MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE

STATE HIGHER EDUCATIONAL ESTABLISHMENT

“UZHGOROD NATIONAL UNIVERSITY”

MEDICAL FACULTY №2

DEPARTMENT OF PUBLIC HEALTH AND HUMANITARIAN DISCIPLINES

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METHODICAL RECOMMENDATIONS

ON “HYGIENE AND ECOLOGY”

for preparation to practical classes of foreign students II year of study

Uzhgorod, 2018

Methodical recommendation on “Hygiene and Ecology” for independent preparation to practical classes of foreign student of 2 th course of the field of knowledge: “Medicine”, specialty “Medical case” / complied: R.Yu. Pohorilyak,D.Ya.Shyp. – “UzhNU”, 2018.

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Approved at the meeting of the Department of public health and humanitarian disciplines of Medical faulty №2 from “_____” _____2018 y., protocol №_____

Approved by the decision of the scientific and methodical board of Medical faculty №2 from “_____” _____2018 y., protocol №_____

№	Theme	Number of hours
	Module 1	
1.	Hygiene as a science, its purpose, objectives, content, hygiene methods and research.	2
2.	Hygienic significance of solar radiation.	2
3.	Methods of determination of intensity and preventive dose of the ultraviolet radiation and its usage for the disease prevention and air sanation.	2
4.	Hygienic significance of climate, weather, their impact on the health.	2
5.	Methods for measuring speed of air and its influence	2
6.	Natural lighting, methods of measurement	2
7.	Artificial lighting, methods of measurement	2
8.	Methods for determining the concentration of CO_2 and oxidation of wind as indicators of anthropogenic pollution of air and ventilation.	2
9.	Technique of the sanitary inspection of water supply sources	2
10.	Methods of hygienic assessment of drinking water	2
11.	Methods of hygienic assessment of soil	2
12	Principles of methodology, technique and basic assessment scheme of environmental factors impact on population health	2
13	Methods of assessing the nutritional status of people	2
14	Methods of medical control of vitamins in organism	2
15	Methods of assessing of nutrition adequacy in organized collectives	2
16	The nutrition peculiarities of people of different age groups and occupations	2
17	Methods of expert assessment of milk, meat and fish	2
18	Theoretical aspects and method of prophylaxis of alimentary diseases	2
19	Methods of investigation of the food poisoning cases.	2
20	Final control	2
	Together	40

Topic № 1

Hygiene as a science, its purpose, objectives, content, hygiene methods and research.

1. Learning objective

1.1. Master the knowledge about the hygiene as a science and the sanitation, their goals, tasks, components, significance of hygienic knowledge for doctors of different profile.

1.2. Learn the classification of hygienic methods and the facilities of the research of the environment and its influence on organism and health.

1.3. Get acquainted with the ways and methods of the public health protection, disease prevention.

1.4. Get acquainted with the procedure, topics of the students' educational, and research work, to assign the topic for each student.

2. Basics

2.1. You should know:

2.1.1. A concept of «prophylaxis» as one of basics of medicine, the hygiene and the sanitation as its components.

2.1.2. Basic concepts, methods and research facilities from physics, chemistry, biology, microbiology, physiology and other preceding courses which are used in research of environmental factors and their influence on human health.

2.1.3. Basics of the mathematical processing of medico-biological research results.

2.2. You should have the following skills:

2.2.1. The physical, chemical and bacteriological measuring of environmental objects and their influence on an organism.

2.2.2. Using the computers or calculators during the statistical processing of the results of hygienic researches.

3. Self-training questions

3.1. Prophylaxis as the main principle of public health protection. Public and individual prophylaxis; the primary, secondary and tertiary prophylaxis.

3.2. The hygiene as a scientific discipline, its purpose, tasks, essence.

3.3. Methods of hygienic research, their classification, description.

3.4. Methods of the environment inspection (sanitary inspection and description; organoleptic, physical, chemical, bacteriological methods, their essence and usage in hygiene study).

3.5. Methods of research of the environmental influence on the human health (experimental physiological, biochemical, histological, toxicological, natural experiment methods, clinical).

3.6. Setting of hygienic norms and regulations as a basis of environment and public health protection, its objects and types.

