton (100,000 cells / cm3)

E. for traditional treatment methods are acceptable for cleaning such water: for plankton removal - microfiltration, for clarification and discoloration - coagulation with settling and further filtering, coagulate

18. Class III includes surface sources:

A. * whose water quality cannot be brought up to the requirements of GOST 2874-82 using traditional cleaning methods

B. traditional treatment methods are acceptable: for plankton removal - microfiltration, for clarification and discoloration - coagulation with settling and subsequent filtration, coagulation with two-stage

C. can be processed into good-quality drinking water by filtering without coagulation or with the use of small doses of coagulant and disinfection

D. with low-turbid and low-colored water that has no smell, contains a small amount of easily oxidized, including organic substances, that has a small increase in iron content

E. springs with more cloudy and colored water, which has a noticeable natural smell, contains slightly more easily oxidized, especially organic substances, a higher iron content

19. Balneological role of water:

A. * water is used for therapeutic purposes, for the rehabilitation of convalescents (consumption of mineral waters, therapeutic baths), and also as a hardening factor (bathing, swimming, rubbing)

B. use of water for cooking and as a component of the diet

C. as a means for washing the body, washing linen, clothes, washing dishes; Maintenance of cleanliness in residential, public, industrial premises, the territory of settlements

D. the role of water is determined by chemical substances that can negatively affect human health, causing the development of various diseases

E. purification of such water at water supply stations contributes to the long-term toxic effect of small concentrations of chemical substances, less often, in emergency and other emergency situations - acute poisoning

20. Physiological functions of water: plastic consists of .....

A. * most of the water is a component of macromolecular complexes of proteins, carbohydrates and fats and forms with them jelly-like colloidal cellular and extracellular structures

B. participation in the metabolism of substances and energy - all processes of assimilation and dissimilation in the body take place in aqueous solutions

C. participation in heat exchange and thermoregulation

D. delivery of nutrients to cells

E. reflex effect on the water-drinking regime and some physiological functions

21. Signs of waterborne epidemics, all except:

A. * the incidence curve has the form of a straight line

B. simultaneous appearance of a large number of patients

C. people who use the same water supply get sick

D. morbidity is maintained at a high level for a long time

E. after carrying out a complex of anti-epidemic measures, the outbreak subsides

2. Discussion of theoretical issues:

Water is a universal solvent of chemicals, and this is the main role of liquid in the life of all living organisms.

Blood, lymph, intercellular, intracellular fluid, tears, saliva, sweat, gastric juice, pancreatic juice, bile, urine, intestinal secretions and secretions from the genital or respiratory tract are all water with substances dissolved in it.

The greater the concentration of water in any biological fluid, the higher the speed of molecular interactions: nutrients are delivered to cells faster, energy reserves are replenished faster, by-products of biochemical reactions are removed faster, renewal and recovery processes take place faster.

With the help of water, it is easier for cells of the immune system to penetrate into the farthest "corners" of the body. A decrease in the amount of water in any biological fluid leads to its thickening and disruption of metabolism.

The hygienic value of water

Physiological functions of water:

- Plastic - water makes up an average of 65% of an adult's body weight. 70% of water is concentrated intracellularly, 30% extracellularly in blood, lymph (7%) and interstitial fluid (23%). The water content in bone tissue is 20% of its mass, in muscle tissue - 75%, in connective tissue - 80%, blood plasma - 92%, vitreous body of the eye - 99% water. Most of the water is a component of macromolecular complexes of proteins, carbohydrates and fats and forms with them jelly-like colloidal cellular and extracellular structures. The smaller one is in a free state;

- Participation in the exchange of substances and energy - all processes of assimilation and dissimilation in the body take place in aqueous solutions;

- Role in maintaining osmotic pressure and acid-base balance;

- Participation in heat exchange and thermoregulation - when 1 g of moisture evaporates from the surface of the lungs, mucous membranes and skin (latent heat of vaporization), the body loses 2.43 kJ (about 0.6 kcal) of heat;

- Transport function - delivery of nutrients to the cells - blood, lymph, removal of waste from the body, waste products of urine, sweat;

- As a component of the diet and a source of macro- and microelements entering the body;

- There are neuropsychiatric disorders caused by the inability to satisfy thirst in the absence of water or its poor organoleptic properties. According to the teachings of I.P. Pavlov about higher nervous activity the groin, taste, aftertaste, appearance, transparency, color of water are irritants acting through the central nervous system on the entire body. The deterioration of organoleptic properties has a reflex effect on the water-drinking regime and some physiological functions, in particular, it increases the secretory activity of the stomach. To water with bad organoleptic properties, a person develops a protective reaction - a feeling of disgust, which forces one to refuse to drink such water, even in spite of thirst.

Epidemiological and toxicological role of water

Water can participate in the spread of infectious diseases:

- As a factor in the transmission of pathogens with a fecal-oral transmission mechanism: intestinal infections of bacterial and viral etiology (typhoid, paratyphoid A and B, cholera, dysentery, salmonellosis, escherichia, tularemia, viral hepatitis A, poliomyelitis, enterovirus diseases caused by Coxsackie viruses , ESNO and others); geohelminthosis (ascariasis, trichocephalosis, hookworm disease); biohelminthosis (echinococcosis, hymenolipidosis); diseases caused by protozoa (amoebic dysentery, giardiasis), zooanthroponosis (tularemia, leptospirosis, and brucellosis);

- As a factor in the transmission of pathogens of skin and mucous membranes (when bathing or other contact with water): trachoma, leprosy, anthrax, molluscum contagiosum, fungal diseases (for example, epidermophytia);

- As a breeding ground for disease vectors - mosquitoes of the genus Anopheles, which spread malarial plasmodium and others (surface water bodies).

Signs of water epidemics:

- The simultaneous appearance of a large number of patients with intestinal infections, a sharp rise in the incidence of the population - the so-called epidemic explosion;

- People who use one water pipe, one branch of the water supply network, one water column, one mine well, etc., get sick;

- Morbidity is maintained at a high level for a long time - as the water becomes polluted and consumed by the population;

- The incidence curve can have one-, two-, three-humped or other character. First of all, diseases with a short incubation period will be registered (escherichiosis, salmonellosis - 1-3 days, cholera - 1-5 days, typhoid fever - 14-21 days, and finally - with a longer one - viral hepatitis A and E - 30 or more days) ;

- After carrying out a complex of anti-epidemic measures (removal of the source of pollution, disinfection of water supply facilities, sanitation of wells), the outbreak subsides, the incidence decreases sharply, but for some time it remains higher compared to its sporadic level - the so-called epidemic plume. This is caused by the appearance during an epidemic of a large number of new potential sources of infection (patients and carriers) and the activation of other ways of spreading

pathogenic microorganisms from these sources - contact and household (through contaminated hands, dishes, children's toys, care items), through food or live vectors (flies), etc.

The toxicological role of water is due to chemical substances that can negatively affect human health, causing the development of various diseases. They are divided into chemicals of natural origin - those that are added to water as reagents, and chemicals that enter water as a result of industrial, agricultural and domestic pollution of water supply sources. Insufficient or ineffective cleaning of such waters at water supply stations contributes to the long-term toxic effect of small concentrations of chemical substances, less often, in emergency and other emergency situations, to acute poisoning.

Balneological role of water

Water is used for therapeutic purposes, for the rehabilitation of convalescents (consumption of mineral water, therapeutic baths), and also as a hardening factor (bathing, swimming, rubbing).

The economic, domestic and national economic role of water

Sanitary and hygienic and economic and household functions of water include:

- Use of water for cooking and as a component of the diet;

- As a means for washing the body, washing linen, clothes, washing dishes; Maintenance of cleanliness in residential, public, industrial premises, the territory of settlements;

- Irrigation of green spaces within settlements;

- Sanitary, transportation and neutralizing functions of water - in the removal of household and industrial waste by the sewage system, their disposal at treatment facilities, self-cleaning of water bodies;

- Extinguishing fires, cleaning atmospheric pollution (rain, snow).

National and economic functions of water:

- Use in agriculture (irrigation in crop production and horticulture, greenhouse farms, poultry and livestock complexes);

- In industry (food, chemical, metallurgical, etc.);

- As water (passenger, freight) transport routes.

Sources of surface water pollution

The main source of pollution is wastewater (especially untreated or insufficiently treated), which is generated as a result of water use in households, industrial enterprises, livestock and poultry farms, etc. Water bodies were partially polluted It is caused by surface runoff: rainwater, stormwater, and water formed during snowmelt. Sewage and surface runoff add a significant amount of suspended substances and organic compounds to the water of the reservoir, as a result of which the color,

turbidity increases, transparency decreases, oxidizability and biochemical oxygen demand (BOD) increase, the amount of dissolved oxygen in the water decreases, the concentration of nitrogen-containing substances increases and chlorides, bacterial insemination increases. With industrial wastewater and runoff from agricultural fields, various toxic chemicals harmful to human health enter water bodies, as mentioned.

The water of surface reservoirs can be polluted due to the use of the reservoir for transport (passenger and cargo steamships, lumbering) purposes, when working in riverbeds (for example, taking river sand), when watering animals, conducting sports competitions, and recreation of the population.

Self-cleaning of surface water bodies

Self-cleaning of surface water bodies occurs under the influence of various factors:

- Hydraulic (mixing and diluting pollution with reservoir water);

- Mechanical (sedimentation of suspended substances);

- Physical (influence of solar radiation and temperature);

- Biological (interaction of aquatic plant organisms and microorganisms with sewage organisms that have entered the reservoir);

- Chemical (destruction of pollutants by hydrolysis);

- Biochemical (transformation and mineralization of organic substances through microbiological destruction, as a result of biochemical oxidation by aquatic autochthonous microflora).

Self-cleaning from pathogenic microorganisms occurs due to their death due to the antagonistic effect of aquatic saprophytic organisms, the action of antibiotic substances, bacteriophages, etc.. In the case of contamination of water bodies with domestic and industrial wastewater, the self-cleaning processes can be suspended. Blooming of reservoirs develops (rapid development of algae, plankton), water decay.

Water supply sources are divided into underground and surface.

Underground sources include:

- Interlayer pressure (artesian) and non-pressure waters lying in aquifers (sandy, gravelly, fractured) between waterproof layers of soil (clay, granite), and therefore reliably protected from the penetration of contamination from the surface. Replenishment of interlayer waters takes place in the feeding zones - places where the aquifer is wedged to the surface, which are at a considerable distance from the places of water intake. Interlayer waters are distinguished by a stable low temperature (5-12 ° C), a constant physical and chemical composition, a constant level and a significant flow rate;

- Groundwater lying in the aquifer above the first waterproof layer of the soil, and therefore in the case of a shallow location, is insufficiently protected from contamination from the surface. They are characterized by seasonal fluctuations in the standing level, discharge, chemical and bacterial composition, which depend on the frequency and amount of precipitation, the presence of surface water bodies, the depth of their occurrence, and the nature of the soil. Filtering through a layer of clean, fine-grained sand, 5-6 m thick and more, groundwater becomes transparent, colorless, and does not contain pathogenic microorganisms. Groundwater reserves are insignificant, therefore, in order to use them as a source of centralized water supply, their artificial replenishment with water using special engineering and technical facilities is provided;

- Spring water, which flows from aquifers that protrude to the surface of the earth due to the lowering of the relief, for example, at the foot of hills, mountains;

- Verhovodka, which lies closest to the earth's surface and is formed due to the filtering of atmospheric precipitation in a limited area. Very small reserves and low water quality do not allow recommending headwaters as a source of domestic and drinking water supply.

Surface waters are divided into flowing (rivers, waterfalls, glaciers), non-flowing (lakes, ponds, artificial open reservoirs). The composition of their water largely depends on the nature of the soil in the catchment area, hydrometeorological conditions and fluctuates significantly throughout the year depending on the season and even the weather. Compared to underground water, surface water is characterized by a large amount of suspended substances, low transparency, increased color due to humic substances that are washed out of the soil, a higher content of organic compounds, the presence of autochthonous microflora, and the presence of dissolved oxygen in the water. Surface reservoirs are easily polluted from the outside, therefore, from an epidemiological point of view, they are potentially dangerous.

In a number of low-water, arid areas, imported and meteoric (atmospheric) water (rain, snow) is used, which is stored in closed reservoirs and overflow wells.

The best situation is when the quality of the water in the source of water supply fully corresponds to modern ideas about good quality drinking water. Such water does not require treatment and it is only necessary not to deteriorate its quality at the stages of extraction from the source and supply to consumers. At the same time, disinfection of such water is provided by sanitary requirements. Such sources can be only some underground interlayer waters, most often - artesian (pressure). In all other cases, water in the source, especially surface water, requires improvement in its quality. First of all, reduction of turbidity (lightening) and chroma (discoloration). Liberation from pathogenic and conditionally pathogenic microorganisms (decontamination). Sometimes the chemical composition is improved by means of special processing methods (desalination, softening, defluorination, fluorination, iron removal, etc.).

Methods of sanitary inspection of water supply sources

Sanitary examination includes three main positions:

- Sanitary and topographic survey of its surroundings;

- Sanitary and technical examination of the condition of the water source equipment.

- Sanitary-epidemiological examination of the area where the water source is located;

The main task of the sanitary-topographic survey of the water source is to find out possible sources of water pollution (landfills, cesspools, toilets, livestock farms, cemeteries, etc.), and establish the distance from them to the water source. In determining the relief of the area (the direction of the flow of rainwater, meltwater to the source of water or to the other side), the direction of the flow of groundwater, floods. On the basis of a sanitary topographic survey, a map-scheme of the location of the water source and the listed objects is drawn up, with the marking of distances and the direction of the slope of the terrain.

In doubtful cases, the connection between the source of water and the source of pollution can be established experimentally. A saturated solution of sodium chloride is poured into the source of pollution at the rate of at least one bucket for every 10 m of distance to the water source, or a solution of fluorescein and every 3-4 hours for one or two days the chloride content (or fluorescence) is determined in the water source.

The sanitary and technical inspection of the water source aims to find out the condition of the technical equipment of the water source, for example, the presence of a log house, "clay castle", paving, canopy, means of transport in the mine well I have water; pumps at artesian wells, their condition, need for repair, etc. The presence of entrances and means of water intake from surface water bodies - a water intake bucket, a coastal water intake well. In the case of centralized water supply, the sanitary and technical condition of the main structures of the water supply system, the water supply network and the structures on it (in particular,

water extraction columns) is assessed. Determining the amount of water in a water source and its flow rate (productivity) is of important practical importance. For example, in a well with a log made of concrete rings, the amount of water is determined by the formula:

$V = \pi R2 h$,

where: V - amount of water in the well, m3;

π - 3.14;

R - radius of the log ring, m;

h - thickness of the water layer, m.

The height of the water layer is determined by a rope with a load, which is lowered until the bottom is felt and the wet part of the cord is measured.

To determine the flow rate of the well, 30-40 buckets of water are pumped out (or drained) from it, note how much the water level has dropped and determine the time during which the previous water level will be restored. Debit is calculated according to the formula:

D =

where: D - flow rate of the well, l / h;

V - volume of pumped water, l;

t - the time during which the water level will be restored and the duration of water pumping, minutes.

The flow rate of a stream or a small river is determined by the formula:

Q = 0.5. b. h. v,

where: Q - flow rate, m3 / sec;

b - flow width, m;

h - greatest depth, m;

v - speed of the flow of the stream, m / sec (determined using a float and a stopwatch).

During the sanitary inspection, water samples are taken from a surface reservoir, a mine well or an artesian well for further laboratory research.

During the sanitary-epidemiological examination, the following are identified and taken into account:

- Presence of intestinal infectious diseases among the population that uses water from this source or lives nearby (cholera, typhoid, paratyphoid A, B, dysentery, viral hepatitis, etc.);

- Presence of epizootics among rodents, domestic animals (tularemia, brucellosis, anthrax, foot and mouth disease, mad cow disease, etc.);

sanitary condition of the settlement (pollution of the territory, methods of collection and disposal of liquid and solid household and industrial waste, etc.).

Water supply systems

There are two water supply systems for settlements: local and centralized (water supply). Local water supply occurs in small urban-type villages and rural settlements. Groundwater is most often used as a source of water supply. For this, wells are arranged, which are of two types: mine and tubular or drilling (wells).

Centralized domestic drinking water supply is the most convenient way to provide the population with water that meets all hygienic requirements. A single system of supplying water in sufficient quantity and high quality regardless of its purpose is envisaged: for drinking and cooking, for economic and sanitary purposes. An independent network of technical water supply is arranged only for the needs of industrial enterprises.

The main parts of the water supply system are:

a) main facilities - water intake, treatment and pumping stations;

b) facilities for water delivery and distribution - water supply networks, tanks for clean water, water distribution and other installations on the network.

Selection of a source of centralized domestic drinking water supply

It is based on two provisions:

- Providing the consumer with a sufficient amount of good-quality drinking water (the quality of the water in the reservoir should be such that modern methods of water treatment allow turning it into good-quality drinking water, which by all indicators would meet the current state standard.

- Ensuring the highest sanitary reliability of the source (the selection of the source is based on an assessment and forecast of the probability of its contamination).

The selection of a source for centralized household and drinking water supply is carried out in the following order: 1) interlayer pressure (artesian); 2) interlayer non-pressurized; 3) groundwater that is artificially replenished; 4) surface waters (rivers, reservoirs, lakes, canals).

When choosing a source, they take into account the sufficiency of water reserves to meet all the needs of the settlement, determine the places of water intake and assess the possibility of organizing sanitary protection zones.

Hygienic principles underlying the selection of a water supply source, requirements for water quality in underground and surface sources, and the selection procedure are reflected in GOST.

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Zones of sanitary protection

The zone of sanitary protection is understood as the territory where a special regime is established and measures aimed at protecting water supply sources and water supply facilities from pollution are carried out.

The entire sanitary protection zone is divided into three zones:

1. The first belt (strict regime zone) - is organized in order to protect the place of water intake from the source and the adjacent areas, as well as the main structures of the water main, designed for lifting, cleaning, disinfection and the entry of water into the main water supply lines. The territory of the first belt is fenced off, protected, and organized; living in it is prohibited, construction is limited only technical facilities. Human access to this area is restricted: only station employees and control authorities have the right to enter this area.

2. The second belt (restriction zone) includes the entire territory from which, due to natural conditions (surface runoff, hydrogeological structure), as a result of industrial, construction, domestic and other use, deterioration of water quality at the place of its intake may be associated from sources.

A restrictive regime is established in the second zone. The use of its territory for industry, agriculture, civil and any other construction is allowed only with the agreement of sanitary organizations.

3. The third belt (surveillance zone) is allocated due to the need for constant monitoring of the epidemic situation.

Water quality indicators and their definition

In various analytical laboratories of our country, experts annually perform at least 100 million water quality tests, and 23% of the determinations consist in the assessment of their organoleptic properties, 21% - turbidity and concentration of suspended substances, 21% are the determination of general indicators - hardness, salinity, COD, BOD, 29% - determination of inorganic substances, 4% - determination of individual organic substances.

A significant number of analyzes are performed by sanitary-epidemiological services. The results of the analyzes show that every fourth sample is hazardous to health in terms of chemicals, and every fifth is in terms of bacteria. It should also be noted that the cost of a comprehensive analysis of the quality of drinking water abroad is about 1,100 dollars.

According to the quality standards, which determine the presence and permissible concentration of impurities, water is distinguished as drinking water, natural water (reservoir for economic-drinking, cultural-domestic, and fishery purposes) and wastewater (normatively treated, effluents of unknown origin, storm water).

Sometimes different types of sources of water consumption are also distinguished, for example, water pipes, wells, artesian wells, underground sources and surface sources, etc. Such selection is made in those cases when it is necessary to take into account the specifics of the source or when any characteristic ways of water pollution can be expected, as well as the ways of the spread of pollution.

Standards of water quality of various sources - limit-permissible concentrations (MPC), indicative permissible levels (ODU) and indicative-safe levels of influence (footwear) - are contained in normative and technical literature, a component of water and sanitary legislation. These include, in particular, state standards - GOST 2874, GOST 24902, GOST 17.1.3.03, various lists, standards, FOOTWEAR, sanitary rules and standards for the protection of surface water from pollution by sewage SNiP No. 4630, etc.

Limiting indicators of harmfulness are established among water quality standards - organoleptic, sanitary-toxicological or general sanitary. The limiting indicator of harmfulness unites a group of standards for substances whose harmful effects on the human body and the environment are most pronounced in this respect. Thus, the organoleptic limiting indicators include standards for those substances that cause an unsatisfactory organoleptic evaluation (by taste, smell, color, foaminess) at concentrations that are within the permissible values. For example, the MPC for phenol, established by the presence of an odor, is 0.001 mg/l in the case of water chlorination and 0.1 mg/l in the absence of chlorination. Organoleptic limiting indicators also include MPC for colored compounds of chromium (VI) and chromium (III), which have the smell and characteristic taste of kerosene and chlorophos, which forms sulfolane foam, etc. Limiting sanitary indicators are established in the form of standards for relatively low-toxic and non-toxic compounds - for example, acetic acid, acetone, dibutyl phthalate, etc. For the rest (main mass) of harmful substances, limiting sanitary and toxicological indicators of harmfulness are established.

Drinking water quality indicators - They can be conditionally divided into groups:

1. organoleptic;
2. chemical;
3. bacteriological;
4. radiological;

Classification of infectious diseases in the mechanism of transmission of which water is involved (WHO)

I. Diseases arising from the use of contaminated water for drinking purposes:

1. Intestinal infections (the leading mechanism of transmission is fecal-oral):

a) bacterial nature: cholera, typhoid, paratyphoid A and B, dysentery, coli enteritis, salmonellosis;

b) of viral etiology: viral epidemic hepatitis A, or Botkin's disease, viral hepatitis E, poliomyelitis and other enterovirus infections, in particular Coxsackie and ESNO) epidemic myalgia, angina, flu-like and dyspeptic disorders, serous meningoencephalitis), oral viral diseases (gastroenteritis, infectious diarrhea);

c) protozoan etiology: amoebic dysentery, giardiasis.

2. Respiratory tract infections, the causative agents of which can sometimes spread through the fecal-oral route:

a) bacterial nature (tuberculosis);

b) viral etiology (adenovirus infections, in particular nasopharyngitis, pharyngoconjunctival fever, conjunctivitis, nasopharyngotonsillitis, rhinitis)

3. Infections of the skin and mucous membranes, which may have a fecal-oral transmission mechanism (anthrax)

4. Blood infections that may have a fecal-oral transmission mechanism (Ku fever)

5. Zooanthroponoses that may have a fecal-oral transmission mechanism (tularemia, leptospirosis, and brucellosis)

6. Helminth infections:

a) geohelminthiasis (trichocephalosis, ascariasis, hookworm disease);

b) biohelminthiasis (echinococcosis, hymenolepidosis).

II. Diseases of the skin and mucous membranes that occur as a result of contact with contaminated water: trachoma, leprosy, anthrax, molluscum contagiosum, fungal diseases (epidermophytia, mycosis, etc.)

III. Diseases caused by helminths living in water: schistosomiasis, dracunculosis.

IV. Transmissible infections that spread vector insects that breed in water (malaria, yellow fever).

Basic requirements for drinking water according to DSanPiN 2.2.4-171-10 (as amended) "Hygienic requirements for drinking water intended for human consumption".

Drinking water, which is directly used by the population, must be safe in terms of epidemics and radiation, be harmless in terms of chemical composition, physiologically complete and of good quality, that is, have good organoleptic properties.

Indicators of the physiological completeness of the mineral composition of drinking water:

1. general hardness - the norm is 1.5-7 mmol/cubic dm

2. dry residue - 200-500 mg/cubic dm

3. fluorides - 0.7-1.2 mg/cubic dm

4. iodine, potassium, calcium, magnesium, sodium

5. total alkalinity

Organoleptic properties of water are those signs that are perceived by human senses and are evaluated by the intensity of perception (smell, taste and aftertaste, color, turbidity).

Odor is the ability of chemicals present in water to evaporate and create pressure

vapors above the surface of the water, irritate the receptors of the mucous membranes of the nose and

sinuses, causing the corresponding sensation (points).

A five-point scale is proposed to characterize the intensity of odors.

Taste and aftertaste - the ability of chemicals present in water after interaction with saliva to irritate the taste buds located on the surface of the tongue and cause the corresponding sensation (points).

Color is a natural property of water that depends on the presence of humic substances in it (degrees).

Turbidity is a natural property of water caused by the content of suspended substances of organic and inorganic origin (1 NOC = 0.58 mg/ cubic dm).

Indicators of the harmlessness of water according to its chemical composition are determined by chemical substances that can negatively affect human health, causing the development of various diseases. Allocate:

- chemicals of natural origin (beryllium, molybdenum, arsenic, lead, nitrates, fluorine, selenium, strontium, etc.).
- chemicals entering the water as a result of industrial, agricultural and domestic pollution of water supply sources (heavy metals, detergents, pesticides, synthetic polymers and their monomers).
- substances that are added to water as reagents during its treatment at water supply stations (aluminum salts)
- substances that are formed during water treatment on NFS (trihalomethanes).

The presence of organic contamination of drinking water is indirectly indicated by: permanganate oxidizability, BSK - biochemical oxygen consumption.

Hygienic characteristics of sources of centralized
drinking water supply

Sources of water for the centralized system of economic and drinking water supply can be both surface fresh water bodies (rivers, lakes, reservoirs, canals, etc.) and underground waters (interlayer - pressure and non-pressure). In conditions of non-centralized (local) water supply, underground (ground) water is most often used.

New surface and underground sources of centralized drinking water supply are selected according to their reliability in the following order:

- interlayer pressure waters;
- interlayer non-pressurized waters;
- ground water (the first ground level from the surface);
- surface waters (rivers, reservoirs, lakes, canals).

Rules for selecting new and controlling existing surface and underground sources of centralized drinking water supply in accordance with
DSTU 4808:2007

- assessment of the conditions of resource formation on the basis of retrospective, modern and predictive analysis
- assessment of water quality at water intake sites
- assessment of the sanitary condition of the water intake site
- assessment of the degree of possible impact of industrial, communal, agricultural and other objects
- assessment of radiation safety

- assessment of the suitability of the intended use of water preparation technology for obtaining high-quality drinking water.

The classification of water quality of sources of centralized drinking water supply according to hygienic and ecological criteria includes 71 indicators, which are divided into 7 groups: organoleptic, general sanitary indicators of chemical composition, hydrobiological, microbiological, parasitological, radiation safety indicators, priority toxicological indicators.

The range of water quality indicators (criteria) is divided into 4 classes:

1st class – excellent, desirable water quality;

2nd class – good, acceptable water quality;

3rd class – satisfactory, acceptable water quality;

Class 4 – mediocre, limited suitability, undesirable water quality.

According to DSTU 4808:2007 "Sources of centralized drinking water supply. Hygienic and ecological requirements for water quality and selection rules" there is an algorithm for determining the class of a water source and adequate methods of water treatment to obtain water, the quality of which would meet the current standards (DSanPiN 2.2.4-171-10):

1. Definition of the source (surface or underground)

2. All indicators of water quality in the source should be divided into groups. There are 7 main groups: organoleptic, general sanitary, hydrobiological, microbiological, parasitological, radiation and toxicological indicators.

3. Using table 1 (for surface water) or table 2 (for underground water), determine which class the water source belongs to by the numerical value for each indicator.

4. Determine the arithmetic mean among the obtained numerical values for each group (I1-I7) – integral block index;

5. Find the generalized integral index of water quality - water source class (arithmetic average among the obtained indices of each group). If there are no values of one or two group indices, Iint is calculated as a fraction of the division of the sum of the values of the available group indices.

6. Depending on the water quality class, the following water treatment methods are distinguished:

- basic (lighting, decolorization, disinfection);

- special (desalination, defluoridation, softening, fluoridation, iron removal, detoxification, deodorization, deactivation).

Hygienic requirements for the quality of water in surface reservoirs, depending on the types of water use, are regulated by Section 8 and Appendix 11 of the State Sanitary Rules for the Planning and Development of Settlements, approved by the Order of the Ministry of Health of Ukraine No. 173 dated 19.06.1996, which defines two different types of economic activity that can lead to pollution of surface water bodies, determine the conditions under which the water body is considered polluted, not suitable in whole or in part for centralized economic and drinking water supply or mass recreation of the population. According to Appendix 11, water quality standards in reservoirs are established depending on the nature of use

water bodies for various types of water use. Water bodies or their sections

are divided into two categories of water use.

The first (water and drinking) category - surface water bodies, which are used for the center alized or decentralized economic and drinking water supply, as well as for water supply of food industry enterprises.

II (communal and domestic) category - surface water bodies that perform a recreational role, water sports, as well as water bodies that are located within the boundaries of the settlement.

Toxic chemical substances, which according to the parameters of toxicometry belong to the I and II hazard classes, with the same limiting indicator of harmfulness when simultaneously contained in water, are capable of exerting a combined effect on the human body, the result of which is the summation of negative effects, that is, an additive effect. In this case, the rule that the sum of the ratios of the actual concentrations (C1, C2...Cn) of each toxic substance in the reservoir water to its MAC should not exceed 1 becomes effective.

Measures for the sanitary protection of water bodies:

1. Legislative (according to the Water Code of Ukraine (Article 58), the Law of Ukraine "On Drinking Water and Drinking Water Supply" (Articles 33-38), Resolution of the Cabinet of Ministers of Ukraine dated December 18, 1998 No. 2024).

2. Planning (justification and implementation of ZSO, which have three belts of a special regime). The first ZSO zone (strict regime) includes the territory and water area of the location of water intakes, the sites of the main water supply facilities and the water supply channel. The second and third zones - the zones of restrictions and observations - cover the territory intended for protection against contamination of the water supply source.

3. Scientific and hygienic (development of MPCs (limits of permissible concentrations) and ODRs (approximate permissible levels))

4. Technological

5. Sanitary and technical.

Excerpt from the Law of Ukraine "On Drinking Water and Drinking Water Supply"

Article 36. Restrictions on economic and other activities in sanitary protection zones

Within the zone of sanitary protection of sources of drinking water and objects of centralized drinking water supply, economic and other activities are limited.

It is prohibited to place, build, put into operation, operate and reconstruct enterprises, structures and other objects that do not fully comply with all requirements and implement measures provided for in projects of sanitary protection zones, projects for construction and reconstruction, other projects .

Within the first belt of the sanitary protection zone, the following is prohibited:

discharge of any wastewater, as well as bathing, laundry, fishing, grazing, livestock drinking and other types of water use that affect water quality;

stay of outsiders, placement of residential and public buildings, organization of moorings for floating vehicles, application of pesticides, organic and mineral fertilizers, laying of pipelines, extraction of gravel or sand, dredging and other construction and installation works not directly related to operation, reconstruction or expansion of water supply facilities and networks; harvesting of wood in the order of felling of the forest for main use.

Within the second belt of the sanitary protection zone, the following is prohibited:

- placement of warehouses of fuel and lubricants, pesticides and mineral fertilizers, storage tanks for industrial waste water, oil pipelines and product pipelines, sludge storage facilities and other objects of increased danger, which create the danger of chemical pollution of water;
- use of chemicals without the permission of the state sanitary-epidemiological service;
- placement of cemeteries, cattle cemeteries, sanitation and filtration fields, irrigation systems, underground filtration structures, manure storages, silage trenches, livestock and poultry enterprises and other agricultural facilities that pose a threat of microbial water pollution, as well as placement of landfills for solid waste, biological and silt ponds; storage and application of pesticides and mineral fertilizers; plowing of land (except areas for planting and afforestation), as well as horticulture and gardening; drainage and use of waterlogged and swampy lands in river floodplains; harvesting of wood in the order of main-use forest felling; extracting sand from a water body and carrying out other dredging works not related to the construction and operation of waterworks; setting up summer camps for cattle and grazing them closer than 300 meters from the shore of a water body; injection of waste (return) water into underground horizons, underground storage of solid waste and development of the subsoil of the earth; contamination of territories with garbage, manure, waste of industrial production and other waste.

Within the third zone of the sanitary protection zone, the following is prohibited:

- injection of used (return) water into underground horizons for the purpose of their burial, underground storage of solid waste and subsoil development, which can lead to pollution of the aquifer;
- placement of warehouses of fuel and lubricant materials, as well as warehouses of pesticides and mineral fertilizers, accumulators of industrial waste water, oil pipelines and product pipelines, which create a danger of chemical pollution of groundwater;
- disposal of waste water that does not meet sanitary rules and standards into water bodies m.

Literature

Main:

1. Hygiene and ecology // textbook for students of higher medical educational institutions in English. /edited by V.G. Bardova – Vinnytsia: NovaKnyga, 2018.

2. Environmental Health: from Global to Local \ Under Howard Frumkin edition – Third edition. - San Francisco, 2016

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4. Korobchanskiy V.A. Hygiene and Ecology \ Korobchanskiy V.A., Vorontsov V.P., Musulbas A.A. - Kharkov, 2006

Seminar class #4

Topic: Hospital hygiene, its importance in ensuring the prevention of intra-hospital infections.
Purpose: To get acquainted with the reasons for the spread of nosocomial infections and methods of prevention.

Basic concepts: nosocomial infections, hospital, prevention
Equipment: laptop, projector

1. Questions (test tasks) to check basic knowledge on the topic of the seminar:
Nosocomial infections: causes of their spread
Since microorganisms are an integral part of nature, nosocomial infections will always exist. Only the intensity of their spread on the territory of the health care facility depends on us.
In fact, nosocomial infections are a collective concept that includes various nosological forms. The most successful and complete is the definition proposed by the WHO European Regional Office. According to it, it is any clinically expressed disease of microbial origin, which affects the patient as a result of his hospitalization or visit to a health care institution for the purpose of treatment. At the same time, nosocomial infections also spread to medical personnel during their professional activities.
The most common reasons for the spread of nosocomial infections are:
• creation of hospital complexes with a large array of sources of infection
• closed environment (wards and medical and diagnostic rooms)
• rapid change of patients in connection with the introduction of new medical technologies
• a large concentration of persons with weakened immunity in limited areas (in the ward)
• the formation of a powerful artificial mechanism for the transmission of infectious agents, associated with invasive interventions and the presence of diagnostic offices visited by patients from different departments
• activation of natural mechanisms of transmission of pathogens of infectious diseases, especially airborne and contact-household, in conditions of close communication between patients and medical personnel
• widespread use of antibiotics and chemopreparations, which leads to the emergence of drug-resistant microorganisms
• increase in the number of patients with HIV infection, tuberculosis, viral hepatitis
• increase in the number of people belonging to the risk group (elderly people, newborns with weak immunity)
• a decrease in the body's defenses in the general population due to the deterioration of the environment
Also, the spread of nosocomial infections is facilitated by the fact that health care institutions constantly use diagnostic devices that require special sterilization methods. However, there is not always the opportunity and time to comply with all requirements for appropriate sterilization measures. The disadvantage is also the non-compliance with the standards of areas, set of main and auxiliary premises, violation of sanitary-hygienic and anti-epidemic regimes in them.
Protection of medical personnel from intra-hospital infections
The safety of medical personnel in the performance of professional duties remains an urgent issue, and its solution requires a comprehensive approach:
• implementation of preventive measures
• purchase of safe medical products
• informing medical staff about ways to prevent nosocomial infections
Medical workers are at increased risk of infection with hemotransmissible infections, especially hepatitis B and C viruses, as well as HIV infection. This can happen when the infected biological fluid of the patient gets on the mucous membranes of the nurse, as well as during an accidental injection or cut with a sharp medical instrument. When injected with an infected needle, the risk of HIV infection is about 0.3%, hepatitis C virus — 10%, hepatitis B virus — 30%.
Biological fluids that carry the threat of infection with hemotransmissible infections are primarily blood, semen, vaginal secretions, milk, as well as inflammatory fluids (pericardial, peritoneal, pleural and synovial exudates and effusions). Other biological substrates not mixed with blood, such as saliva, urine and tear fluid, do not pose a threat. Therefore, the prevention of nosocomial infections is primarily to prevent potentially dangerous contact of the medical worker with the patient's biological fluids.
The most effective methods of prevention today are vaccination against hepatitis B and prevention of emergency situations when working with sharp and sharp instruments. The latter is achieved by using safe medical devices that automatically retract or automatically blunt needles, destructors to destroy metal needles, etc.

Avoiding an emergency situation will help not only special medical products, but also observance of basic rules of medical manipulations. In particular, in order not to damage the skin with an infected needle, a medical worker should not put a cap on it and use it after giving injections, taking blood, etc. Needles and other sharp instruments are placed in special containers immediately after use, which should be placed as close as possible to the place of medical manipulation.
It is important that the medical pers onal was provided with individual barrier protection means:
• gloves for procedures involving contact with the patient's biological fluids
• masks and special glasses-screens to protect the eyes when splashing of liquids is possible
• waterproof robes and aprons, etc
Also, medical personnel should be familiarized with the algorithm of actions in case of an emergency situation. Of great importance is the availability of means of post-contact prevention with antiretroviral drugs, which, in case of timely administration, reduce the risk of infection by 80%.
Medical workers should be aware of the danger to their health caused by nosocomial infections. This will help the head nurse to organize disinfection and sterilization measures at the appropriate level in the health care facility.
Measures for the prevention of nosocomial infections in hospitals
The prevention of nosocomial infections as a component of occupational health and safety in medicine involves the organization and control of disinfection and sterilization measures:
• preventive and central disinfection
• disinsection
• deratization
• disinfection
• pre-sterilization cleaning
• sterilization of medical products
Disinfection is the most effective measure against nosocomial infections. It helps to destroy pathogenic and conditionally pathogenic microorganisms in the wards and functional rooms of hospital departments, on medical instruments and equipment.
When carrying out the final disinfection in the ward (box) after the discharge of the patient, it is necessary to carry out 100% chamber disinfection of soft equipment (blankets, pillows, mattresses, etc.).
In a number of cases, disinfection remains almost the only way to combat nosocomial infections in a hospital. However, some hospital strains of the causative agents of such infections are not only antibiotic-resistant, but also resistant to the influence of external factors, in particular, to the action of disinfectants.
Therefore, the choice of means for disinfection should be balanced, multifaceted. It is necessary to take into account both the spectrum of antimicrobial activity and the purpose of their use (disinfection of surfaces, disinfection of medical products, equipment in operating rooms, etc.).
Only products registered in accordance with the established procedure are allowed for use in healthcare facilities. They must indicate for which stage of sterilization they are designed - disinfection, pre-sterilization cleaning or actual sterilization.
Today, for the disinfection of medical devices and other objects in health care facilities, agents with high bactericidal activity and detergent properties are used, which make it possible to combine disinfection with room cleaning or pre-sterilization cleaning in one step.
In order to prevent the emergence of resistant strains of microorganisms in health care facilities, a timely rotation of disinfectants at the level of replacement of the active substance should be carried out. Disinfectants that meet modern requirements guarantee the protection of the health of patients and medical personnel from intra-hospital infections.
For air disinfection, it is recommended to use modern shielded ozone-free UV irradiators-recirculators. The device passes air through it, exposing it to UV lamps. At the same time, the use of recirculators is possible in the presence of people and has no time limits.
Sterilization itself is also an important measure for the prevention of nosocomial infections. It is carried out with the aim of destroying microorganisms of all types, including spore forms, on or in medical products.
The attention of medical personnel should be drawn to the fact that an important issue of sterilization in a health care institution is to ensure the protection of sterilized products from infection. For this, it is necessary to strictly follow the rules of packaging and stacking of products

before sterilization, use reliable packaging materials, strictly observe the work regime in the sterile zone, constantly monitor the operation of the equipment.
3. Topics of reports/abstracts:
1. Nosocomial infections: causes of their spread
2. Prevention of nosocomial infections.