3.7. Distinctive features of setting of norms and regulations for natural environmental factors, and anthropogenic factors.

3.8. Principles of the hygienic norm and regulation setting, organizations, responsible for that. Sanitary and legal legislation on the environment and public health protection.

3.9. Sanitation as a practical application of hygienic regulations and sanitary norms and rules, its use in work of health-officers and doctors of other specialties.

GENERAL INFORMATION FOR PREPARATION TO THE PRACTICAL CLASS

Prophylaxis is one of the basic principles of public health service. The main duty of the medical workers is the taking of the disease prevention measures for healthy people and exacerbation, complication and relapse prevention for the ill.

Prophylaxis means the wide system of state, public and medical measures for preserving and strengthening people's health, the upbringing of the healthy young generation, work capacity and people's longevity increasing.

There is public (social) and personal (individual) prophylaxis. *Public (social) prophylaxis* is guaranteed by the state measures reflected in the Constitution and basic legislation concerning health protection. These measures guarantee the rights of people to work, to housing, rest, education and treatment, pensions in other words, the possibility of harmonious development, both physical and intellectual, of preserving their health, ability to work and live without diseases.

Individual (personal) prophylaxis includes fighting the nervous and other systems overloading, work, recreation and feeding regimens violation, hypodynamia, alcohol and smoking abuse.

Prophylaxis is divided into three kinds: primary, secondary and tertiary in accordance to the specific kinds of pathology. *Primary prophylaxis* includes prophylactic technologies of preventing disease through removing risk factors (causes and conditions of its development) and improving general body resistance to risk factors. *Secondary prophylaxis* includes medico-prophylactic technologies of revealing a disease, preventing its progress, aggravation and possible complications. *Tertiary prophylaxis* includes medico-prophylactic technologies aimed at removing negative aftermaths of the disease (relapses, complications, temporary and permanent disability, death).

The more completely the population is embraced with prophylactic measures, the healthier it will be.

The Hygiene is a branch of the medical knowledge, the science dealing with protecting and consolidating social (collective) and personal (individual) health by means of prophylactic measures.

The objective of the hygiene may be defined as the preservation and strengthening of people health. The ways and means of achieving of the hygiene objectives are presented in the diagram 1, which must be closely studied during the lesson.

Main tasks of hygiene are the following:

1. Studying the natural and anthropogenic environmental factors and social conditions affecting the health of a human.
1. Studying the laws of the impact of environmental factors and conditions on the human body or population.
2. Scientific substantiation and development of hygienic standards, rules and measures for rational use of environmental factors beneficial for human body as well as removing the harmful factors or limiting them to safe levels.
3. Practical implementation of developed hygienic recommendations, rules and standards in national economy, controlling and improving their effectiveness.
4. Forecasting the sanitary situation for the nearest and remote future, taking into account plans of the national economy development, proper hygienic problems arising from the forecasted situation, scientific research of such problems.

Sanitation means the practical use of standards, sanitary rules and recommendations developed by the hygienic science and helping to optimize the conditions of education, upbringing, everyday life, leisure and nourishment, aimed at strengthening and preserving people's health.

The sanitation is achieved by sanitary and anti-epidemic measures. These measures are implemented by population, state organs, enterprises, institutions and organizations, agricultural enterprises, trade unions and other public organizations. The adequate fulfillment of sanitary and anti-epidemic measures is controlled by sanitary-and-epidemiological services. There are school, housing and municipal, industrial and food sanitation.

School sanitation is a system of control of sanitary norms, rules and hygienic demands concerning physical development and state of health of children and adolescents, their daily regimen, organization of study, work, leisure, physical culture, as well as designing establishments for small children, creating and operating them, supplying with furniture and equipment for babies, preschool, school children and adolescents.

Housing and municipal sanitation provides the control of measures for sanitary protection of atmospheric air, water and soil from pollution, carrying out rational, scientifically grounded planning, building or providing sanitary amenities and improving sanitary conditions for the settlements, dwelling houses, educational, cultural, health protection establishments, sports structures etc..

Industrial sanitation is a complex of measures of control of the adherence to the standards of industrial environment which provide for developing sanitary, technical and engineering measures to fight harmful working conditions.

Food sanitation is a complex of measures of controlling the adherence to hygienic requirements in designing, building and operating food industry enterprises, materials and equipment, designing new recipes and technologies of food production, preserving, transporting, storing food and carrying out measures of preventing alimentary tract diseases.

Laws of Hygiene

The first law of hygiene

Can be formulated as follows: level of health of the people (disease, decreasing of the resistance, immunological status, adaptation-compensatory opportunities of organism), caused by physical, chemical, biological and psychogenic etiological factors, can occur only at presence of three driving forces:

1)source of pollution,

2)mechanism of its influence or ways of its transference

3)and human susceptible organism.

The second law

People unfavorably influence on the environment in connection with their physiological, domestic and industrial action(negative anthropogenic action).

During the process of live the man allocates in environment excrement (faces, urine), which are very dangerous in the epidemic and sanitary attitude. Human activities can release substances into the air, water and soil some of which can cause problems for humans, plants, and animals.

The third law (of natural pollution)

The environment is polluted not only under the action of people, but some pollutants come from natural sources

1. Volcanoes spew out ash, acid mists, hydrogen sulfide, and other toxic gases.
2. Sea spray and decaying vegetation are major sources of reactive sulfur compounds in the air.
3. Forest fires create clouds of smoke that blanket whole continents.
4. Trees and bushes emit millions of tons of volatile organic compounds (terpenes and isoprenes).
5. Pollen, spores, viruses, bacteria, and other small bits of organic material in the air cause widespread suffering from allergies and airborne infections.
6. Storms in arid regions raise dust clouds that transport millions of tons of soil and can be detected half a world away.
7. Bacterial metabolism of decaying vegetation in swamps and of cellulose in the guts of termites and ruminant animals is responsible for as much as two-thirds of the methane (natural gas) in the air.

The fourth law– is the law of positive anthropogenic influence on environmental of human society.

However we must not think, that the environment is absolutely defenseless in front of the activity of the man. The nature has huge resources of self-preservation, self-updating, self-regulation, maintenance of ecological balance, self-cleaning, but these reserves are not boundless.

The fifth law

The fifth law of hygiene is the law of inevitable negative influence of the muddy environment on health of the population. People also become ill through exposure to hazards in the environment. Many diseases are linked to environmental problems such as polluted drinking water, poor waste disposal and air and exposure to mosquitoes and other carriers of disease.

The sixth law

The sixth law of hygiene is the law of positive influence of the factors of a natural environment on health of the population.The natural factors of the environment (air, water, good-quality food) have a positive influence on people's health. They provide preservation and strengthening of the human health

Topic №2

Hygienic significance of solar radiation.

1. Learning objective

1.1. Become familiar with physical and biological characteristics of ultraviolet radiation (UVR).

1.2. Master the methods of measuring the ultraviolet radiation intensity and the methods of organization of the UV irradiation (UVI) for the purpose of the UV deficiency prevention and the control of it.

1.3. Master the methods of air sanation by the UVR and its efficiency assessment.

2. Basics

2.1. You should know:

2.1.1. Nature, physical characteristics and spectral distribution of the solar radiation.

2.1.2. Main biological effects of the UVR.

2.1.3. Deficiency and excess of the UVR and its effect on health.

2.1.4. Types of the artificial UVR sources. Photaria.

2.1.5. Methods of measuring and estimation of the UVR intensity.

3. Self-training questions

3.1. The nature of the solar radiation, basic constituent elements.

3.2. Spectral distribution of the ultraviolet diapason of the solar radiation at the edge of the atmosphere and earth surface (regions A, B, C). The ozone layer and its hygienic significance.

3.3 Artificial ultraviolet radiation sources, their physical and hygienic characteristics.

3.4. Measuring methods of the UVR intensity – physical, photochemical, biological, mathematical (calculation).

3.5. Types and mechanisms of the UVR effects: biogenic – general- stimulatory, vitamin D forming, chromogenic and non-biogenic – bactericidal, virulicidal, cancerogenic etc.