4. Summing up: New methods and organizational measures to improve the sterilization of medical devices made it possible to effectively resist the spread of nosocomial infections. However, often the source of infection is not contaminated instruments, but the hands of a medical worker who, during the performance of his duties, comes into contact with both patients and medical products.

Literature

Main:

1. Hygiene and ecology // textbook for students of higher medical educational institutions in English. /edited by V.G. Bardova – Vinnytsia: NovaKnyga, 2018.

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Seminar session No. 5
Topic: Peculiarities of hygienic requirements for the planning and operation of medical and preventive facilities. Hygienic assessment of conditions of stay of patients in medical and preventive institutions.

Purpose: to get acquainted with the requirements for the planning and operation of medical and preventive facilities and to be able to carry out a hygienic assessment of the conditions of stay of patients in medical and preventive facilities, to learn the main architectural, sanitary-technical and sanitary-hygienic methods and means for the prevention of intra-hospital infections in modern medical facilities - preventive institutions, creation of safe conditions for the stay of patients and the work of staff.

Basic concepts: LPZ, ward area standards.
Equipment: laptop, projector
1. Questions (test tasks) to check basic knowledge on the topic of the seminar:
2. Discussion of theoretical issues:
Plots of land for LPZ are allocated within the boundaries of populated areas in accordance with general plans or detailed planning plans in the immediate vicinity of the settlement zone. Multidisciplinary hospitals with a capacity of more than 1,000 beds, or the same specialized hospitals (infectious, psychoneurological) should preferably be designed in a suburban green zone at a distance of at least 1,000 m from housing. Pharmacies, women's consultations, dental polyclinics, offices of private practitioners and family doctors (with the exception of dermatovenerological, infectious, phthisiatric) can be located directly in residential buildings. The named establishments must have a separate entrance.

On the site (mansion) of the hospital with inpatient departments, a number of functional zones are planned: a zone of medical buildings - separately for somatic and infectious patients, a polyclinic zone, a garden and park zone, an economic zone and a zone of the pathology department. If the hospital includes maternity, radiological, psychosomatic, and tuberculosis departments, they must have separate garden and park zones (grounds). Separate entrances in hospitals should also have zones: infectious and non-infectious buildings, patho-anatomical building and household (the entrances of the last two zones can be combined, if necessary).
The territory of the LPZ site with an inpatient facility should be landscaped, landscaped, have internal driveways and paved walkways. The area of the garden and park zone should be at least 25 m2 per bed; the number of green spaces should be at least 60% of the land area, the building area - 12-15%. The site of the LPZ with the inpatient facility must have a fence 1.6 m high. The territory of the LPZ, which is not occupied for development, is landscaped, and pedestrian and driving paths are paved. It is not allowed to plant fruit trees and trees that can cause allergic reactions such as pollinosis in the garden and park area of the hospital.
The main principle of planning the reception department is timeliness. The "flow" of patients entering the hospital through the reception department should be unidirectional, that is, through the reception department and to the place of permanent treatment. In the case of centralized construction of the hospital area of a multidisciplinary hospital, the reception department should be designed in such a way as to avoid the cross movement of patients when entering the hospital and being discharged from it. The shorter the cycle of providing medical care, the greater the number of flows projected for the hospital: for emergency medical care hospitals - 1 flow per 150 beds; somatic - 1 flow per 200 beds, psychosomatic - 1 flow per 600 beds; tuberculosis dispensaries - 1 flow per 800 beds. To serve each flow of patients, the hospital must have one complete set of reception and diagnostic rooms, which consist of a waiting room, a dressing room, an examination room, a shower (bathroom) room, and a dressing room.
Separate boxes (maternity, operating, X-ray, resuscitation) are provided for the provision of specialized emergency care in the reception departments of hospitals. In children's and infectious diseases hospitals (departments), it is mandatory to have a sanitary pass for medical personnel, which consists of a changing room-wardrobe for personal clothes, a shower room and a changing room-wardrobe for overalls.
The main planning unit of the somatic ward department is the ward section - an isolated complex of wards and medical and auxiliary rooms, which are intended for patients with the same type of

pathology. In order to prevent VLI, ward sections of any profile should be impassable, have in their composition a full set of premises to provide for the treatment and household needs of patients: treatment wards (total number of 20-30 beds), doctors' offices, day rest room for patients, procedure or manipulation room, enema, sanitary rooms, storerooms for storing clean and dirty linen, canteen-buffet, sanitary units for staff and patients. In order to prevent overcrowding of patients, it is not allowed to place more than 4 beds in the wards

If the department consists of two or more sections, common rooms are allocated, such as the manager's office, specialized and medical and diagnostic offices. Wards are located compactly, all premises, the operation of which may violate the medical and security regime, hygienic comfort (toilets, procedure rooms) are moved to the periphery of the section. The mutual location of the wards with other rooms of the section should ensure the shortest possible paths of movement of patients and medical personnel.

Infectious disease department. The specificity of architectural and planning decisions of infectious disease departments is determined by the presence of an infectious disease in the patient. Therefore, on the one hand, it poses a real danger to medical personnel and other patients, on the other hand, it is particularly vulnerable to secondary infection. For this purpose, the infectious department on the territory of the hospital site is always located in a separate building. In multidisciplinary infectious diseases hospitals, in addition, entire floors or separate wings (cases) are allocated for patients with gastrointestinal diseases, respiratory diseases, blood infections, that is, diseases with the same transmission path. When placing patients with different infectious pathologies on the same floor, individual sections must be impassable and separated from each other by airlocks equipped with bactericidal irradiators or bactericidal air recirculators. In the infectious disease department, instead of wards, boxes, semi-boxes and boxed wards are designed. Patients with highly contagious and particularly dangerous infections (cholera, chicken pox, plague, etc.) are isolated and treated in boxes. The composition of the box includes: vestibule at the entrance for the patient (from the side of the yard); a sanitary room with a bath, a sink and a toilet; ward; the gateway at the entrance from the department with a washbasin. In addition, a window for the transfer of food is provided in the wall from the airlock. A sick person, as a rule, in the acute period of the disease, accompanied by a medical worker, gets to the boxing ward directly from the street, without coming into contact with other patients and the staff of the department. Her entire subsequent stay in the hospital takes place in a separate room.

The semi-box is also intended for individual insulation, but does not have a separate entrance from the street. Boxed wards are used for the stay of 3-4 patients with the same infection and do not have a separate entrance from the street and the bathroom. The lavatory with a hand basin in such a ward has an entrance from the gateway and is intended only for the use of patients.

Department of surgical profile. Almost 76% of hospital-acquired infections occur precisely after surgical interventions and subsequent discharge of postoperative patients. In domestic medical institutions, the distinction between "clean" and "purulent" surgical departments is traditionally accepted, but such a distinction is quite conditional, since purulent postoperative complications in "clean" patients are not at all rare. However, surgical interventions against the background of an already existing purulent process (purulent appendicitis, peritonitis, etc.) should be carried out in separate operating rooms, and the discharge of such patients should take place in the departments of purulent surgery ("septic"), and in the absence of such - in a separate ward section of the general surgical department for patients with purulent complications. Thus, the main architectural and planning measure for the prevention of VLI in surgical hospitals is the maximum separation of all rooms for "clean" and purulent patients and patients with other infectious complications at all stages of the patient's stay in the hospital. A specific feature of the planning of surgical departments is also the presence of a special dressing room and a room for processing the vessels of bedridden patients.

The operating unit is designed separately from all other units of the hospital and consists of operating rooms and a number of auxiliary rooms. The main principle of planning operating units is the presence of two impenetrable, isolated departments - a septic and an aseptic one with a full set of all the necessary rooms (with the exception of specialized cardiosurgical and neurosurgical ones). Operating rooms (one for every 30 beds) are designed for 1 operating table. The movement of personnel and patients in the operating block is carried out according to the strict principle of zoning of premises, while the following zones are distinguished: 1) general hospital mode; 2) limited regime (surgeons' offices, instrumental and material rooms, room for diagnostic studies; 3) strict regime (pre-operative, anesthesia, equipment, sterilization, personnel sanitary pass, postoperative wards; 4) sterile zone (operating rooms). At the entrance to the operating unit, it is necessary to arrange a gateway that would separate it from other premises of the hospital, and a sanitary pass for the staff. The dressing room for the personnel of the operating unit should be located behind the changing room of the sanitary pass so that it is possible to leave the outer work clothes in the room of the strict regime zone. The entrance to the operating unit can be carried out through the gateway (delivery of the patient, passage of anesthesiologists, technical personnel onal), or through a sanitary pass (surgeons, operating nurses). These streams must not cross.

In the maternity hospital, depending on the capacity, the organization of the vast majority of a) individual maternity wards, b) family maternity wards, c) individual maternity rooms is envisaged. The former observation departments have now been reorganized and operate in the mode of individual and family delivery rooms, individual postpartum wards, which is an effective method of preventing the occurrence of intra-hospital infections.

Wards for the hospitalization of pregnant women, women in labor and women with infectious diseases in the stage of acute clinical manifestations must have a bathroom, a separate entrance, and be equipped with supply-exhaust ventilation with negative pressure. These wards are equipped with a functional bed or a transforming bed for receiving birth and for the mother to stay on it during the entire period of hospitalization, with the necessary medical equipment and means for giving birth (balls, a chair, a Swedish wall, a special mat). When entering the ward for hospitalization of pregnant women, women in labor and women with infectious diseases in the stage of acute clinical manifestations, medical personnel wear a disposable gown, cap, and rubber gloves. At the end of the work, these clothes are removed, hands are treated, and only after that the staff leaves this ward.

If there are no conditions for a separate entrance to the ward for the hospitalization of pregnant women, women in labor and women with infectious diseases in the stage of acute clinical manifestations, it is necessary to implement measures for the maximum isolation of the patient in compliance with the conditions for the prevention of the spread of infection.

The sanitary and technical equipment of hospitals and other medical facilities must necessarily provide cold and hot water supply, sewage, heat supply, electricity and gas supply, ventilation and telephony. The first three engineering systems are of particular importance in the prevention of VLI.

Water supply. As a rule, medical and preventive facilities are connected to the city's domestic and drinking water supply, taking into account water consumption standards. For existing and newly built hospitals, reserve (autonomous) hot water supply systems for premises with a special anti-epidemic regime (operating, delivery, resuscitation, food blocks, showers, etc.) are necessarily provided.

Hand basins with hot and cold water supply and faucets must be installed in wards for patients (including children's and babies), doctors' offices, locks of boxes, semi-boxes and boxed wards, procedural, dressing, pre-operative, maternity, medical posts nurses at the newborn wards, restrooms. Mixers with elbow taps are installed in pre-operative, maternity, dressing rooms and other rooms that require a special regime and cleanliness of hands. Hand sinks in staff restrooms,

wards and box locks in infectious, dermatological and venereological, and tuberculosis departments are also equipped with hand faucets.

Sewage. Toilets for staff and patients, in addition to sanitary devices - toilets and urinals, must be equipped with cabins, hand wash basins, clothes hooks, electric hand dryers, and mirrors. In women's toilets, in addition, it is necessary to provide a hygiene room with a rising shower ("bide"). In the toilets of the infectious, dermatological and venereological, tuberculosis departments, pedal descents for flushing tanks are arranged. Neonatal wards should have wide sinks suitable for washing children.

Wastewater from hospitals is discharged into the city-wide sewage system, and in its absence, a full cycle of biological cleaning and disinfection must be carried out at local sewage treatment plants. Wastewater from infectious and tuberculosis hospitals (except for sewage from the food block and laundry) must be disinfected at local treatment facilities (within the facility's land plot) before entering the city-wide network.

The specific epidemically hazardous waste of the hospital includes: remains of organs and tissues from surgical, maternity, pathology departments, infected dressing material, hygiene products and small single-use instruments, corpses of laboratory animals. In order to organize an effective and safe system of treatment of medical waste in accordance with the State sanitary and anti-epidemic rules and norms for the treatment of medical waste, approved by the Order of the Ministry of Health of Ukraine dated June 8, 2015 No. 325, it is advisable to divide them into separate groups:

- category A - epidemically safe medical waste; disposable blue bags;
- category B - epidemically dangerous medical waste; disposable hermetic red bags; with the inscription "especially dangerous", "dangerous, sharp objects":
- category C - toxicologically dangerous medical waste; disposable hermetic yellow bags; with the inscription "dangerous";
- category D - radiologically hazardous medical waste; disposable hermetic black bags with the sign "radiation danger";

Spec hospital waste (infected dressing material, parts of organs and tissues, etc.) can be burned on the territory of the hospital in a special furnace - "incinerator", which is installed on the territory of the economic zone, taking into account the wind direction, at a distance of no closer than 50 m from the wards . For a small amount of specific waste, electric mufflers, more powerful furnaces operating on fuel oil or natural gas can also be used. When the temperature inside the incinerator is more than 3500C, a separate chimney is provided for the furnace. Incineration furnaces must be located in a separate building. Their location in the general hospital boiler room with a separate entrance or in the basement and basement floors of the hospital's utility buildings is also allowed. Slag and ash from waste incineration are taken to landfills together with other household waste. The disposal of infected specific waste in landfills together with household waste of the hospital is strictly prohibited.

LPZ heating systems must be central, water-based and meet the following general requirements: a) ensure uniform and sufficient heating of the air in the premises throughout the heating season; b) do not pollute the air and do not create noise during operation; c) have means of regulation and be available for cleaning and maintenance. Hospitals and maternity homes can also be equipped with local boiler rooms on natural gas, which are allowed to be placed on attics and flat roofs of buildings. In rooms with an aseptic regime (operating, delivery, intensive care, wards for burn patients, rooms for aseptic preparation of medicines, blood and its preparations, and the like), the most appropriate is a system of panel radiant heating with the laying of water heating channels in the thickness of concrete blocks (walls, floors). When using external water heating devices (batteries, convectors), they are placed under window openings.

LPZ ventilation systems depend on the functional purpose and profile of individual rooms and departments. To prevent the aerogenous spread of infectious disease agents within the same building or functional unit, when installing ventilation systems in rooms with an aseptic mode

(for example, operating rooms), it is necessary to create air support - the advantage of inflow before extraction; in rooms with a possible release of pathogens (for example, infection boxes) - rarefaction, that is, the advantage of exhaust over inflow. In all premises of the refinery, with the exception of operating rooms, a system of natural supply and exhaust general exchange ventilation is installed.

The peculiarity of the ventilation of infectious departments is that: first, exhaust ventilation is carried out naturally through exhaust ducts with deflectors separately from each box, semi-box, ward department; secondly, supply ventilation should be artificial (mechanical) with outside air supplied to the corridors of ward sections.

The air supplied (including air conditioners) to rooms with an aseptic regime (operating, maternity, burn rooms, resuscitation and intensive care rooms, wards for babies, infants, premature and injured children) must be pre-cleaned with aerosol (bacterial) filters

In operating units: a) the airlock between the operating unit and other premises of the hospital must have air support; b) the general direction of air movement should be as follows: operating room > pre-operative (anesthetic) > corridor, exhaust ventilation must be arranged in the corridor; c) fresh air is supplied to the upper zone of the premises, extraction - 40% of the air volume from the upper zone, 60% - from the lower; d) separate ventilation channels are provided for clean and purulent operating theaters, delivery rooms, resuscitation.

All premises, equipment, medical and other equipment of medical and preventive facilities must be kept clean. Wet cleaning of premises (washing the floor, wiping furniture, equipment, windowsills, doors, etc.) is carried out using detergents at least twice a day, and if necessary - more often. Wiping the window glass from the inside should be done at least once a month. All equipment for cleaning (buckets, bowls, etc.) must be clearly marked with the name of the premises and types of work performed, be used strictly for their intended purpose and be stored separately.

2) General cleaning of wards and other functional premises and offices, which involves thorough washing of walls, floors, all equipment, as well as wiping of furniture, lamps and protective blinds, should be carried out according to the approved schedule at least once a month.

General cleaning (washing and disinfection) of the operating unit and dressing rooms is carried out once a week with the removal of equipment, furniture and other equipment. In the hospital, a 2-3 month supply of detergents and disinfectants should be available at all times.

3) Premises that require a special regime of sterility, asepsis and antiseptics rooms (operating rooms, dressing rooms, delivery rooms, intensive care rooms, wards for newborns and premature children, as well as children under 1 year of age, procedure, infection boxes, bacteriological and virological laboratory boxes, milk rooms, etc.) after cleaning, as well as in the course of current operation, it is necessary to periodically irradiate with ultraviolet stationary or mobile bactericidal lamps at the rate of 1 W per 1 m3 of the room, or use recirculating bactericidal irradiators.

Sanitary treatment of an aseptic department (block) involves daily cleaning of wards and auxiliary premises of the department, as well as general cleaning according to the schedule.

Wards and other premises that require access to fresh air through the cabin, transoms, and sashes are ventilated at least four times a day.

Nowadays, personal hygiene and, above all, hand hygiene of medical personnel is considered as one of the most important measures of infection control, which allows to interrupt the development of nosocomial infections.

Tests

A) regular hand washing with soap is mandatory:
before and after physical contact with the patient;
before cooking and serving food, before eating;
after specific functions of the body (visiting the toilet, defecating, etc.);
in all other cases, when the hands are clearly contaminated;

B) hygienic hand antiseptic is mandatory:
before performing invasive procedures;
before working with particularly sensitive (immunocompromised) patients and infants;
before and after manipulations with wounds, catheters;
before and after putting on medical gloves;
after contact with secretions and objects containing blood or with the possibility of microbial contamination (for example, examination of an infected patient, measurement of rectal temperature, etc.);
C) surgical hand antiseptic is mandatory:
before any surgical operations
3. Topics of reports/abstracts:
1. Peculiarities of location in the settlement, territory planning and building systems of multidisciplinary and specialized hospitals, outpatient polyclinic institutions.
2. Basic hygienic principles and requirements for planning and interior decoration:
- reception departments of the hospital;
- departments of therapeutic, surgical, infectious profile;
- obstetric departments.
1. Basic hygienic requirements for sanitary and technical equipment of hospitals (natural and artificial lighting, heating, ventilation; water supply, removal and disposal of liquid and solid waste, their features for infectious and surgical departments).
2. Organization of the sanitary and hygienic regime in inpatient departments of the hospital, outpatient clinic.
3. A complex of sanitary-technical, planning, sanitary-hygienic and organizational measures to prevent the occurrence and spread of intra-hospital infections.

Literature

Main:

1. Hygiene and ecology // textbook for students of higher medical educational institutions in English. /edited by V.G. Bardova – Vinnytsia: NovaKnyga, 2018.

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3. General hygiene. Hygiene propaedeutics/Textbook for foreign students. / E.I. Honcharuk, Yu.I. Kundiev, V.G. bardo otter - K.: Higher school, 2000.

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Seminar lesson No. 6
Topic: Nutrition in preventive medicine. Food organization in medical and preventive institutions. Sanitary and hygienic control over the organization of medical and preventive nutrition at industrial enterprises.