3.6. Erythemal, physiological, preventive doses of the UV radiation. Quantitative determination of the UVR intensity using different measuring methods.

3.7. The UVR disadvantage and its effect on health. Main symptoms of "solar insufficiency" and cases requiring the preventive UV irradiation.

3.8. Artificial UVR sources, principles of their functioning, main technical characteristics. Photaria. 3.9. Excessive exposure to natural and artificial UVR sources. "Ozone holes" as a hygienic problem. UVR as an occupational hazard. Methods and means of protection.

GENERAL INFORMATION FOR PREPARATION TO THE PRACTICAL CLASS

The solar radiation is an integral corpuscular flow (consisting of protons, alfa-elements, electrons, neutrons, neutrinos) and electromagnetic (photon) radiation.

The solar ultraviolet radiation wave lenght less then 290 nm is completely absorbed by oxygen and ozone of the upper atmosphere. Atmospheric pollution by factory waste helps the ozone layer destruction resulting in appearance of "ozone holes". The shortest and the most harmful UV waves reach the earth surface through these "ozone holes" .

Artificial UVR sources:

1)direct mercury-quartz lamps (MQL), mercury-arc lamps (MAL) generate UVR 2) wave lengths of 240 - 380 nm;

2) erythemal lamps (LE-15, LP-30, LP-30) - wave lengths of 285-380 nm;

3)bactericidal lamps (LB-30) - wave lengths of 240-380 nm.

The solar and artificial UVR band consists of three regions:

- region A - long-wave ultraviolet radiation: λ = 315-400 nm;

- region B - middle-wave ultraviolet radiation: λ = 280-315 nm;
- region C- short-wave ultraviolet radiation: λ = 10-280 nm.

Biological effects of the ultraviolet radiation may be biogenic (general-stimulatory, vitamin D formation, chromogenic) and non-biogenic (bactericidal, carcinogenic, etc.).

1. General-stimulatory (erythemal) effect of the ultraviolet radiation is typical for the wave length of 250-320 nm, reaching the maximum at 250 and 297 nm (double peak) and the minimum at 280 nm. This effect results in the photolysis of skin proteins (the UV rays may penetrate the skin as deep as 3-4 mm). The following toxic products of photolysis are generated during this process: histamine, choline, adenosine, pyrimidine etc. These substances are absorbed by blood, they can stimulate metabolism, reticuloendothelial system (RES), marrow, rise the levels of haemoglobin, erythrocytes and leucocytes, increase enzyme activity and liver function, stimulate the activity of the nervous system etc.

The UVR general-stimulatory effect is emphasized by its erythemal effect, which consists in reflex dilation of capillary vessels, particularly when exposed to the intensive infrared radiation. The erythemal effect may result in the skin burn if exposed to the extensive radiation.

2. Vitamin D forming (Antirachitic) effect of the UVR is typical for the 315-207 nm wave length (region B), reaching the maximum at 280-297 nm. This effect consists in the decomposition of calciferols: ergosterin (7,8-dehydrochplecterol) of the skin fat (in sebaceous glands) turns into the vitamines D_2 (ergocholecalciferol), D_3 (cholecalciferol), and the provitamin 2,2-dehydroergosterin - into the vitamin D_4 under the UVR influence due to the decomposition of the benzene ring.

3. Chromogenic (tanning) effect of the UVR is typical for regions A, B with wave lenght of 280-340 nm, reaching the maximum at 320-330 nm and 240-260 nm. Transformation of tyrosine (amino acid), dioxyphenilalanine and the products of adrenaline decay helps to generate the black pigment melanin under the influence of the UVR and the enzyme tyrosinase. This pigment protects the skin and the whole body from the ultraviolet, optical and infrared radiation surplus.

4. Bactericidal (non-biogenic) effect of the UVR is typical for regions C and B with wave lenght from 300 to 180 nm, reaching maximum at 254 nm (according to some other sources - 253.7-267.5 nm). First, the irritation of bacteria under the influence of the UVR activates their metabolism, then a dose increase provokes the bacteriostatic effect and further - photodecomposition, protein denaturation and microorganisms death.

5. Photo-ophthalmic effect of the UVR (the inflammation of the eye mucous membrane) may be observed high in the mountains (“snow disease” among the alpinists), and also among the electric welders and physiotherapists that don’t follow the security rules during the work with the artificial UVR sources.

6. Cancerogenic effect of the UVR is more evident in hot tropical climate conditions and during an exposure to high levels and long-term action of the UVR technical sources (electric welding etc.).

Categories of light:

1. Ultraviolet(UV) – 100-400 nm-causes short- and long- radiation term damage to exposed living matter, particularly, in humans, sunburn, photoageing and cancer of the skin.

2. Visible light-400- 800 nm-allows us to see; enables plants to create food molecules; drives human biorhythms; lifts human mood

3. **Infrared radiation- 800 -17000 –**warms our bodies

Topic №3

Methods of determination of intensity and preventive dose of the ultraviolet radiation and its usage for the disease prevention and air sanation.

1. Learning objective

1.1. Strengthen and to supplement knowledge about the biological effect and hygienic significance of the ultraviolet radiation (UVR).

1.2. Master the methods of organization of the UV irradiation (UVI) for the purpose of the UV deficiency prevention and the control of it.

1.3. Master the methods of air sanation by the UVR and its efficiency assessment.

2.Basics

2.1. **You should know**:

2.1.1. Main biological effects of the UVR.

2.1.2. Deficiency and excess of the UVR and its effect on health.

2.1.3. Types of the artificial UVR sources.

2.1.4. Methods of measuring and estimation of the UVR intensity.

3.Self-training questions

3.1. Types and mechanisms of the UVR effects: biogenic - general-stimulatory, vitamin D forming, chromogenic and non-biogenic-bactericidal, virulicidal, cancerogenic etc..

3.2. Distinctive characteristics of biological effects of the UVR band (regions A, B, C).

3.3. Erythemal, physiological, preventive doses of the UV radiation. Quantitative determination of the UVR intensity using different measuring methods.

3.4. The UVR disadvantage and its effect on health.

3.5.Main symptoms of “solar insufficiency” and cases requiring the preventive UV irradiation.

3.6. Usage of the UVR for primary and secondary prophylaxis of different diseases.

3.7. Artificial UVR sources, principles of their functioning, main technical characteristics.

3.8. Excessive exposure to natural and artificial UVR sources, “ozone holes”as a hygienic problem. UVR as an occupational hazard.

3.9. Methods and means of protection from the excessive UVR exposure.

GENERAL INFORMATION FOR PREPARATION TO THE PRACTICAL CLASS

Usage of the sun and artificial UVR sources for primary and secondary prophylaxis of chronic cardiovascular diseases

Considerable amount of material on the preventive doses of the natural (solar) and artificial UVR slowing down the development and the clinical course of cardiovascular diseases has been accumulated by practical medicine and special researches (V.G. Bardov, 1990). Toning up of cerebral (brain) cortex, normalization of the reactions of stimulation and inhibition, improvement of the state of vegetative nervous system, activisation of some enzymes, increase of erythrocyte amount in blood, normalization of lipid composition and cell membrane permeability, stimulation of anticoagulant system, mineral metabolism (especially phosphrus and calcium metabolism), blood pressure reduction, decrease of hypertention stroke frequency and severity, cardiovascular fitness ascension, angina pectoris, cardiac infarctions and cerebral strokes reduction are registered after preventive UV irradiation. Aerosolaria (sun-air bathes) and medicinal beaches are used for primary and secondary helioprophylaxis of the diseases and health conditions listed above. These facilities must not cause overheating or cooling (they must be protected from wind). Chaise longues or the beach sand is used often for sun bathes. Special tables, accounting for the sun climate of different places determine the insolation time.

Common scheme of cardiovascular diseases (CVD) UV prevention

For primary and secondary prevention of CVD is recommended courses of UV irradiations 3-4 times a year with duration of each course of 1 month and with intervals between them – 2-3 monthes. In Ukraine (taking into account seasonality of CVD) preventive courses of UV prevention better to conduct in october, december, february and april. In summer it is enough to spend 30-60 minutes on open air for receiving preventive dose of UVR because of UVR intensity and not much clothes. In case of time limitation of natural UV prevention by summer period, UVR of antropogenic origin is used for this order. After determination of erythemal dose for concrete human under concrete irradiation conditions courses of primary and secondary prevention will be conducted .