Purpose: to learn how to perform a hygienic assessment of the ration of therapeutic and preventive nutrition. To master the method of medical control for the organization of medical and preventive nutrition at industrial enterprises.
Basic concepts: therapeutic and preventive nutrition.
Equipment: laptop, projector

Questions (test tasks) to check basic knowledge on the topic of the seminar:

1. Why does nutrition have a significant impact on the formation of human health?
2. What is the specific effect of nutrition?
3. What is the health effect of nutrition?
4. What is the protective effect of nutrition?
5. What is the parapharmacological effect of nutrition?
6. What types of food are allocated?
7. For what purpose and to which population group is rational nutrition prescribed?
8. For what purpose and to which population group is preventive nutrition prescribed?
9. For what purpose and to which population group is medical and preventive nutrition prescribed?
10. For what purpose and to which population group is medical (dietary) nutrition prescribed?
11. What is the principle of quantitative completeness of the diet?
12. What is the principle of a high-quality diet?
13. What is the principle of a balanced diet?
14. What is the principle of optimality of the diet?
15. What is the principle of ration adequacy?
16. What is the principle of diet safety?
17. On what is the appointment of therapeutic and preventive nutrition based?
18. What types of therapeutic and preventive nutrition are available?

Discussion of theoretical issues:
Nutritional hygiene is a medical science that studies the impact of food and nutrition on human health, various collectives, and the entire population and develops scientific foundations and practical principles for the rational organization of nutrition for different age and professional groups of the population and the prevention of diseases arising from improper nutrition. food poisoning and infectious diseases with food transmission, etc.
Nutrition due to its functions and biological action:
1. Ensures the growth and development of the body.
2. Forms the level of health.
3. Restores working capacity.
4. Increases life expectancy.
5. Reduces the level of foodborne diseases and the most important non-infectious diseases with foodborne risk factors.
6. Accelerates recovery and contributes to the prevention of relapses of diseases.
7. Contributes to the protection of the population from the effects of adverse industrial and environmental conditions.
The theoretical generalization of the achievements of food hygiene made it possible to formulate the axioms of human biological existence, which are as follows:
1. Energy needs are primary relative to all other human needs.
2. The body of an adult must function in isoenergetic conditions.
3. The maximum energy value of the diet should correspond to the maximum physical activity.
4. Processes of dissimilation (catabolism) occur in the body constantly, regardless of food intake.
5. The processes of assimilation (anabolism) occur only under the conditions of providing the body with energetic, plastic and bioregulatory substances.
6. Food should be biologically informative, that is, it should contain all the necessary substances for the regulation of metabolism.
7. The content of glucose, triglycerides and cholesterol in food requires conscious regulation, since these substances are risk factors for the development of the most common non-infectious diseases (diabetes, obesity, atherosclerosis).
8. For young organisms, athletes, military personnel, the rate of food intake should exceed the rate of its assimilation to ensure high activity of plastic processes.
9. In the case of quantitative and qualitative nutritional deficiency, the immune system (protective and adaptive capabilities of the body) first suffers, resulting in a high level of infectious and non-infectious morbidity of the population.

Rational nutrition - (from the Latin rationalis - reasonable) is a physiological nutritional supplement for healthy people. During the organization of rational nutrition, scientifically based physiological norms of consumption of food substances and energy for different population groups are guided. Rational nutrition is an expediently organized and timely provision of the human body with nutritious and tasty food, which contains the optimal amount of various nutrients necessary for maintaining vital activity, growth and development of a person, preserving his health and increasing life expectancy.

Principles of rational nutrition

1. The principle of quantitative completeness - the energy value of an adult's diet should correspond to the body's energy expenditure.

2. The principle of qualitative completeness - the diet must contain all the nutrients that are necessary for plastic purposes and regulation of physiological functions.

3. The principle of balance – the food ration should be balanced in terms of nutrients.

4. The principle of optimality - it is necessary to adhere to the diet.

5. The principle of adequacy – the chemical composition of food, its assimilation and digestion must correspond to the peculiarities of human metabolic processes.

6. The principle of satisfaction - food should be tasty, with its characteristic aroma and should be consumed in comfortable conditions.

7. The principle of safety - food must be safe in epidemiological, toxicological and radiological terms.

Classification of alimentary pathology

Diseases associated with irrational nutrition.

- Diseases associated with complete hunger or partial malnutrition.

- Diseases associated with nutritional deficiency:

- protein deficiency (kwashiorkor);

- protein-energy deficiency (alimentary dystrophy, alimentary marasmus);

- vitamin deficiency (scurvy, pellagra, beriberi, rickets, xerophthalmia, chicken blindness, ariboflavinosis and others);

- mineral deficiency (endemic goiter, dental caries, osteoporosis, iron deficiency anemia and others);

- deficiency of essential polyunsaturated fatty acids (PUFA) ω9, ω6, ω3 in the cis form (atherosclerosis).

- Diseases associated with energy and nutrient overnutrition:

- energy excess (metabolic syndrome, atherosclerosis, diabetes and others);

- protein excess (gout);

- an excess of saturated fatty acids in trans form (atherosclerosis, oncological diseases);

- vitamin excess (hypervitaminosis A, D and E);

- mineral excess (fluorosis, selenosis, molybdenum gout and others).

- Disease of irrational combination of food products (diarrhea).

- Diseases of an irrational diet (gastritis, peptic ulcer disease of the stomach and duodenum, pancreatitis).

- Secondary alimentary diseases associated with disruption of nutrient assimilation processes (secondary hypotrophy, hypovitaminosis, hypomicroelementosis).

- Diseases associated with alimentary risk factors (alimentary diseases — atherosclerosis, oncological diseases, diabetes and others).

- Diseases associated with food intolerance (food allergy, food idiosyncrasy, psychogenic food intolerance).

- Diseases associated with the consumption of epidemically and sanitary dangerous food (food infections, food infestations, food poisoning).

Therapeutic and preventive nutrition is a special type of nutrition intended for the protection of persons working in harmful and dangerous working conditions by increasing the body's resistance to the influence of harmful production factors, regulating the mechanisms of biotransformation and detoxification of xenobiotics, and preventing occupationally caused nutrient deficiencies.

The need to use LPH as an effective means in preventive medicine arose due to the fact that production activity in some branches of the mining, processing industry, agriculture, certain branches of medicine, etc. is associated with a possible adverse effect of dangerous chemical, physical or biological factors of the production environment on the body of workers. This can cause both specific consequences (occurrence of occupational diseases or occupational poisoning) and non-specific consequences (deterioration of the general state of health, reduction of work capacity, increase of non-specific morbidity, exacerbation of chronic somatic diseases, etc.).

Functional purpose of LPH:

1) increasing the protective functions of the body's physiological barriers (skin, mucous membranes, etc.) in relation to the penetration of harmful factors into the body's internal environment;

2) differential impact on the processes of biotransformation of xenobiotics, stimulation of the mechanisms of formation of low-toxic products of metabolic transformations and, conversely, inhibition, blocking of biotransformation processes in case of formation of more toxic metabolites;

3) activation of the body's antioxidant protection system, increasing its effectiveness;

4) activation of the processes of binding, neutralization and removal from the body of toxic substances and their products transformation;

5) maintaining and improving the functional state of organs and systems that are mainly affected by harmful production factors; increasing the antitoxic function of the liver as a specific detoxification organ, especially if harmful factors are hepatotropic;

6) compensation of nutrient deficiency that occurs in the body as a result of the direct influence of harmful production factors and in the process of their metabolic transformation;

7) maintenance of auto-regulatory processes of the body, including adaptive, compensatory, immunoregulatory processes;

8) increasing the general resistance of the body, its adaptive reserves, working capacity, improving well-being, reducing general and occupational morbidity, continuing an active lifestyle, preventing premature aging.

3. Topics of reports/abstracts:

1. Functions of food and the factors that provide them.
2. Alimentary diseases (primary diseases and secondary diseases of insufficient and excessive nutrition).
3. Use of the protective and pharmacological action of food for the purpose of organizing therapeutic and preventive and other types of nutrition.
4. Proteins, fats, carbohydrates, vitamins, mineral elements and their importance in nutrition.
5. Basic requirements for building a human diet.
6. Energy value and nutrient composition of food rations. Sources of energy in food.
7. Basic principles and forms of therapeutic and preventive nutrition.
8. Appointment of therapeutic and preventive nutrition. Peculiarities of the organization of LPH at various industrial enterprises.
9. Rations of therapeutic and preventive nutrition and analysis of their effectiveness.

Literature

Main:

1. Hygiene and ecology // textbook for students of higher medical educational institutions in English. /edited by V.G. Bardova – Vinnytsia: NovaKnyga, 2018.

2. Environmental Health: from Global to Local \ Under Howard Frumkin edition – Third edition. - San Francisco, 2016

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Seminar class #7

Topic: Hygienic assessment of working conditions. The method of organizing preliminary and periodic medical examinations of workers of certain professions. Occupational hygiene of medical workers in medical and preventive institutions.

Purpose: to get acquainted with the occupational hygiene of medical workers in medical and preventive institutions and the method of organizing preliminary and periodic medical examinations of workers of certain professions

Basic concepts: work, working conditions

Equipment: laptop, projector

1. Questions (test tasks) to check basic knowledge on the topic of the seminar:

2. Discussion of theoretical issues:

Occupational hygiene considers issues related to working conditions and their impact on the human body; develops hygienic and curative-prophylactic measures aimed at improving and preserving the health of employees, increasing work capacity and productivity. Human activity, depending on the conditions of implementation and features of technological processes, can be accompanied by a significant deviation of the parameters of the production environment from their natural value, which is desired to ensure the normal functioning of the human body.

MEDICAL EXAMINATIONS OF EMPLOYEES: GROUNDS AND PROCEDURE

Who is subject to mandatory medical examination?

A medical examination is mandatory for the following categories of employees:

- employed in hard work;

- at jobs with harmful or dangerous working conditions;

- at jobs where there is a need for professional selection;

- persons under the age of 21 (regardless of profession and type of activity).

Medical examinations for employees who are engaged in heavy work and work with harmful or dangerous working conditions are carried out in accordance with the List of harmful and dangerous factors of the production environment and labor process, when working with which preliminary (periodic) medical examination of employees is mandatory, given in the appendix 4 to Order No. 246, which directly indicates the danger factor itself, the frequency of examinations, the specialty of the doctors who must participate in them, the laboratory tests that must be conducted, as well as special medical contraindications (in addition to the general ones).

Thus, the harmful and dangerous factors of the production environment and labor process include:

- chemical substances, their compounds and elements (of inorganic and organic origin);

- complex chemical mixtures, compositions, chemical substances for a specific purpose (organic dyes and pigments, pesticides, synthetic detergents, synthetic polymer materials: resins, varnishes, glue, plastics, lubricants, coolants, sealants, paints, enamels; fertilizers; pharmacological agents);

- industrial aerosols mainly of fibrogenic and mixed type of action (asbestos, cement, fiberglass, carbon dust);

- biological factors (protein and vitamin concentrates, compound feed, enzyme preparations, biostimulants, infected material and material infected with parasites, pathogens of infectious diseases);

- physical factors;

- physical overload and overstrain of individual organs and systems and other factors of the labor process (lifting and manual movement of loads, visually straining work (with optical devices, watching the screen).

According to the same principle as appendix 4, appendix 5 to Order No. 246 was built — it contains a list of works for which preliminary (periodic) medical examination of employees, periodicity of examinations, participation of doctors, laboratory tests and medical contraindications are mandatory.

These works include:

- work at height, climbing work and work related to climbing to a height, as well as maintenance of lifting mechanisms;

- the work of electrical personnel performing operative maintenance and repair work on operating electrical installations with a voltage of 127 V and above alternating current and 110 V direct current, as well as installation and adjustment work, research and measurements in these electrical installations;

- works in forest protection, shafting, alloying, transportation and primary processing of the forest;

- work in the oil and gas industry and offshore drilling;

- all types of underground works;

- work at hydrometeorological stations, communication facilities;

- geological exploration, topographic, construction works;

- works related to maintenance of pressure vessels;

- the work of machinists (firemen), boiler room operators, employees of the gas inspection service;

- work related to the use of explosives, work in explosive and fire-hazardous industries;

- work in military security, special communication services, cash collection apparatus, banking structures, other institutions and services that are allowed to carry firearms and use them;

- work in the gas rescue service, voluntary gas rescue teams, military units and units for the prevention and liquidation of open gas and oil fountains, military mining, mining rescue services of ministries and institutions, in fire protection.

- emergency and rescue services (works) for liquidation of emergency situations of natural and man-made disasters racter;

- work on mechanical equipment (lathe, milling and other machines, stamping presses, etc.).

The list of jobs where there is a need for professional selection, approved by a joint order of the Ministry of Health of Ukraine and the State Committee of Ukraine for Supervision of Labor Protection dated September 23, 1994 p. No. 263/121 (in this list, unlike the previous ones, only the type of work and psychophysiological indicators for professional selection are given).

Jobs where there is a need for professional selection include:

- all types of underground works;

- work in caissons, pressure chambers, closed spaces;

- diving works;

- work at height, climbing work, work related to climbing;

- maintenance work on operating electrical installations up to and above 1000 V and performance of operational switching, debugging, installation work and high-voltage tests in them; work under voltage in electrical installations up to and above 1000 V; works related to operating energy equipment;

- work related to the use of explosive materials, work in explosive and fire-hazardous industries;

- work, the performance of which involves the carrying of firearms;

- emergency and rescue operations and fire extinguishing operations;

- works related to the management of ground, underground air and water transport;

- jobs related to emotional and nervous stress (air traffic controllers, railway traffic controllers; energy system operators);

- work on maintenance and operation of compressor oil pumping and gas regulating stations, linear systems of main oil and gas pipelines;

- works related to drilling, production and processing of oil, gas, condensate and their preparation for transportation and storage;

- works directly related to the production of ferrous and non-ferrous metals.

Organization of the procedure

Taking into account the requirements of the above lists and other regulatory acts, enterprises determine contingents of employees who are required to undergo medical examinations.

In some cases, employers can allow their employees to perform their work duties only after the latter pass a medical examination.

At the same time, the employer has no right to oblige the employee to undergo a medical examination, if this is not provided for by law. The establishment of the contingent of employees who undergo mandatory medical examinations is carried out by the employer together with the State Labor Service and the trade union committee. In the event of a change in the technological process, the introduction of new enterprises, technologies, workplaces and professions, the employer is obliged to inform the territorial office of the State Labor Service about this at the end of the reporting year. Based on this information, the number of employees is adjusted annually.

According to paragraphs 2.2. According to Order No. 246, the State Labor Service institutions annually, upon application by the employer (his representative), with the participation of a representative of the primary trade union organization or a person authorized by the employees, determine the categories of employees who are subject to a preliminary (periodic) medical examination and draw up an Act of determination of the categories of employees who are subject to a preliminary medical examination by December 1 (periodic) medical examination, according to the form specified in Appendix 1 to Order No. 246.

On the basis of the Act on determining the categories of employees who are subject to preliminary (periodic) medical examination, the employer compiles, within a month, in four copies, name lists of employees who are subject to periodic medical examinations, according to the form given in Appendix 2 to Order No. 246, on paper and electronic media , coordinates them in the territorial institution of the State Labor Service. One copy of the list remains at the enterprise (with the official responsible for organizing the medical examination), the second is sent to health care institutions, the third to the State Labor Service, the fourth to the working body of the executive directorate of the Social Insurance Fund against accidents at work and professional diseases of Ukraine.

To conduct a preliminary (periodic) medical examination of employees, the employer must conclude or timely renew a contract with a health care institution and provide it with a list of employees who are subject to a preliminary (periodic) medical examination.

At the time of hiring, in case of transfer to other difficult work, work with harmful or dangerous working conditions, the employer must issue a referral for a mandatory preliminary medical examination of the employee in the form specified in Appendix 3 to Order No. 246.

The employer, at the expense of his own funds, provides for the organization of medical examinations, expenses for an in-depth medical examination of an employee with suspicion of occupational and production-related diseases and their medical rehabilitation, dispensation of employees of risk groups for the development of occupational diseases.

On the basis of the list of employees who are subject to periodic medical examinations, the health care institution draws up a plan-schedule for their implementation, agrees it with the employer and the institution of the State Labor Service.

The plan-graph shows p methods of conducting medical examinations, laboratory, functional and other studies and doctors involved in their conduct. Medical examination by doctors is carried out only if the results of the mentioned studies are available.

Types of medical examinations: preliminary and periodic

The following types of medical examinations are distinguished:

- previous (during hiring);

- periodic (during the employee's employment, at least once every 2 years);

- overtime (at the initiative of the employee or employer).

A preliminary medical examination is carried out at the time of employment for the purpose of:

- determination of the employee's state of health and registration of the original objective indicators of health and the ability to perform professional duties without deterioration of the state of health in the conditions of the action of specific harmful and dangerous factors of the production environment and labor process;

- detection of occupational diseases (poisonings) that occurred earlier during work at previous productions, and prevention of production-related and occupational diseases (poisonings).

The list of general medical contraindications to work with harmful and dangerous factors of the production environment and labor process is given in Appendix 6 to List No. 246.

The purpose of periodic medical examinations is:

- timely detection of early signs of acute and chronic occupational diseases (poisoning), general and production-related diseases among employees;

- provision of dynamic monitoring of the state of health of employees under the influence of harmful and dangerous production factors and the labor process;

- resolving the issue of the employee's ability to continue working under the conditions of the action of specific harmful and dangerous production factors and the labor process;

- development of individual and group treatment and prevention and rehabilitation measures for employees classified as a risk group based on the results of a medical examination;

- carrying out appropriate health measures.

The periodicity of conducting medical examinations, the specialties of doctors participating in their conduct, the list of necessary laboratory, functional and other studies, medical contraindications for admission to work, related to the influence of production factors, are defined in the List of harmful and dangerous factors of the production environment and work environment of the process, when working with which preliminary (periodic) medical examination of employees is mandatory, given

in Appendix 4 to Order No. 246, and the List of works for the performance of which preliminary (periodic) medical examination of employees is mandatory, given in Appendix 5 to Order No. 246.

The periodicity of medical examinations in health care institutions may be changed by the State Labor Service, based on the specific sanitary and hygienic and epidemic situation, but at least once every two years.

The procedure for passing a medical examination by an employee

The preliminary (periodic) medical examination is carried out by the commission for conducting medical examinations of health care institutions (hereinafter referred to as the Commission). The commission is headed by the deputy chief physician or a person authorized by the chief physician who has training in occupational pathology.

The commission has the right to supplement the types and volumes of the necessary examinations and studies, taking into account the specifics of the action of production factors and medical contraindications.

The Commission must include a therapist, doctors who have received training in occupational pathology. In the absence of individual doctors, specialists from other health care institutions are involved in conducting medical examinations on a contractual basis. The commission ensures the necessary laboratory, functional and other studies.

To undergo a medical examination, the employee presents to the Commission a passport or other document certifying his identity and an outpatient medical card. If the medical examination is preliminary (upon hiring), the employee presents a referral issued by the employer in the established form.

Employees for whom primary and periodic preventive drug examinations are mandatory must provide the Commission with a certificate of passing a preventive drug examination in accordance with the Resolution of the Cabinet of Ministers of Ukraine "On Mandatory Preventive Drug Examination and Procedure for Its Conduct" dated November 6, 1997 No. 1238.

Employees for whom preliminary and periodic psychiatric examinations are mandatory must provide the Commission conducting the medical examination with a certificate of passing a preliminary (periodic) psychiatric examination in accordance with the Procedure for conducting mandatory preliminary and periodic psychiatric examinations and the list of medical psychiatric contraindications for performance of certain types of activities (jobs, professions, services) that may pose an immediate danger to the person conducting this activity or others, approved by the Resolution of the Cabinet of Ministers of Ukraine dated September 27, 2000 No. 1465.

Employees employed in jobs requiring professional selection must provide the Commission, which conducts a medical examination, with the conclusion of a psychophysiological examination.

Separate laboratory, functional and other studies that were carried out during the transfer the employee's stay in a hospital or during the period of the employee seeking medical help may be taken into account when conducting medical examinations, but not more than 3 months before the medical examination.