In time of UV irradiation vitamin C and D, Ca and P should be prescribed.

Indications and contra-indications for UV prevention

Primary prevention prescribes for practicaly healthy people of different age, with serious risk factors of hypertension, chronic ischemic disease, miocardial infarction, cerebral blood circulation disorders. Contra-indications for it are acute stage or exacerbation of all internals diseases, active tuberculosis of lung and kidneys, acute eczema, susceptibility to bleeding, nephritis, malaria, blood circulation insufficiency, malignant tumors, marked cachexy, heightened sensibility to UVR.

Secondary prevention prescribes for patient in remission. Contra-indications for it are exacerbation or complication of disease is form of hypertension stroke, acute strokes of angina pectoris, acute period of cerebral stroke, miocardial infarction, state of health worsening, headache, and contra-indications for primary prevention.

General principles of UV prevention:

1. rational clinical examination

2. doctor's control of irradiation

3. in time stoppage of irradiations in case of complicatioms appearance

4. optimization of labour and rest

5. rational nutrition

6. drug treatment in out-patients departments

Instruction on the determination of the efficiency of the air sanation by the UV irradiation

Planting of the air is performed on beef-extract agar or special agar in Petri dish in Krotov's device before irradiation (exposure) to estimate the air sanation efficiency. The irradiation is performed using the bactericidal lamps LB-30 or mercury-quartz lamps in accordance with the pre-calculated exposure. Replanting (secondary planting) of the air in Petri dish is done after the exposure. Dishes are incubated in the thermostat during 24 hours at the temperature of 370C. The number of colonies after the incubation is calculated in both Petri dishes before and after the exposure. The air contamination with the microbes is estimated by determination of microbe air contamination index (microbe number) (the number of microorganisms per 1 m3 of the air) and the Staphylococcus hemalyticus population. Microbe number is calculated using the following formula:

$$M.n. = \frac{\mathrm{A}-1000}{\mathrm{T}-\mathrm{V}}$$

where: M.n. – number of microbes in 1 m3 of the air; A – number of colonies in Petri dish;

T – duration of air sampling in minutes.;

V –air transmission speed of Krotov's device, l/min.

Efficiency degree and efficiency coefficient characterize the bactericidal effect of the UVR. Efficiency degree represents the percentage of decrease in the number of microbes. Efficiency coefficient represents by how many times the microbe number has decreased in the same air volume (colonies number disparity in Petri dishes before and after air exposure)

The artificial UVR sources are widely used for medical treatment of rheumatism, neuralgic pain, cutaneous tuberculosis (scrofuloderma) and in surgery to speed-up operative, traumatic, war, purulent (septic) wound regeneration and their complications. The UVR effect on the wound consists of bactericidal properties, the speed-up of the purulent discharges rejection, kerato-plastic skin function stimulation, and general analgetic effect. Artificial UVR sources of wide band (such as the direct mercury-quartz lamps) are used for this purpose. The wound hydration, scarring and epithelization period (wound regeneration) are sped up during exposure of both the wound surface and the healthy structure around injury, which is the source of the regeneration process, to the UV radiation.

Topic №4

Hygienic significance of climate, weather, their impact on the health.

1.Learning objective

1.1. Master the fundamental methods of collection, processing and analysis of hydrometeorologic and other information for the hygienic assessment of climate and weather in the region.

1.2. Master the scheme and methods of assessment of the weather and climate influence on human body and health. To elaborate hygienic recommendations for healthy and sick men for prevention of the heliometeorotropic reactions.

2. Basics

2.1. You should know:

2.1.1. Physiology of human thermoregulation and adaptation.

2.1.2. Basics of the environmental hygiene.

2.1.3. Medical classification of the weather conditions.

2.1.4. Methods of medical and meteorological forecast.

2.1.5. Methods of heliometeorotropic reactions prevention (permanent, seasonal, urgent) for healthy and sick men suffering from different diseases.