When deciding on the fitness for work of a specific employee during a preliminary (during hiring) medical examination, the Commission is guided by medical contraindications defined in the List of harmful and dangerous factors of the production environment and labor process, when working with which a preliminary (periodic) medical examination is mandatory of employees (Appendix 4 to Order No. 246), the List of works for which preliminary (periodic) medical examination of employees is mandatory (Appendix 5 to Order No. 246), as well as the List of general medical contraindications to

work with harmful and dangerous factors of production environment and labor process (Appendix 6 to Order No. 246).

The issue of suitability for work in each individual case is decided individually, taking into account the peculiarities of the functional state of the organism (character, degree of manifestation of the pathological process, presence of chronic diseases), working conditions and the results of additional examination methods.

Each doctor who participates in the examination of the patient gives a conclusion about the state of health of the employee, confirms it with a personal signature and personal seal, participates in the final discussion of the fitness of the examined person to work in the chosen profession and, if necessary, determines medical and health measures.

Documents on the results of medical examinations

The results of the preliminary (periodic) medical examination of employees and the conclusion of the Commission on the state of health are entered in the Card of the employee who is subject to a preliminary (periodic) medical examination (hereinafter — the Employee Card) in the form given in Appendix 7 to Order No. 246, and in the Medical cards of outpatients (form 025/o), approved by the order of the Ministry of Health of Ukraine "On approval of forms of primary accounting documentation and instructions for their filling, used in health care institutions regardless of the form of ownership and subordination" dated February 14, 2012 year No. 110.

The Employee's Card contains the employee's health complaints, medical history, results of medical examination, laboratory, functional and other tests, diagnosis, conclusion on the employee's professional fitness to work in his profession.

The employee's card contains confidential information, is stored in a health care institution that conducts a medical examination on the basis of a contract with the employer during the employee's employment, and is provided to the Commission during medical examinations.

On the basis of the Employee Card, the Commission issues to the employee a medical certificate of the employee's preliminary (periodic) medical examination in the form given in Appendix 8 to Order No. 246.

In the event of a change of place of work, the employee's card is issued to the employee for a signature to undergo a medical examination at the new place of work.

A copy of the employee's card is kept in the archives of the health care institution that conducted the medical examination on the basis of the contract with the employer for 15 years after the employee's dismissal.

Based on the results of periodic medical examinations (within a month after their completion), the Commission draws up the Final Act on the results of the periodic medical examination of employees (hereinafter — the Final Act) in the form specified in Appendix 9 to Order No. 246, which is made in six copies — one copy remains in the health care institution that conducted the medical examination, others are given to the employer, a representative of a trade union organization or a person authorized by employees, a professional pathologist, an institution of the state sanitary and epidemiological service, a working body of the executive directorate of the Fund.

If necessary, the Commission has the right to send an employee suspected of having a disease, as well as an employee with more than 10 years of work experience, for additional examinations, consultations and health-rehabilitation measures to specialized health care institutions, to departments and courses of occupational diseases of higher medical educational institutions and institutions postgraduate education.

If, during a periodical medical examination, suspicions arise regarding the presence of an occupational disease in an employee, the health care institution sends a request for drawing up a sanitary-hygienic description of the working conditions of the employee if he is suspected of having an occupational disease (poisoning) to the State Labor Service institution serving the territory, where the enterprise is located, in accordance with the Procedure for drawing up and requirements for sanitary and hygienic characteristics of working conditions, approved by the order of the Ministry of Health of Ukraine dated December 13, 2004 No. 614, and also sends it in the established order to the professional pathologist of the city, district, region, who refer the patient to specialized health care facilities that have the right to diagnose occupational diseases.

The term of storage of the Final Act is 5 years.

The employer keeps the place of work for the employee for the period of the medical examination (position) and average earnings and, based on the results of a medical examination, informs the employee about the possibility (impossibility) of continuing to work in the profession.

The results of a medical examination can be challenged by an employer or a citizen in higher-level health care institutions or in court.

Obligations of the employer

According to Art. 17 of Law No. 2694, the employer is obliged to provide financing and medical examinations of employees. According to the results of periodic medical examinations, if necessary, the employer must ensure the implementation of appropriate health measures.

The employer has the right, in accordance with the procedure established by law, to bring an employee who evades a mandatory medical examination to disciplinary responsibility, and is also obliged to suspend him from work without salary.

The employer is obliged to provide at his own expense an extraordinary medical examination of employees:

- at the employee's request, if he believes that the deterioration of his health is related to working conditions;

- on his own initiative, if the employee's state of health does not allow him to perform his work duties.

During the medical examination, the employees' place of work (position) and average earnings are stored.

The average earnings are maintained for employees during not only a routine medical examination, but also examinations in preventive centers, clinics of research and educational medical institutes (universities) to clarify the diagnosis or determine the role of production factors in the development of the disease.

It should be clarified that the average salary for the period of the medical examination is paid only during periodic (during the employee's employment) medical examinations. During the period of the preliminary (at the time of hiring) medical examination, it is impossible to maintain the average earnings due to its (earnings) absence, and the payment of the tariff rate (salary) is not provided for by law.

The employer is obliged to organize laboratory studies of working conditions with the determination of harmful and dangerous factors of the production environment and the labor process at specific workplaces of employees in accordance with the hygienic classification of work according to indicators of the harmfulness and danger of factors of the production environment, the difficulty and tension of the labor process in order to determine the categories of employees, which are subject to a

preliminary (periodic) medical examination, and submits these data to the relevant sanitary-epidemiological station.

During the conclusion of the employment contract, the employer must inform the employee under his signature about the working conditions and the presence at his workplace of dangerous and harmful production factors that have not yet been eliminated, the possible consequences of their impact on health, and about the employee's rights to benefits and compensation for work in such conditions in accordance with the legislation and the collective agreement.

An employee may not be offered work that, according to a medical opinion, is contraindicated for him due to his health. Persons with the conclusion of a psychophysiological examination are allowed to carry out works of increased danger and those that require professional selection.

The employer agrees on the plan-schedule for conducting medical examinations by health care institutions, and also ensures timely and organized attendance of employees for medical examinations and examinations. The employer's duty is to monitor the conduct of medical examinations within the terms agreed with health care institutions and to appoint persons responsible for the organization of medical examinations.

The employer suspends employees who have not passed medical examinations within the prescribed period, and also does not allow those employees to work for whom, according to a medical opinion, such work is contraindicated due to their state of health.

The employer is obliged to ensure the implementation of appropriate health measures of the Final Act in full and to eliminate the causes that lead to occupational diseases (poisoning).

The employer has the right to hire minors only after a preliminary medical examination.

An occupational disease is a disease that arose as a result of the insured's professional activity and is caused exclusively or mainly under the influence of harmful substances and certain types of work and other work-related factors.

To acute occupational diseases and acute occupational diseases

poisonings include cases that occurred after a one-time (during

no more than one work shift) exposure to dangerous factors,

harmful substances.

Acute occupational diseases are caused by the action of chemicals

substances, ionizing and non-ionizing radiation, significantly

physical exertion and overstrain of individual organs and systems

a person They also include infectious, parasitic and allergic ones

diseases, etc. Acute occupational poisonings are mainly caused by harmful substances of acute action.

Investigation and accounting of cases of detection of chronic occupational diseases and poisonings

Professional nature of chronic diseases and poisonings (hereinafter - diseases) determined by an expert commission consisting of specialists of a medical and preventive institution (hereinafter - the institution), which has been granted such a right by the Ministry of Health of Ukraine. If necessary, specialists (representatives) of the enterprise, the working body of the executive directorate of the

Fund, the trade union organization of which the victim is a member are involved in the work of the commission.

Classification of the disease as occupational is carried out in accordance with the Procedure for establishing the connection between the disease and working conditions (hereinafter referred to as the Procedure).

The connection between the disease and the working conditions of the employee is determined on the basis of clinical data and sanitary and hygienic working conditions, established by occupational hygiene doctors of the institution (facility) of the State Labor Service with the participation of specialists (representatives) of the enterprise, trade unions and the working body of the executive directorate of the Fund.

For each patient, the institution draws up a report on the P-3 form, which is sent within three days after the diagnosis is established:

- the employer of the enterprise whose harmful production factors led to the occurrence of the disease;

- the relevant institution (facility) of the State Labor Service;

- the institution that serves the enterprise;

- to the relevant working body of the executive directorate of the Fund.

The employer organizes an investigation of the disease within ten working days from the moment of receiving the notification.

The investigation is conducted by a commission consisting of representatives of:

- the relevant institution (facility) of the service (head of the commission), which carries out state sanitary supervision of the enterprise;

- the establishment that serves the enterprise;

- enterprises;

- the trade union organization of which the patient is a member (or the authorized labor team on labor protection issues);

- the relevant working body of the executive directorate of the Fund. The investigation commission is obliged to:

- to develop a program of investigation into the causes of occupational disease;

- distribute functions among commission members;

- consider the need to involve experts in its work;

- conduct an investigation into the circumstances and causes of occupational disease;

- draw up a report on the investigation of a chronic occupational disease in the P-4 form (hereinafter - the report of the P-4 form) in accordance with Appendix 15, in which measures to prevent the development of an occupational disease and ensure the normalization of working conditions, as well as identify persons who have not fulfilled the relevant requirements of legislation on labor protection and on ensuring sanitary and epidemic welfare of the population.

In the event that the employer or other members of the commission refuse to sign the act of form P-4, a corresponding act is drawn up, which is an integral part of the act of form P-4.

The main causes of industrial injuries and occupational diseases and measures to prevent them

Organizational reasons: lack or poor quality of training on labor protection issues; lack of control; violation of the requirements of instructions, rules, norms, standards; non-fulfillment of labor protection measures; violation of technological regulations, rules of operation of equipment, vehicles, tools; violation of norms and rules of scheduled and preventive maintenance of equipment; insufficient technical supervision of dangerous works; use of equipment, mechanisms and tools not for their intended purpose.

Technical reasons: malfunction of production equipment, mechanisms, tools; imperfection of technological processes; structural defects of the equipment, imperfection or lack of protective fencing, safety devices, signaling and blocking means.

Sanitary and hygienic reasons: increased (above the MPC) content of harmful substances in the air of working areas; insufficient or irrational lighting; increased levels of noise, vibrations; unsatisfactory microclimatic conditions; the presence of various radiations above permissible values; violation of personal hygiene rules.

Economic reasons: irregular salary payment; low earnings; irregularity of work; desire to perform overtime work; part-time work or at two different enterprises.

Psychophysiological reasons: erroneous actions due to worker fatigue due to excessive difficulty and tension of work; monotony of work; sick condition of the employee; negligence; inconsistency of the employee's psychophysiological or anthropometric data with the equipment used or the work performed; dissatisfaction with work; unfavorable psychological microclimate in the team.

The main measures to prevent and eliminate the causes of industrial injuries and occupational morbidity

Technical measures include industrial sanitation and safety measures.

Industrial sanitation measures include organizational, hygienic and sanitary-technical measures and means that prevent harmful industrial factors from affecting workers. This is the creation of a comfortable microclimate through the installation of appropriate heating, ventilation, and air conditioning systems; thermal insulation of building structures and technological equipment; replacing harmful substances and materials with harmless ones; sealing of harmful processes; reduction of noise and vibration levels; stand up updating rational lighting; ensuring the necessary regime of work and rest, sanitary and household services.

Safety measures include a system of organizational and technical measures and means that prevent exposure of workers to dangerous production factors. These include: development and implementation of safe equipment; mechanization and automation of technological processes; use of safety devices, automatic blocking devices; correct and convenient location of equipment controls; introduction of systems of automatic regulation, control and management of technological processes, fundamentally new harmless and safe technological processes.

Organizational measures include: proper organization of work, training, control and supervision of labor protection; compliance with labor legislation, legislative and other normative legal acts on labor protection; implementation of safe methods and scientific organization of work; carrying out reviews, lecture and visual campaigning and propaganda on labor protection issues; organization of scheduled and preventive maintenance of equipment, technical inspections and tests of transport and lifting equipment, pressure vessels

Occupational hygiene of medical personnel

Among the leading problems of the hygiene of medical and preventive institutions in recent years, the issue of occupational hygiene of the medical staff has become more and more important. The

labor activity of medical workers is combined with the possibility of negative influence of various specific professional factors.

Based on the varying degrees of their significance and depending on the activity profile, specialization and specific working conditions, they include:

• high neuro-emotional stress associated with a sense of empathy, responsibility for the patient's health and life;

• contact with infectious diseases, the danger of infection and injury during manipulations, examinations, operations, staying in an environment where carriers and vectors of diseases live;

• unfavorable chemical and physical environment at the workplace (difficult microclimate, atmospheric pressure that often changes, pollution of air and objects with medicinal, anesthetic, disinfectant and other chemicals, exposure to ionizing radiation, electromagnetic fields of radio frequencies, quantum (laser, etc.) radiation, ultrasound, noise, vibration and other unfavorable physical factors);

• forced body position (surgeons, otorhinolaryngologists, dentists), eye strain, physical exertion during most manipulations and operations, lack of sufficient conditions for short-term rest during the work shift;

• violation of the physiologically optimal structure of the day regime, associated with work at night and after-hours, with a state of emotional stress, which makes it difficult to completely disconnect from professional affairs after the end of the working day.

Numerous studies show that in the real conditions of the professional activity of medical personnel (both doctors and junior and middle-level medical personnel), these harmful effects can reach values that are close to or even exceed the values allowed by sanitary legislation. So, for example, in operating rooms the air temperature can reach 28-30 °C and more, the relative humidity of the air - 85-90%, creating conditions of severe thermal discomfort for the operating team. A significant excess of permissible drug concentrations (penicillin, dibazole, phenobarbital, etc.) can be observed in procedure rooms and pharmacies. The possibility of infection during the autopsy of the dead and the study of biopsy material, contacts with substances harmful to the body (formalin, chloroform, xylene, benzene, dyes, etc.) are integral companions of the doctor's activity in the pathology department.

This situation causes a high level of morbidity among medical workers.

In the structure of this morbidity, ischemic heart disease, hypertension, allergic and gynecological diseases, complications of pregnancy and the postoperative period, diseases of the musculoskeletal system, vision and hearing disorders, etc. prevail.

Different professional groups of medical workers differ from each other not only in the level, but also in the structure of morbidity. So, for example, it was noted that complications of pregnancy (late toxicosis), childbirth pathology (premature birth, bleeding, etc.) in female surgeons and anesthesiology occur 2-3 times more often than in laboratory doctors.

About 20% of manipulation nurses suffer from various allergic diseases: dermatitis, vasomotor rhinitis, asthmatic bronchitis.

In order to weaken the influence of adverse professional factors on the health of medical workers and prevent them, a targeted system of preventive measures is necessary, an important element of which should be high-quality professional selection.

For involvement in the medical profession it (especially for those types of it that are associated with increased professional risk) it is absolutely not enough just to strive to master this or that medical

profession. For this, in addition to appropriate initial general education and special knowledge, strong physical and mental health, unencumbered heredity, the ability to overcome significant physical and mental stress, a developed sense of mercy and empathy, the ability to self-sacrifice and many other qualities are necessary personality

Currently, there is a clearly established list of general medical contraindications for admission to work in health care facilities, the activities of which are associated with adverse professional factors.

They include:

• congenital anomalies of organs with pronounced insufficiency of their functions;

• organic diseases of the central nervous system with persistent pronounced functional disorders;

• epilepsy with frequent attacks and personality change;

• diseases of the endocrine system with marked functional impairment;

• malignant neoplasms;

• pronounced forms of diseases of the blood and hematopoietic organs;

• hypertensive disease II-III stage;

• heart disease with insufficient blood circulation;

• chronic lung diseases with pronounced pulmonary and cardiac insufficiency and tendency to bleeding;

• severe bronchial asthma with severe circulatory disorders without an attack;

• active forms of tuberculosis of any localization;

• peptic ulcer disease of the stomach and duodenum with frequent exacerbations or tendency to complications;

• cirrhosis of the liver and active chronic hepatitis, damage to the biliary tract with severe attacks;

• chronic pancreatitis, gastroenteritis and colitis with frequent exacerbations;

• chronic kidney diseases with symptoms of kidney failure, urolithiasis with frequent attacks or complications;

• collagenosis;

• diseases of the joints with frequent exacerbations or persistent dysfunctions;

• persistent violation of menstrual function;

• pregnancy and lactation period;

• chronic inflammatory diseases of the uterus and appendages with frequent exacerbations;

• pregnancy pathology (abortion and antenatal damage to the fetus) in women of childbearing age;

• diseases of the optic nerve and retina;

• anophthalmos;

• glaucoma.

Taking into account the specifics of working conditions and professional hazards inherent in some specialized departments, a list of additional medical contraindications to work in these departments

has been established. So, for the staff of non-infectious, infectious and tuberculosis hospitals and departments, anti-tuberculosis dispensaries, specialized tuberculosis dispensaries, maternity homes, preventive sanatoriums, research institutes, bacteriological laboratories and leprosariums, they are as follows:

• allergic diseases;

• chronic bronchitis that often worsens, chronic pneumonia, bronchial asthma;

• pronounced, often recurrent, acute and chronic colitis;

• candidiasis and other mycoses;

• chronic diseases of the urinary tract;

• chronic subatrophic changes of the upper respiratory tract with a tendency to atrophy, hyperplastic laryngitis, ozena. For the staff of psychiatric, psychoneurological and narcological hospitals, clinics, dispensaries, sanatoriums and medical and industrial (medical and labor) workshops, the following contraindications are additionally established:

• chronic subatrophic changes of the upper respiratory tract with a tendency to atrophy, ozone, curvature of the nasal septum with impaired nasal breathing function;

• violation of the function of the olfactory analyzer (anosmia);

• dysfunction of the vestibular apparatus;

• allergic diseases;

• chronic diseases of the anterior chamber of the eyeball, eyelids, conjunctiva, cornea, tear ducts;

• marked autonomic dysfunction;

• drug addiction, drug addiction, including chronic alcoholism. In the process of work, the medical staff of treatment and preventive institutions can be exposed to various occupational hazards, which necessitates the use of targeted measures for occupational safety and hygiene both at the stage of preventive and ongoing sanitary supervision. Let's outline some of them. So, sanitary and household premises for service personnel of hospitals and other hospitals must meet the following criteria:

• the number of wardrobes in the dressing rooms must fully (100%) correspond to the list of personnel;

• the area of dressing rooms for street clothes should be at least 0.08 m2 per hanger (hook) of the dressing room;

• the area of dressing rooms for home and work clothes — not less than 0.4 m2 per closet. Dressing rooms should be equipped with double-door wardrobes that can be closed and ventilated, the number of them should correspond to the number of employees.

The following requirements apply to the number of shower cabins and sanitary devices for personnel:

• the number of shower cabins is determined by the following calculations: one shower cabin per 10 people in infectious and tuberculosis departments, one shower cabin per 15 people — in other departments;

• the number of sanitary devices should meet the needs of employees, based on the calculation of 1 device per 1 person. In operating rooms b lokah restrooms for personnel (male and female) should be designed from two adjacent rooms for undressing and dressing with a shower.

Obstetric observation reception and children's departments should be equipped with sanitary passes for staff with dressing rooms and showers at the rate of 1 shower cabin for 5 people.

Personal hygiene rooms (rooms) should be provided for female workers, which include procedure cabins, equipped with hygienic showers with flexible hoses and mixers for hot and cold water, hooks (hangers) for linen and clothes. The area of the procedure cabin should be at least 2.0-2.25 m2.

In order to provide service personnel with hot food in hospitals and other hospitals, canteens or cafeterias should be provided. The number of seats in canteens or cafeterias should be provided at the rate of 10-12 per 100 employees.

Staff rooms with an area of at least 12 m2, equipped with refrigerators, electric heating devices and sinks for washing hands, must be provided in each structural unit.

It is not allowed to use anesthesia and other devices without equipment for removing and absorbing vapors of narcotic substances that enter the air space with exhaled air in the operating and maternity units. It is not allowed to use anesthesia and breathing apparatus with broken sealing of the gas transmission system, without hoses (air extractors) or suction filters with activated carbon. In procedural, aerosol inhalation cabinets, dressing and sterilization departments, there should be fume cupboards for performing manipulations related to the use of highly active medicines, equipped with a sink and flushing to the sewer.

The parameters of the internal environment in functional and production premises and at the workplaces of service, medical and other personnel must correspond to the normative values for the main parameters of the microclimate and air environment (temperature, humidity and speed of air movement, air exchange, chemical and bacteriological its composition).

Medical personnel who work with harmful chemical substances or are subject to the influence of adverse production factors must constantly undergo the necessary medical examinations.

3. Topics of reports/abstracts:

1. Medical examinations.

2. Occupational hygiene of medical personnel.

3. Investigation and accounting of cases of detection of chronic occupational diseases and poisonings.

4. Summing up: Medical personnel who work with harmful chemical substances or are subject to the influence of adverse production factors must constantly undergo the necessary medical examinations.

Literature

Main:

1. Hygiene and ecology // textbook for students of higher medical educational institutions in English. /edited by V.G. Bardova – Vinnytsia: NovaKnyga, 2018.

2. Environmental Health: from Global to Local \ Under Howard Frumkin edition – Third edition. - San Francisco, 2016

Additional:

3. General hygiene. Hygiene propaedeutics/Textbook for foreign students. / E.I. Honcharuk, Yu.I. Kundiev, V.G. bardo otter - K.: Higher school, 2000.

4. Korobchanskiy V.A. Hygiene and Ecology \ Korobchanskiy V.A., Vorontsov V.P., Musulbas A.A. - Kharkov, 2006

Seminar class #8

Topic: Physical development as an important criterion for assessing the health status of children and adolescents. Hygienic principles of rational organization of physical education and training of children and adolescents. Scientific basis of medical and professional consultation.
Goal:
Basic concepts:
Equipment: laptop, projector

1. Questions (test tasks) to check basic knowledge on the topic of the seminar:
1. In a 10-year-old boy, the value of the sigmoid deviation for body length is -1.44σ, for body weight -1.52σ, for chest circumference -1.32σ. The profile of physical development is included in one sigma. Give an assessment of the child's physical development.
A. *Physical development in terms of length, body weight and chest circumference is below average, proportional.
B. Physical development is average, proportionate.
C. Physical development is low, harmonious.
D. Physical development is average, disproportionate.
E. Physical development in terms of length, body weight and chest circumference is low, inharmonious.

2. In a 13-year-old girl, the value of the sigmoid deviation for body length is +2.17σ, for body weight is +2.08σ, and for chest circumference is +2.11σ. The profile of physical development is included in one sigma. Give an assessment of the schoolgirl's physical development.
A. *Physical development in terms of length, body weight and chest circumference is high, proportional.
B. Physical development in terms of length, body weight and chest circumference is average, inharmonious.

C. Physical development according to the indicated characteristics is above average, harmonious.
D. Physical development in terms of length, body weight and chest circumference is above average, disproportionate.
E. Physical development according to the indicated signs is high, disharmonious.

3. According to regression scales, it was established that a 13-year-old girl has individual indicators of body weight +2.31σR and chest circumference +2.17σR. Give an assessment of the schoolgirl's physical development.
A.* The girl's physical development is sharply disharmonious, due to increased fat deposition.
B. The girl's physical development is disharmonious.
C. The physical development of the girl according to the indicated signs is harmonious.
D. The girl's physical development is high and harmonious.
E. The girl's physical development is high, disharmonious.

4. The body length of a 10-year-old boy is in the range from M+1σ to M+2σ. Individual indicators of body weight +1.33σR and chest circumference +1.12σR. Give an assessment of the physical development of the schoolboy according to regression scales.
A. *The child's physical development is above average, disharmonious.
B. The child's physical development is sharply disharmonious.
C. The child's physical development is average, harmonious.
D. The child's physical development is high and harmonious.
E. Physical development of the child is above average, harmonious.

5. An 8-year-old boy has a body length of 130.1 cm (+0.36σ), a body weight of 28.5 kg (+0.12σ), and a chest circumference of 63.0 cm (+0.10σ). The biological level of development corresponds to the calendar age. Functional indicators within ±1σ. Evaluate the child's physical development using a comprehensive method.
A. *The physical development of the child is average, harmonious.
B. Physical development of the child is above average, harmonious.
C. The child's physical development is high, disharmonious.
D. The child's physical development is high and harmonious.
E. The child's physical development is sharply disharmonious.

6. In an 8-year-old boy, the value of the sigmoid deviation for body length is -0.78σ, for body weight is +0.83σ, and for chest circumference is +0.51σ. The profile of physical development is included in two sigmas. Give an assessment of the child's physical development.
A. *The physical development of the boy in terms of length, body weight and chest circumference is average, disproportionate.
B. The physical development of the boy according to the indicated signs is above average, proportional.
C. The physical development of the boy according to the indicated signs is low, harmonious.
D. The physical development of the boy according to the indicated signs is above average, disproportionate.
E. The boy's physical development in terms of length, body weight, and chest circumference is low and inharmonious.

7. An 11-year-old girl has a sigmoidal deviation of +0.23σ for body length, +1.99σ for body weight, and +1.89σ for chest circumference. The profile of physical development is included in two sigmas. Give an assessment of the schoolgirl's physical development.
A. *The physical development of the girl in terms of body length is average, in terms of body weight and chest circumference it is above average, disproportionate.
B. The physical development of the girl in terms of length, body weight and chest circumference is average, inharmonious.
C. The physical development of the girl according to the indicated signs is above average, harmonious.
D. The physical development of the girl in terms of body length is average, in terms of body weight and chest circumference, it is high, inharmonious.

E. The physical development of the girl according to the indicated signs is high, inharmonious.

8. A 7-year-old girl has individual indicators of body weight +0.57σR and chest circumference +0.43σR. Give an assessment of the physical development of the schoolgirl according to regression scales.
A. *The girl's physical development is harmonious.
B. The girl's physical development is disharmonious.
C. The girl's physical development is average.
D. Physical development of the girl in tall
E. The girl's physical development is above average.

9. According to regression scales, the body length of a 14-year-old student was assigned to indicators that are within the range of M+2σ and above. Individual indicators of body weight +1.98σR and chest circumference +1.78σR. Give an assessment of the student's physical development.
A. *The child's physical development is high, disharmonious.
B. Physical development of the child is above average, harmonious.
C. The child's physical development is average, harmonious.
D. The child's physical development is high and harmonious.
E. The child's physical development is sharply disharmonious.

10. Give an assessment of the physical development of a 10-year-old girl on the regression scale, if the indicators of body weight and chest circumference are within ±1δR.
A. *Harmonious.
V. Disharmonious.
S. Middle.
D. Low.
E. Vysoky.

11. A 10-year-old girl has a high level of physical development (M+3δ), her body length has increased by 10 cm per year (twice as much as for her age), the number of permanent teeth corresponds to her age (20), the development of secondary sexual characteristics is ahead age terms for three years (Ma, R, Ah, Menarche). Advancement of biological age can be due to:
A. * Endocrine disorders.
B. Accelerations.
S. The composition of the diet.
D. Engage in sports.
E. Deficiencies in hygienic education.

12. Anthropometric studies are widely used to study the physical development of children and adolescents. Choose a physiometric research method from the following.
A. * Determination of the vital capacity of the lungs.
B. Measurement of body length.
C. Determination of body weight.
D. Determination of the shape of the spine.
E. Determination of the shape of the chest.

13. A 4th-grade student was found to have sharply disharmonious physical development. The boy suffers from chronic bronchitis in the stage of compensation. During the year, he did not suffer from acute diseases. What health group does the boy belong to?
A. *3 health group.
B. 1 health group.
P. 2 health group.
D. 4 health group.
E. 5 health group.

14. The assessment of the physical development of a preschool child showed: physical development is average, according to body weight, chest circumference is harmonious, biological age corresponds to the calendar age. There are no chronic diseases. During the year, he was ill 5 times with acute respiratory diseases. What health group does the boy belong to?

A. *2 health group.
B. 1 health group.
P. 3 health group.
D. 5 health group.
E. 4 health group.

15. Define the health group of a schoolchild suffering from rheumatic carditis in the stage of subcompensation:

A. *The fourth group.
B. The second group.
S. The fifth group.
D. The first group.
E. The third group.

16. After conducting an in-depth medical examination in the fifth grade of a comprehensive school, children were divided into health groups. To which health group should children who have morphological deviations, functional deviations after suffered diseases, those who are often sick be classified?

A. *2 health group.
B. 1 health group.
P. 3 health group.
D. 4 health group.
E. 5 health group.

17. There are 38 students in a secondary school class. During the year, 4 children were not sick at all, 8 were sick once, 11 – 2 times, 6 – 3 times, 5 – 4 times, 2 – 5 times, 1 – 6 times and 1 – 8 times. How many students in the class belong to the group of children who often get sick?

A. *9 students.
B. 15 students.
P. 4 students.
D. 2 students.
E. 1 student.

18. An analysis of the morbidity of schoolchildren aged 7-10 years, 11-14 years and 15-17 years revealed that one of the classes of diseases has the widest distribution in all age periods. What are these diseases?

A. *Diseases of respiratory organs.
B. Injuries and poisoning.
C. Diseases of digestive organs.
D. Skin diseases.
E. Infectious diseases.

19. Indicators of the level of biological development of middle and high school students are as follows: body length, annual increase in body length, ossification of hand bones, number of permanent teeth. What other indicators of development in these age periods acquire special importance?

A. *Development of secondary sexual characteristics.
B. Body weight.
S. Circumference of the chest.
D. ZHEL.

E. Muscular strength of the hand.

20. During the medical examination of all 7th grade students, the compliance of biological development with calendar age was determined according to the following criteria: annual increase in body length, ossification of hand bones, number of permanent teeth, development of secondary sexual characteristics. Which of the listed criteria is the most informative indicator of biological age?

A. *Ossification of the bones of the hand.

B. Body length.

S. Annual increase in body length.

D. Number of permanent teeth.

E. Development of secondary sexual characteristics.

2. Discussion of theoretical issues:

Physical development is a set of morphological and functional features of an organism that characterize the processes of its growth and biological maturation, a reserve of physical strength.

A comprehensive assessment of physical development includes:

1. Evaluation of the results of anthropometry and somatoscopy. Anthropometry is a unified method of measuring the human body and its parts. Somatoscopy – examination and description of signs of body proportions and appearance.

2. Assessment of the functional state of various body systems. Trade dynamometry (measurement of hand muscle strength), spirometry (functional research of the respiratory system) and functional tests of the cardiovascular system are routinely performed.

3. Determination of the child's biological age (bone age is most often determined by an X-ray of the hand).

Such a comprehensive assessment of physical development indicators is carried out in case of a significant deviation of the child in physical development and suspicion of endocrine, genetic and some other diseases, or in children's groups for special tasks. In the practice of the district pediatrician, they are often limited only to the assessment of anthropometric data.

Peculiarities of anatomical and psychophysiological development of children in different age periods.

The main periods of mental development are distinguished: early (from birth to three years), preschool age (from three to seven), junior school age (from seven to 10 years), middle school or adolescence (from 10 to 15 years), high school or youth age (from 15 to reaching maturity).

The processes of growth and development take place unevenly and unevenly in certain age periods. Each organ system has its own unique patterns. The growth and development of individual organs and body systems are closely related and their activity is directed by the central nervous system.

The growth of children is determined by hereditary factors, and its degree and features depend on the social conditions of life.

During the first years of life, the activity of the central nervous system improves. The morphological and functional state of the brain changes significantly. A child's body weight increases significantly, especially during the first year. Respiratory and circulatory organs are developing. A rapid formation of conditioned reflexes is observed: in particular, first of all, a vestibular conditioned reflex, visual and skin-tactile reflexes, adaptation to the environment continues. The duration of sleep gradually decreases and passive maternal immunity is lost.

Preschool age is characterized by a slowdown in growth and ossification processes, the activity of the cardiovascular system improves. The formation of speech is completed, vision and hearing develop intensively, thermoregulation processes are accelerated. Excitation processes prevail over inhibition processes. The second signal system is intensively formed.

In the school period (age 7), the increase in the mass of brain tissue is completed, and inhibitory control increases. These processes are balanced at the age of 12. In children 7-10 years old, the main properties of the nervous system in terms of their characteristics approach the properties of the

nervous system of adults, although they are still unstable. Static and dynamic functions of the spine develop, the motor analyzer improves, movements become coordinated.

Middle and high school age is characterized by a general restructuring of the body caused by puberty. Activation of endocrine glands causes a significant acceleration of physical and physiological development. An imbalance of neuropsychological processes is noted, the balance between the 1st and 2nd signal systems changes, the cardiovascular system lags behind the growth of the body, which causes increased fatigue. Puberty occurs, which is accompanied by the lability of the psyche and the autonomic nervous system. The processes of cortical activity, ossification, and skeletal muscle development intensify. The growth of the lungs leads to an increase in VLDL. The gender difference between girls and boys becomes sharply noticeable, which manifests itself in different rates of growth, physical development, the specifics of metabolic processes, etc.

During the practical session, students learn the leading medical, physiological and psychological criteria for assessing the development of a child entering school, carry out a hygienic assessment of children's functional readiness to enter school, and solve situational problems on the subject of the session.

Patterns of increase in basic anthropometric indicators in children

Regularity of increase in body length. The average body length of a full-term newborn baby is 51-54 cm. In the 1st year of life, the growth rate of a child changes every quarter: in the first quarter, height increases by 3 cm every month, in the second - by 2.5 cm every month, in the third - by 2 cm every month, in the fourth - by 1 cm every month. During the first 2-4 years of life, the body length increases by 8 cm annually and by the end of the 4th year it is 100 cm. From the 5th year until the beginning of puberty, the body length increases by an average of 6 cm, and in the puberty period - by 8-12 cm per year.

Regularity of body weight gain. The average body weight of a full-term newborn baby is 3100-3500 g. During the first half of life, the average monthly increase in body weight is 800 g, in the second half - 400 g. By the end of the 1st year of life, the child's body weight reaches 10 kg. In the 2nd year of life, she adds 3-3.5 kg, and from the 3rd year to the 10th - 2 kg annually. Thus, at the age of 5, the child's body weight is 20 kg, at 10 years - 30 kg. During puberty, body weight increases by 4 kg annually.

Regularity of chest circumference increase. At the time of birth of a full-term child, the circumference of the chest is 32-34 s m, increases by 2 cm per month during the first half of the year, by 0.5 cm per month during the second half of the year. At the age of 2-10 years, this indicator increases by 1.5 cm annually, during puberty - by 3 cm per year. Thus, the circumference of the chest is: at the age of 2 months - 45 cm, 1 year - 48 cm, 5 years - 55 cm, 10 years - 63 cm.

Regularity of head circumference increase. A full-term newborn baby has an average head circumference of 34-86 cm. In the first six months, the head circumference increases by 1.6 cm every month, in the second - by 0.5 cm every month. In children aged 1 to 10 years, the head circumference increases by 1 cm annually. Thus, the head circumference of children aged 6 months is 43 cm, 1 year – 46 cm, 5 years – 50 cm, 10 years – 55 cm.

Criteria for a comprehensive assessment of the state of health of children and adolescents:

- Presence or absence of chronic diseases at the time of examination.
- The level of functional state of the main body systems.
- The degree of resistance of the body to the adverse effects of environmental factors.
- The level of neuropsychological and physical development achieved and the degree of its harmony.

In accordance with the specified criteria, a scheme for the distribution of children and adolescents by health groups was developed. There are 5 health groups:

The first group of health - healthy children and adolescents with harmonious development and the level of development of the body's functional systems corresponding to their age.

The second group of health - Healthy children and adolescents, who have functional and some morphological abnormalities, as well as reduced resistance to acute and chronic diseases, that is, they get sick often and for a long time.

The third group of health - Children and adolescents who suffer from chronic diseases in a state of compensation, with preservation of the functional capabilities of the body.

The fourth health group - Children and adolescents who suffer from chronic diseases in a state of subcompensation, with reduced functional capabilities of the oranism.

The fifth health group - Children and adolescents who suffer from chronic diseases in a state of decompensation, with significantly reduced functional capabilities of the body.

The calendar age is measured by the number of rotations of the Earth around the Sun and is expressed in the calendar scale. However, the calendar age cannot fully serve as an indicator of the health, working capacity, and quality of life of a person of the same year of birth. It is well known that even the appearance of people of the same calendar age can be so different that the targeted determination of age can be erroneous. In this regard, to assess the vitality and functional state of the organism, biological age is used, not calendar, which more adequately reflects the degree of age-related changes in the organism, its biological capabilities in relation to future life, and the rate of aging.

The most common health assessment criteria in modern medicine are called biological markers, which are understood as certain signs, an integral reflection of individual aspects of human life. During the research, such techniques were used as assessment of the heart's performance (Ruffier's test); determination of the adaptation potential characterizing the level of health; determination of the state of the central nervous system (orthostatic test); determination of biological age, as well as assessment of the level of physical fitness using test exercises: 100-meter run, standing long jump, 500-meter run (girls) and 1000 meters (boys), pull-ups (boys) and bending and stretching hands resting on the floor (girls).

The following periods of childhood are distinguished: A. Intrauterine stage: 1) the phase of embryonic development — up to 9 weeks of pregnancy; 2) phase of placental development (fetus) — 9-40 weeks of pregnancy; B. Beyond the womb stage: 1) the newborn period (0-28 days); 2) the period of infancy, or the period of breastfeeding (29 days — 12 months), (note that in some cases breastfeeding is artificial); 3) the period of neutral childhood (1—Lessons): a) before preschool (1—3 years); b) preschool (3-7 years old); 4) lower school age (7-10 years); 5) middle school age (11-14 years); 6) the period of puberty, or high school age (15-18 years).

Internally, the fetal stage is of great importance for the further life of the human body. It consists of two phases: the embryonic development phase and the fetal phase. In the first phase, the formation of organs and systems takes place, which ends by the 56th day of pregnancy. From the 22nd to the 23rd day, the embryo's heart begins to beat. Since organs are formed in the embryonic phase, during this period the embryo is particularly sensitive to the adverse effects of the environment — infection, ionizing radiation, the effects of chemicals, and drugs. Exposure to various harmful substances during this period often leads to deformities and malformations. The phase of placental development is characterized mainly by the growth of the fetus, although the development of already formed organs continues not only in this phase, but also after birth. During the first year of life, the child grows intensively: by the end of the year, the weight that was at birth triples, the body length increases by 25 cm. This requires a full-fledged diet with sufficient energy value. The alimentary canal is characterized by the functional immaturity of enzyme systems and absorption processes, so acute and chronic indigestion can easily occur.

Proper feeding is very important for an infant, i.e. feeding such food that its digestive tract is able to digest.

From the moment of birth, the child has passive immunity: in his bloodstream there are antibodies transferred from the mother. During the first months of life, passive immunity weakens and acquired immunity begins to form as a result of the influence of various infectious agents encountered by the body.

The main features of the intrauterine period of development are the rapid growth and nutrition of the child's body at the expense of the mother's. The mother's lungs also breathe for the fetus, metabolism takes place thanks to the mother's enzymes, liver and kidneys. Therefore, the development of the embryo and fetus is greatly influenced by nutrition, lifestyle and the state of health of the mother.

From the moment a child is born, the neonatal period begins - the first period of extrauterine existence. It is characterized by the process of rebuilding various body systems, adapting them to extrauterine existence. From the moment of birth, the child's lungs begin to function. The beginning of pulmonary breathing is associated with the reorganization of blood circulation: the cilia of the oval fossa, the ductus arteriosus are closed, the large and small circles of blood circulation are formed. The digestive system begins to work, the basic metabolism increases. These processes are most intense in the first 7 days of life, that is, in the early neonatal period. At this time, the remnant of the umbilical cord becomes desolate, mummified and falls off, the umbilical wound heals (up to the 14th day of life). Upon reaching a year, the period of neutral childhood begins, which lasts up to 7 years. The intensity of growth and the body's ability to respond with a widespread response to diseases gradually decrease. In the pre-school period (from 1 to 3 years old), children learn to eat independently, move around and actively learn about the world around them, they develop phrasal language. But even at preschool age, they have not yet developed the ability to concentrate attention on a specific task, to learn abstract, generalizing concepts.

Methods of assessment of children's physical development

Assessment of physical development is carried out by comparing the child's individual indicators with normative ones. The first (basic), and in many cases, the only method of assessing a child's physical development is conducting anthropometric studies and evaluating the obtained data. At the same time, two main methods are used: approximate calculations and anthropometric standards.

The method of approximate calculations is based on the knowledge of the main patterns of increasing body mass and length, chest and head circumferences. Appropriate normative indicators can be calculated for a child of any age. The permissible interval of deviations of the actual data from the calculated data is ±7% for the average indicators of physical development. The method gives only an approximate picture of the physical development of children and is used by pediatricians, as a rule, in the case of providing medical care to children at home.

The method of anthropometric standards is more accurate, since individual anthropometric values are compared with normative ones according to the age and gender of the child. Regional tables of standards are of two types: sigma and centile.

When using tables compiled according to the method of sigma standards, compare The calculation of the actual indicators is carried out with the average arithmetic value (M) for this characteristic of the same age-sex group as that of the child we are examining. The resulting difference is expressed in sigma (δ is the mean squared deviation), determining the degree of deviation of individual data from their average value.

When using tables compiled by the method of centile standards, it is necessary to determine the centile interval to which the actual value of the symptom corresponds, taking into account the age and gender of the patient, and give an estimate. The method is not mathematized and therefore better characterizes variational series in biology and, in particular, in medicine. It is easy to use, does not require calculations, fully provides an opportunity to assess the relationship between various anthropometric indicators and is therefore widely used in the world.

The state of physical development was assessed by comparing anthropometric indicators (height, weight, chest circumference) compared to normative ones. For the comparison of anthropometric parameters, anthropometric tables of standards were used, taking into account age and gender. Children's biological maturity and somatotype were also determined as a marker of the phenotypic diversity of the children's population. These indicators were differentiated depending on the age and gender of the examined contingent. Socio-biological factors were studied by the family survey method using a specially developed questionnaire, followed by variation-dispersion analysis of the obtained data. Somatoscopic indicators include: the condition

of the skin and mucous membranes, the degree of fat deposition, characteristics of the musculoskeletal system (bones, shape of the chest, spine, legs and feet), as well as signs of puberty (hair under the armpits and on the pubic area, development of the mammary glands) in girls, facial hair, development of the thyroid cartilage of the larynx, voice mutation in young men) The leading somatometric indicators are considered to be: body length and weight, chest circumference and other contours (head, shoulder, hip circumferences, etc.), which are determined based on the use of special antpropometric points Physiometric indicators include: muscle strength of the hands, vital capacity of the lungs, standing strength, etc.

The human body is arranged in such a way that a sedentary lifestyle quickly leads to deterioration of health. At the same time, the gradual destruction of the organism and exhaustion of physical and intellectual forces is increasing every day.

 The French doctor A. Trousseau wrote that movement by its action can replace any medicine, but all the medicine in the world cannot replace movement.

There are 5 main types of physical loads that are used in different cases.

1. Isometric exercises are physical exercises in which the muscles are strained, but there is no movement in the joints. For example, you stand in front of a mirror and tense your muscles for 10-20 seconds, and then relax - a typical isometric exercise. If you lean against a stationary object, this is also a classic example of isometry.

Studies have shown that isometric exercises contribute to an increase in the size and strength of muscles. But such exercises do not have a positive effect on the cardiovascular system at all. On the contrary, isometric contractions of the muscles of the hand - squeezing the object for a few seconds - lead to a short-term increase in blood pressure, which is potentially dangerous for patients with hypertension. This type of physical activity can provoke heart failure or even a heart attack.

2. Isotonic exercises are physical exercises that cause muscle contraction and joint movement. Classic examples are weightlifting and general strengthening gymnastics.

These exercises help to increase muscle mass and increase its strength, but like isometric exercises, they have a very slight effect on the cardiovascular system: they do not contribute to the development of endurance, do not increase the circulating blood volume and the vital capacity of the lungs, do not lower blood pressure and heart rate.

It has been established that it is possible to develop incredible muscle mass and strength and at the same time have a disorder of the cardiovascular system.

3. Isokinetic exercises are a relatively new category of physical exercises, which includes lifting sports equipment at different speeds. For example, in a typical isotonic exercise, you lift a barbell and then drop it to the floor. In an isokinetic exercise, you spend effort not only to raise the barbell, but also to lower it to the starting position.

It is important that, in addition to strengthening muscles, isokinetic exercises contribute to the development of endurance, like running and swimming.

4. Anaerobic exercises - "without oxygen". Loads of this type require that the exercises are performed without using the oxygen we breathe. In other words, any exercise of maximum activity similar to a sprint, during which fatigue is reached in 2-3 minutes, is considered anaerobic.

For example, a 100-meter dash is almost entirely anaerobic, while a marathon run is 99% aerobic. A sprinter can run the entire distance without breathing at all, while a marathoner must maintain a balance between oxygen consumption and expenditure for 2 or more hours.

A person can have high anaerobic capabilities and be in a bad state of health.

5. Aerobic exercises are exercises that require a large amount of oxygen over a long period of time and force the body to improve its systems responsible for oxygen transport. With these exercises, the volume of blood increases; the volume of the lungs increases; the heart muscle is strengthened; the concentration of cholesterol in the blood and the risk of developing coronary heart disease decrease.

Aerobic exercises, as a rule, are associated with overcoming long distances at a slow pace, and not with performing quick bursts. For those who want to get the health benefits of aerobics, 90 minutes of classes per day (15-20 km per week) is enough.

In order for aerobic exercises to bring the maximum benefit, it is necessary to achieve a sufficiently high heart rate during exercise, which will ensure a training effect, which will manifest itself in beneficial changes on the part of the cardiovascular system. In this case, it is necessary to be guided by the concept of optimal heart rate. This is the minimum heart rate at which the optimal health effect is achieved.

How to determine the optimal heart rate? First, for this, you need to subtract half of your age from 205 (for women, subtract your age from 220). For example, at the age of 50, the maximum heart rate in men is 205 - 25 = 180, in women - 220 - 50 = 170. The optimal heart rate is equal to 80% of these numbers. For example, 80% of 180 - 144 blows in 1 minute. If you bring your heart rate to this number and stay in this mode for at least 20 minutes. 4 times a week, so you get a good aerobic effect.

At the heart of the deterioration of health is a whole complex of socio-economic reasons, not the least of which is the imperfection of the existing system of medical examination of children and adolescents: the deterioration of the quality of nutrition, environmental pollution ("technological overload"); an increase in stressful situations in the lives of schoolchildren and based on the fact that one of the most sensitive and objective indicators of the state of health of the child population is physical development, and the processes of growth and development of a child are closely related to many environmental factors and individual characteristics, factors were identified that have a reliable or close to reliable influence on the physical development of children: type and improvement of housing; the number of family members per room; the temperature regime of the dwelling; the humidity of the dwelling; the presence of noise in the dwelling; the social status of the mother; the mother's neuro-emotional stress at work; the delivery of this child on time; the period of the newborn in the first 28 days; the nature of nutrition; regime nutrition of the child. With a probability greater than 98%, it can be stated that children who live in a separate apartment or house are 3.5 cm taller than children who live in dormitories or communal apartments, and children from damp and overcrowded housing are 3.5 cm taller 4-5 cm shorter than their peers from comfortable conditions. Tendencies to decrease height in children of primary school age are revealed if the housing does not have communal amenities and if it is noisy. At the same time, the material conditions of the family do not significantly affect the body length of children, which coincides with the data of other researchers. The general impact of unfavorable living conditions of children reduces body length by an average of 2.8 cm. To illustrate this pattern, we present Figure 2. Most of the factors we studied are related to parents, that is, the effect of these factors on the child is indirect, not direct.

The method of sigmoidal deviations with a graphic representation of the physical development profile involves comparing each individual characteristic with the weighted average arithmetic value for this characteristic at a certain age, which allows determining its actual deviation from normative values.

Further, by dividing the actual deviation by the value of the mean squared deviation, the sigmoid deviation (σ) is found, which provides information about by what sigma value the indicators of the child under study differ from the average indicators characteristic of a certain age-sex period.

Deviations in the range from –1 σ to +1 σ are considered the average development of the investigated characteristic, from –1.1 σ to –2 σ – below average development, from –2.1 σ and below – low, from +1.1 σ to + 2 σ – above average, from +2.1 σ and above – high. To build a profile of physical development, horizontal lines are drawn at the same distance from each other, the number of which is determined by the number of signs to be evaluated, and on each of them the values of the obtained deviations are placed, which are connected by straight lines. The method of sigma deviations allows you to determine the degree of development of each individual sign of physical development and its proportionality, information about which is provided by the profile itself. If the values of the deviations are within one sigma, the development is considered proportional, if they are not, it is disproportionate.

The use of the method of assessing physical development on regression scales allows to overcome the main drawback of the method of sigmoid deviations, namely the separate nature of the assessment of each somatometric characteristic. Evaluation tables in this case take into account the correlation between height, body weight and chest circumference and, therefore, allow to give a more thorough assessment of the degree of physical development based on a set of interrelated features.

The first stage of assessment of physical development according to evaluation tables of regression scales is aimed at finding a group (development average, below average, above average, low, high) to which the child's body length should be assigned.

Next, find the indicators of body weight and chest circumference, which should correspond to the actual height, and compare the actual indicators of the studied signs with them. To do this, subtract its standard from the value of the actual development of the signs normal value and divided by the regression sigma (R) for each investigated feature.

The comprehensive method of assessing physical development allows taking into account both the peculiarities of the morphofunctional state of the organism and the correspondence of the level of its biological development to the calendar age/

The centile method, in contrast to the traditional, oriented assessment of signs of physical development, which vary according to the law of normal distribution, is an effective non-parametric method of concisely describing the nature of their distribution, which has right- or left-sided asymmetry.

The essence of the centile method is to compare the actual sign of the development of a separate characteristic of physical development with an ordered series, which includes in its structure the entire range

of fluctuations of the studied sign, divided into 100 intervals, which have an equal probability of falling into them, but the sizes of these centile intervals in absolute units of measurement are not the same .

To determine the degree of physical development, 7 fixed centiles are used: 3rd, 10th, 25th, 50th, 75th, 90th and 97th and, accordingly, 8 centile intervals:

- 1st interval (below 3%) – very low indicators;
- 2nd interval (from 3% to 10%) – low indicators;
- 3rd interval (from 10% to 25%) – reduced indicators;
- 4th and 5th intervals (respectively from 25% to 50% and from 50% to 75%) – average indicators;
- 6th interval (from 75% to 90%) – increased indicators;
- 7th interval (from 90% to 97%) – high indicators;
- 8th interval (above 97%) – very high indicators.

First, based on body length and its annual increase, the number of permanent teeth, the degree of development of secondary signs of puberty, the term of ossification of the bones of the hand, the child's biological age is determined and compared with the calendar age. Depending on the values of the obtained indicators, it may correspond to the calendar age, be ahead of it or lag behind it.

The next stage of the complex method is related to the assessment of the morphofunctional state of the organism using regression scales and age-sex standards of the development of functional indicators. Physical development is considered:

 harmonious, if the determined values of body weight and chest circumference are within M±1 σ R or from M±1.1 σ R and functional indicators are characterized by deviations from –1 σ and above;

 disharmonious, if the determined values of body weight and chest circumference are within the range from M σ 1.1 σ R to M σ 2 σ R or from M+1.1 σ R to M+2 σ R due to mass deficiency or increased fat deposition and functional indicators are in the range from -1.1 σ to -2 σ;

 sharply disharmonious, if the values of body weight and chest circumference determined are within the range of M 2.1 σ R and below or from M+2.1 σ R and higher due to a lack of mass or increased fat deposition and functional indicators are characterized deviations from –2.1 σ and below.

Hardening means an increase in the body's resistance to the effects of air and water temperature fluctuations, air humidity, atmospheric pressure, solar radiation, and other physical factors of the environment.

Basic principles of hardening:

1. gradualness – a gradual increase in the intensity and duration of the influence of the hardening factor;
2. systematicity – procedures should be carried out regularly according to a defined system;
3. complexity – purposeful combination of participation in the hardening of all organs and systems of the body and the influence of several environmental factors;
4. individual regimen, its correspondence to the biological rhythms of the body.

Hardening values:

1. increases the adaptation capabilities of the organism to the influence of adverse factors;
2. reduces sensitivity to respiratory and other infectious diseases;
3. increases work capacity;
4. contributes to the formation of positive physiological reactions.

The main factors of hardening are: air, water, solar radiation and corresponding to the capabilities of the body, but gradually increasing physical load and self-training of the psychophysiological state.

Healthy lifestyle program

1. □ consideration and use of individual biorhythms;
2. □ increase in psycho-emotional stability (ability to restrain oneself);
3. □ motor activity optimal for the body;
4. □ rational quality and mode of nutrition;
5. □ complex regular hardening;
6. □ hygienic behavior in everyday life, work process;
7. □ regulation of physiological functions;
8. □ prevention, overcoming bad habits (drugs, alcohol, smoking);
9. □ use of biologically active substances and geroprotectors;
10. □ medical correction of diseases (mainly chronic ones).

Physical Education

Physical culture is of great importance for preserving and strengthening the health of each person and for the prevention of hypodynamia. Physical exercises affect the cerebral cortex and subcortical centers, create a balanced neuropsychological state, induce a feeling of vigor, stimulate the development of the body's muscular system, cardiovascular system.

Physical culture includes:

1. □ morning exercise to restore physical activity and work capacity after sleep;
2. □ physical culture breaks during the working day at the factory to increase work capacity;
3. □ physical exercises in free time from work.

Methodology of hygienic assessment of children's functional readiness to enter school

Assessment of children's functional readiness to enter school involves an express assessment of the body's functional capabilities and an in-depth psychophysiological examination of the child's higher nervous activity.

Express assessment of a child's functional readiness to enter school

An express assessment of the child's functional readiness for admission and systematic schooling is carried out on the basis of the results of the Kern-Iracek complex psychophysiological test, the indicators of the quality of sound speech and the accuracy of movement coordination.

The Kern-Irasek test consists of three tasks: 1) drawing a person; 2) redrawing a short phrase of 3-4 words; 3) redrawing a group of points. Each task is evaluated in points (the best score is 1 point, the worst is 5 points). The sum of the data on the performance of individual tasks is the overall result of the study.

The first task is that the child must draw a figure of a person without any instructions from the researcher, the second is that the child copies a phrase from a stencil that is made in advance and includes a simple short phrase, for example: "He ate soup" or "She drank juice", the third is that the child looks at the stencil for 1 minute, and then tries to reproduce the form of the arrangement and the number of dots on a

sheet of paper (Fig. 1). Criteria for the general evaluation of the test results: high readiness for studying at school - up to 5 points, average readiness - 6 - 10 points, low readiness - more than 11 points.

The quality and purity of sound pronunciation is evaluated during the verbal reproduction of words that are difficult to articulate, such as: crab, heron, egg, ax, shovel, chair, newspaper, winter, mouse, fish, seagull, key.

The accuracy of coordination of movements and, therefore, the readiness to perceive writing skills, is determined using the "Circle cutting" test. The child is offered a card on which seven circles are depicted, located at a distance of 1 mm from each other. The middle circle is marked with a thick line and has a diameter equal to 50 mm. The future student must cut a circle along the thickened line within 1 minute. The time count starts from the moment when the scissors touched the thickened line. They evaluate the time and quality of the test.

In-depth psychophysiological examination of the child's higher nervous activity

An in-depth psychophysiological examination of the child's higher nervous activity in order to determine his readiness to study at school involves the study and quantitative assessment of mechanical, visual and verbal no-logical memory, as well as verbal-logical thinking.

Assessment of mechanical memory. The child is asked to memorize and then reproduce, by writing on a sheet of paper, ten numbers presented on separate cards or written on the board. The numbers can be different, preferably both one- and two-digit, from 1 to 16.

The child under investigation carefully examines the proposed numbers for 1 minute and tries to remember them, and then writes down these numbers on a sheet of paper in any order by memory for 1 minute. The criterion characteristic of mechanical memory is its performance indicator, which is calculated according to the formula:

$$PMP = \frac{c}{N} \cdot 100\%;$$

where PMP - performance of mechanical memory;

c - the number of correctly reproduced numbers;

a - the number of erroneously reproduced numbers;

n - the number of presented digits.

Performance of mechanical memory is considered high if the result is between 80% and 100%, average - between 50% and 80%, low - less than 50%.

Evaluation of verbal-logical memory The researcher twice clearly and loudly pronounces 10 words intended for memorization. Words should be simple, have specific visual characteristics and be easy to reproduce. For example: mountain, cat, window, book, vase, table, star, flower, tree, saw. The child under investigation must write on a sheet of paper the words he managed to remember or draw images

corresponding to these words within 1 minute. The performance indicator of verbal and logical memory is calculated according to the formula:

$$PVLP = \frac{from}{n} \cdot 100\%;$$

where: PVLP - performance of verbal and logical memory;
c - the number of correctly reproduced words;
a - the number of erroneously reproduced numbers;
n - the number of presented digits.
The criteria for evaluating the results are similar to the previous ones.

Assessment of figurative memory. A card with 9 simple geometric shapes is presented to the child being studied for memorization. Presentation time and playback time are the same - 1 minute. The image memory performance indicator is calculated by the formula:

$$POP = \frac{from}{n} \cdot 100\%;$$

where: POP - image memory performance;
c - the number of correctly reproduced figures;
a - the number of erroneously reproduced figures;
n - the number of presented figures.
The criteria for evaluating the results are similar to the previous ones.

Evaluation of verbal and logical thinking. The child being examined is offered a card with a group of words written on it, consisting of 10 options of 4 words each.

At the same time, every 3 words in each group have a clear meaningful connection, and the fourth word is superfluous, unrelated to the others. The extra word should be crossed out;

Example:
1. book, briefcase, suitcase, bag 2. milk, cheese, bread, cream
3. minute, second, time, evening 4. weight, clock, glasses, thermometer
5. Vova, Mykola, Masha, Yura 6. winter, summer, night, autumn
7. table, chair, window, cabinet 8. birch, pine, berry, oak
9. notebook, pen, pencil, newspaper 10. mother, grandmother, father, teacher

Extra words: 1) book, 2) bread, 3) evening, 4) glasses, 5) Masha, 6) night, 7) window, 8) berry, 9) newspaper, 10) teacher.

For each correct answer, the child is awarded 2 points, for each incorrect answer - 0. Then the total number of points is calculated.

The overall result is considered low if the child scored from 0 to 6 points; average - from 8 to 12 points, high - from 14 to 20 points.

A specially developed standardized 20-point scale is used for a comprehensive assessment of the indicators of children's functional readiness to enter school, with a score of 1-6 indicating a low level of functional readiness, 7-13 points indicating an average level of functional readiness, 14-20 points - about a high level of functional readiness of the child.

3. Topics of reports/abstracts:
1. Methods of assessing children's physical development
2. Physical culture
3. Wrapping up children
4. Summary of results
Physical development is one of the integrative indicators of a child's health, biological maturity of all body systems. The main methods of physical development research are easy to perform for children of any age, which determines their wide use in pediatrics.5.Список рекомендованої літератури

Literature

Main:

1. Hygiene and ecology // textbook for students of higher medical educational institutions in English. /edited by V.G. Bardova – Vinnytsia: NovaKnyga, 2018.

2. Environmental Health: from Global to Local \ Under Howard Frumkin edition – Third edition. - San Francisco, 2016

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3. General hygiene. Hygiene propaedeutics/Textbook for foreign students. / E.I. Honcharuk, Yu.I. Kundiev, V.G. bardo otter - K.: Higher school, 2000.

4. Korobchanskiy V.A. Hygiene and Ecology \ Korobchanskiy V.A., Vorontsov V.P., Musulbas A.A. - Kharkov, 2006

Seminar session No. 9
Topic: Anti-radiation protection in medical institutions and other facilities where sources of ionizing radiation are used. Methods and means of radiation control.

Purpose: To master the methods and means of measuring the levels of radiation and the concentration of radionuclides in air, water, food products, radioactive contamination of work surfaces, individual exposure doses of those working with sources of ionizing radiation, and to evaluate their results.

Basic concepts: radiation, radionuclide, sources of ionizing radiation
Equipment: laptop, projector

1. Questions (test tasks) to check basic knowledge on the topic of the seminar:

1. Closed sources of ionizing radiation are used in the radiology department of the hospital for the treatment of cancer and thyrotoxicosis. What measures are most necessary for the protection of personnel when working with sources of ionizing radiation of the closed type?
*AND. Reduction of working time and use of a leaded screen
B. Increasing the distance to the source
C. Shielding of the source
D. Systematic cleaning of surfaces from radioactive contamination
C. Use of lead aprons

2. Changes in which organs and systems are more often detected during medical examinations of women working in foundries:
*A. Diseases of the central nervous and cardiovascular systems, gynecological diseases, reproductive disorders
B. Respiratory diseases
C. Diseases of the blood system
D. Changes in immunological reactivity
E. Specific pathology of the female reproductive system

3. The radiologist of the regional oncology dispensary received a radiation dose of 10 mSv per year. Specify which indicators should be used to estimate the radiation dose of a radiologist:

A.*Irradiation dose limit.
B. Level of intervention.
S. The level of practical activity.
D. Preventable dose.
E. Annual intake of radionuclide to the body.

4. In the radiological department of the hospital, gamma radiation therapy units of the "Agate" type and other closed sources of ionizing radiation are used for the treatment of malignant neoplasms. Which of the listed measures should be used to protect medical personnel when working with radioactive sources of this type?
A.* Reduction of work time and shielding of the source
B. Screening of the source and use of personal protective equipment for respiratory organs.
C. Systematic cleaning of surfaces from radioactive contamination and reduction of work time.
D. Sealing of installations and organization of ventilation of premises.
E. Increasing the distance to the source and observing the rules of personal hygiene.

5. Name which of the outstanding ancient scientists listed below was the first to describe occupational pathology.
A. *Ramazzini.
B. Avicenna.
S. Herodatus.
D. Hippocrates.
E. Galen.

6. List the main tasks of preliminary medical examinations:
A. *Professional selection of such workers, whose psychophysiological features and general somatic state of health allow them to work for any length of time in harmful conditions in a specific profession.
B. Study of absolute contraindications to work by profession.
C. To prevent persons who have such health disorders, which may be aggravated under the influence of specific harmful occupational factors, from work.
D. Study of early signs of occupational diseases.
E. Development and implementation of preventive measures.

7. Name one of the most significant professional hazards for a dentist:
A.*Infections from patients with diseases of the upper respiratory tract.
B. Constant psycho-emotional tension.
S. Muscle tension.
D. Non-observance of safety and sanitary rules.
E. Wear and tear of medical equipment, tools, equipment.

8. Microclimate indicators were measured during the examination of the surgical department of the regional clinical hospital. The results of the conducted research: the average air temperature is 200C, the relative humidity is 50%, the speed of air movement is 0.1 m/s. Give a hygienic assessment of the operating room microclimate:
A.* The microclimate is comfortable.
B. The microclimate is uncomfortable and overheated.
S. The microclimate is uncomfortable and cooling.
D. The microclimate is uncomfortable with high humidity.
E. The microclimate is uncomfortable with increased air movement speed.

2. Discussion of theoretical issues:
Radiation hygiene is a branch of hygienic science and sanitary practice, the purpose of which is to ensure the safety of workers working with sources of ionizing radiation and the general population.

Tasks of radiation hygiene include:
- sanitary legislation in the field of the radiation factor; - preventive and ongoing sanitary supervision of objects that use sources of ionizing radiation;
- hygiene and labor protection of personnel working with sources of ionizing radiation and personnel working in adjacent premises and on the territory of controlled zones;
- control over the levels of radioactivity of environmental objects (atmospheric air, air of the working area, water of reservoirs, drinking water, food products, soils and others);
- control over the collection, storage, removal and disposal of radioactive waste, their burial and the like.

Radioactivity is the ability of some chemical elements to spontaneously disintegrate with the formation of ionizing radiation, a characteristic feature of which is the transformation of atomic nuclei of some elements into others.
The unit of measurement of radioactivity is Becquerel (Bq, Vq). 1 Bk is equal to one spontaneous decay per 1 s. Extrasystemic unit of radioactivity is Curie (Ku, Cu). 1 Ku is equal to 3.7•1010 Bk. In medical practice, such a unit of activity as the milligram equivalent of radium mg-eq is also used. Ra, that is, the number of milligrams of any source of □-radiation, which creates the same ionization effect as 1 mg of radium.

Isotopes (isos - the same, topos - place; Greek) are varieties of a chemical element whose atoms have nuclei with the same number of protons, but differ in the number of neutrons. Nuclides are nuclei of all isotopes. However, nuclides can be both stable and unstable (radionuclides). Radionuclides are characterized by intranuclear transformations, which result in the spontaneous release of corpuscular particles and ionizing radiation.

Ionizing radiation is a flow of particles or quanta of electromagnetic radiation, the passage of which through a substance leads to its ionization (transformation of neutral atoms and molecules into ions) with the formation of electric charges of different signs.
Two groups of ionizing radiation are known:
1. Corpuscular:
• □-particles – heavy particles that consist of two neutrons and two protons;
• □-particles – electrons or positrons, • protons – positively charged elementary particles;
• neutrons – neutral elementary particles with the mass of a proton
• mesons – elementary particles with a negative charge and an energy of 25-100 MeV and a mass 300 times greater than the mass of an electron.
2. Wave (electromagnetic):
• □-radiation – electromagnetic radiation with a wavelength less than 0.05 n/m.
• X-ray radiation - electromagnetic radiation with a wavelength of 0.05 - 10 n/m, which is received in X-ray tubes as a result of the impact of the energy of electrons from the red-hot cathode that fall on the anode;
• short-wave ultraviolet radiation – electromagnetic radiation with a wavelength of 10-110 n/m (vacuum ultraviolet).

A radionuclide is a radioactive atom with a certain mass number and charge (atomic number). Radioactive isotopes are radioactive atoms with the same charge (atomic number) and different mass numbers, that is, with the same number of protons and different numbers of neutrons in the nucleus.
Types of nuclear transformations:
α-decay is characteristic of heavy (with a large mass number) elements and consists in the departure from the nucleus of an atom - a particle - by its nature of a helium nucleus (2 protons and 2 neutrons), as a result of which the nucleus of a new chemical element with a mass number appears. smaller by 4 and a charge smaller by 2: 226 88 Ra □ 222 86 Rn + 4 2 He. Having received an α-particle, the atomic nucleus is in an excited state with an excess of energy, which is released in the form of γ-radiation, that is, α-decay is always accompanied by γ-radiation. β-electron decay - a process in which an electron is ejected from the nucleus of an atom (from one of the neutrons), as a

result of which this neutron turns into a proton, in connection with which a new element with the same mass number and with a charge greater than one is formed : 40 19 K e -1 + 40 20 Ca + , where -neutrino A nucleus excited by the loss of an electron in most cases also emits γ-quanta. β-positronic decay - - a process in which a positron escapes from the nucleus of an atom (from one of the protons), as a result of which the proton turns into a neutron and a new chemical element appears with the same mass number and a unit less charge: 64 30 Zn e +1 + 64 29 Cu Electron-K-capture - when the nucleus (one of the protons) captures an electron from the nearest K-orbit, due to which this proton turns into a neutron, as a result of which the nucleus of a new chemical element appears with the same mass number and charge, less by one: 64 29 Cu + e -1 64 28 Ni Electrons move to the vacant K-orbit (and successively from other orbits), and the free energy is emitted in the form of characteristic X-ray radiation . Spontaneous nuclear fission is characteristic of heavy transuranic elements, in which the ratio of neutrons to protons is greater than 1. As a result, the nuclei of two new elements are formed, in which the n : p ratio is closer to unity, and the “extra” neutrons are emitted in the form of neutron radiation: 235 9 U + 1 0 n 90 36 Kr + 140 56 Ba + 5 1 0 n. Thus, from the qualitative side, nuclear transformations are characterized by: type of decay, type of radiation, half-life - the term for which half of the initial number of atoms decays. (According to the law of radioactive decay, the number of atoms N that decayed during the term t is proportional to the initial number of atoms): N = N0 e - t . From a hygienic point of view and the choice of methods of deactivation of radioactive waste, all radionuclides share on short-lived (T½ < 15 days) and long-lived (T½ > 15 days): short-lived ones are kept in septic tanks until their activity decreases, and then they are discharged into the general sewer or taken out, and long-lived ones are taken out and buried in special burial grounds.

Quantitative measure of radioactive decay - activity (Q) - is the number of decays of atoms per unit of time. The unit of activity in the Si system is the becquerel (Bk) - one decay per second (s -1). Due to the fact that this unit is very small, derivatives are used - kilobecquerel (kBq), megabecquerel (MBq). Extrasystemic (obsolete) unit of activity - curie (Ku) - is the activity of 1 g of chemically pure radium, equal to 3.7 1010 Bq (decays per second). This unit, on the contrary, is very large, so derivatives are used - millicuries (mCu), microcuries (μCu), nanocuries (nCu), picocuries (pCu). For radionuclides, which are characterized by γ-radiation, activity is also expressed through the gamma equivalent - the ratio of γ-radiation of this radionuclide to γ-radiation of radium. The calculated gamma constant of radium - 8.4 r/hour - is the dose rate created by γ - radiation of 1 milligram of radium at a distance of 1 cm through a platinum filter 0.5 mm thick. Milligram-equivalent of radium (mg-equivalent Ra) is a unit of radionuclide activity whose γ-radiation is equivalent to γ-radiation of 1 milligram of Ra at a distance of 1 cm through a 0.5 mm platinum filter.

Physical properties

Ionizing radiation and radionuclides have certain qualitative and quantitative characteristics. As qualitative characteristics of radionuclides are used:

• type of nuclear transformation (-decay, electronic -decay, positron -decay, K-capture, spontaneous nuclear fission, thermonuclear reaction);

• half-life - that is, the time during which half of all radionuclides of a certain type decay. (For example: Uranus-238 – 4.47 billion years, Radium-226 – 1600 years, Lead-214 – 26.8 minutes). As a quantitative characteristic of radionuclides, the following are used:

• activity characterized by the number of nuclear transformations per unit of time.

The units of activity are Becquerel (Bk) and Curie (Ki). However, the so-called -equivalent, which is measured in milligram-equivalent of radium, should be considered a more convenient quantitative criterion of a radionuclide for -radiation.

The qualitative characteristics of ionizing radiation include:

- the type of radiation:
- corpuscular (α, β, n), electromagnetic (γ-, x-ray: charac. in K-capture, braking - in an x-ray tube);
- radiation energy measured in Joules (J) and electron volts (eV);

-penetrating ability, which is characterized by the length of travel of particles or -quanta in the substance and is expressed in units of length (m, cm, mm);

- ionizing capacity characterized by total ionization (the total number of ion pairs formed by particles or □-quanta in the substance) and linear ionization density (the number of ion pairs per unit length).

Quantitative characteristics of ionizing radiation include:

• absorbed dose, the units of measurement of which are Gray (Gy) and Rad;
• equivalent dose, the measurement units of which are Sievert (Zv) and Ber;
• effective dose, the measurement units of which are Sievert (Zv) and Ber;
• exposure dose (for □– and □–radiation), the units of which are the number of coulombs/kg (Cl/kg) and Roentgen (P);
• particle flux density (for corpuscular radiation), the units of which are the number of particles per 1 cm3.

Irradiation dose is radiation energy that is absorbed in a unit of volume or mass of a substance in a certain time. It should be emphasized that, as mentioned above, there are the following types of doses: absorbed, equivalent, effective and exposure.

The absorbed dose (D) is the amount of ionizing radiation energy absorbed by the irradiated body (body tissues) per unit mass. The unit of absorbed dose is joule per kilogram (J/kg) or Gray (Gy, Gu). 1 Gy = 1 J/kg. Extrasystemic unit - Rad (from the English radiation absorber dose (rad) - absorbed dose of radiation). 1 Gy = 100 rads.

The equivalent dose (H) is the value of the absorbed dose, which is multiplied by the radiation quality factor (k), which takes into account the ability of a certain type of radiation to damage body tissues (H = D □ k). The radiation quality factor (k) is a factor introduced to take into account the biological effectiveness of various types of ionizing radiation.

The unit of measurement of equivalent and effective doses is Sievert (Zv.). The non-systematic unit is Ber, that is, the biological equivalent of an x-ray (rem (English) – roengen equivalent for man – the equivalent of an x-ray for a person). This indicator is used because, depending on the physical properties of the radiation, the biological effectiveness of one dose can be different. 1 Sievert = 100 Ber.

There is a slightly different classification of organs by sensitivity to radiation, which distinguishes 4 groups of critical organs:

I gr. – gonads, red bone marrow, lymphoid tissue, lungs;
II gr. – lens, intestines, liver, kidneys, muscles;
III gr. – skin, thyroid gland, bone tissue, other viscera other bodies;
IV gr. - skin of hands and feet.

The exposure dose characterizes the ionization effect of X-ray and □-radiation in the air and, therefore, represents the ratio of the total charge of all ions of the same sign formed in the air to the air mass in the specified object. Exposure dose measurement units are X-rays (P) or coulombs per kilogram (Cl/kg). Ionizing radiation has high biological activity, moreover, it can negatively affect biological organisms and, under certain conditions, lead to their destruction and death.

All radiation effects are divided into:

- stochastic (probable) - thresholdless, assessed by the possibility of the risk of lesions - carcinogenic, mutagenic, hereditary effects. They are difficult to experimentally study, it is impossible to clearly establish the threshold of harmful effects. These effects are mainly manifested at low doses (when occupational and natural exposure during life does not exceed 100 Ber);
- non-stochastic effects - threshold, the severity of the lesion depends on the radiation dose. It is also possible to set an action threshold, that is, to determine safe levels of exposure and regulate it. All existing NRBs are based on the prevention of the occurrence of these effects. Nonstochastic effects include acute and chronic radiation sickness, radiation burns, and radiation cataract.

At radiation doses over 100 Ber, acute radiation sickness develops (100-200 Ber - mild; 200-300 Ber - moderate; 300-500 Ber - severe and over 500 Ber - extremely severe). Doses of 500-600 Ber with a single exposure are absolutely lethal. Another form of acute radiation damage is radiation burns. 1st degree reaction – dose up to 500 Ber; 2nd degree - up to 800 Ber; 3 degrees - up to 1200 Ber; 4 degrees - more than 1200 Ber. Chronic radiation sickness of 3 degrees of severity may occur with long-term external or internal exposure of a person to small, but doses that exceed permissible values.

Groups of critical organs.
Bergagnier's law
Three groups of critical organs are established in descending order of radiosensitivity:
Group I - the whole body, gonads and red bone marrow;
Group II – muscles, thyroid gland, adipose tissue, liver, kidneys, spleen, gastrointestinal tract, lungs, lens of the eye and other organs, except for those belonging to groups I and III;
Group III – skin, bone tissue, hands, forearms, ankles and feet.

To protect workers and the population from ionizing radiation, the following regulations have been established: according to the effects on critical organs, the following regulations have been established:
Category A – personnel in contact with radiation; GDD – 2 Ber/year (0.2 Sv/year) and 40 mBer/week.
Category B – personnel located in premises adjacent to radiation sources; GDD - equivalent annual dose of 0.2 Ber (0.02 Sv/year).
Category B - the rest of the population, including personnel who work outside the scope of radiation; GDD - 0.1 Ber (0.01 Sv/year).

The natural radiation background is the natural level of radioactivity in a given area, which mainly depends on natural factors. On average, it is about 100 mBer/year, but it can fluctuate significantly due to natural and anthropogenic causes. In Crimea, 6-30 mR/h. (more - in the Mountainous Crimea - outcrops of rocky rocks that contain uranium). The composition of the natural radiation background:
• – cosmic radiation (25–40%) – there are two protective screens: the EMF of the Earth and the ozone layer; on average, a person on Earth receives 28 mBer/year;
• – natural radioactivity of soil (granite), air, water – natural and artificial geochemical provinces;
• - food products - about 25%. Thus, external exposure is 75%, and internal exposure is 25%. since there are additional anthropogenic sources of increasing the natural radiation background for the population:
• – NPP regions, consequences of their accidents and nuclear explosions;
• – diagnostic x-ray procedures (x-ray, the patient receives 1 Ber immediately);
• – television – watching color TV for 4 hours a day, a person receives 50 mBer per year.
Hence, the doctor's role is to reduce the natural radiation background: the correct appointment of x-ray diagnostic procedures, the transition to endoscopic research methods; sanitary and educational work with the population regarding TB, especially children.
The radiation threat when working with sources of ionizing radiation consists in the fact that external and internal irradiation of the body has both a direct and an indirect effect on intracellular structures, the features of which are imperceptibility for humans, the presence of a certain latent period of manifestation of the biological effect and the effect of summation of absorbed doses. During the action of ionizing radiation on the body, molecules are ionized and, although the duration of the existence of such ions is only 10-10 s, during this time free radicals are formed - chemical compounds that react with tissues, as a result of which the concentration of important metabolites decreases, metabolism is disturbed, radiotoxins are formed. This attitude leads to corresponding somatic lesions and because even before the death of the organism. As a result of damage caused by ionizing radiation to nuclear structures, genetic lesions occur. Also of great importance are remote consequences of exposure, which may occur 5 to 20 years after exposure.

3. Topics of reports/abstracts:
1. Types of ionizing radiation used in medicine and their sources (X-ray machines, radionuclides, charged particle accelerators, etc.).
2. Qualitative characteristics of ionizing radiation (penetrating and ionizing ability).

3. Quantitative characteristics of ionizing radiation (exposure, absorption and equivalent dose, particle flux density, dose rate).
4. Qualitative and quantitative characteristics of radionuclides (type of nuclear transformation, half-life, activity), units of measurement.
5. Biological action of ionizing radiation and the main factors on which it depends.
6. The main types of radiation damage to the body (somatic, somato-stochastic, genetic) and the conditions of their occurrence.
7. The main means of using radionuclides and other sources of ionizing radiation for diagnostic and therapeutic purposes.
8. Rules for working with open and closed sources of ionizing radiation.
9. The concept of radiation safety groups of radionuclides and classes of work with exposed radioactive substances.
10. Radiation control devices and the basic principles of their operation.
11. Radiation safety regulation and hygienic principles of anti-radiation protection.

4. Summary of results
So, the main types of radiation damage include:
• somatic lesions (acute and chronic radiation sickness, local radiation lesions (burns, cataracts), etc.);
• somato-stochastic lesions (reduction of life expectancy, oncogenesis, teratogenic effects, etc.);
• genetic lesions (dominant or recessive gene mutations, chromosomal and chromatid aberrations, etc.).

Literature

Main:

1. Hygiene and ecology // textbook for students of higher medical educational institutions in English. /edited by V.G. Bardova – Vinnytsia: NovaKnyga, 2018.

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