2.1.6. General and applied medical classifications of climate.

2.1.7. Structure and organization of the climate and the weather conditions inspection and forecast services.

3. Self-training questions

3.1. Environment and its components. The main mechanisms of environmental influence on human health.

3.2. Weather and its definition. The weather forming and characterizing factors.

3.3. Mechanism of the atmospheric motion. Formation of different weather types.

3.4. Main thermobaric processes: trade-winds, antitrades, cyclones, anticyclones, atmospheric fronts. Temperature inversion.

3.5. Weather influence on human health and emotional state. Heliometeorotropic reactions and their definition, mechanism of their development.

3.6. Medical classification of the weather conditions, the significance of their main characteristics.

3.7. Influence of meteorological conditions on atmospheric air pollution. Smog.

3.8. Medical weather forecast, principles and methods of helimeteorotropic reactions prevention. Influence of extreme weather conditions on human emotional state.

3.9. Climate and its definition. The climate forming and characterizing factors.

3.10. Classification and hygienic characteristics of different climatic zones. Climatic zones of Ukraine.

3.11. Climate features of different natural and geographical regions.

3.12. Acclimatization. Main hygienic aspects of acclimatization in the North, the South, in arid zone and mountains.

3.13. Hydrometeorology service, the processing methods and the significance of meteorological supervision data for medical-hygienic assessment of the climate and the weather conditions.

3.14. Usage of the climate factors for recovery and disease prevention, sanatorium-and-spa treatment in case of different diseases.

GENERAL INFORMATION FOR PREPARATION TO THE PRACTICAL CLASS

Climate and weather as combination of environmental factors

Weather is the physical and chemical characteristics of the bottom layer during the short period of time (hours, days, weeks) (*Weather* is the day-to-day meteorological conditions experienced in a place or area).

Climate is long-term weather regime, repeating in the particular region systematically (*Climate* is the long-term prevailing weather conditions in an area).

So, weather is the changeable phenomenon, while climate is the statistically permanent phenomenon characterizing the particular region.

The weather forming factors:

1. Natural:

The solar radiation intensity (total and erythematous UV radiation, solar illumination duration) and the solar activity (solar spots, active regions, chromospheric bursts, radio-wave radiation);

The type of underlying surface (snow, water, soil etc.);

The atmospheric motion (cyclones, anticyclones, atmospheric fronts, trades, monsoon etc.).

2. Antropogenic:

The atmosphere pollution by industrial waste (smog);

The destruction of the woods, land reclamation (melioration), irrigation, formation of artificial reservoirs;

The weather type depends on region climate and time of the year.

The weather characterizing factors:

1. Heliophysical:

- the solar radiation intensity (total and erythematous UV radiation, the solar illumination duration);

- the solar activity (solar spots, active regions, chromospheric bursts, radio-wave radiation);

2. Geophysical:

- the planet and abnormal geomagnetic intensity, geomagnetic storms, impulses.

3. Atmospheric electricity:

- the atmospheric electric field intensity, atmospheric electroconductivity, air ionization, electromagnetic oscillation and discharges.

4. Meteorological factors:

- air temperature, surface radiation temperature;
- air humidity;
- direction and air movement speed;
- atmospheric pressure.

5. Synoptic phenomena:

- the cloudiness, precipitations and their characteristics (rain, snow etc.).

6. Chemical characteristics of the bottom layer:

- concentrations of oxygen, carbon dioxide, atmospheric pollutants.

The climate forming factors:

The geographical latitude of the region determinates the sun-raising above the horizon, the solar radiation intensity per earth surface;

The height above sea level and the relief (flat and undulating grounds, highlands);

The surface type (forests, forest-steppes, steppes, deserts, water reservoirs);

The closeness to seas, oceans, the type of the nearby sea currents (warm, e.g. Gulf Stream, cool, e.g. Labrador Current);

The air circulation types (cyclones, anticyclones, atmospheric fronts, trades, monsoon, wind strength and duration, that dominate in the region, for example phene, north, bora, sirocco ect.).

The climate characterizing factors:

1. Regional temperature conditions are characterized by the following parameters:

- the absolute minimum temperature;
- the absolute maximum temperature;
- the average annual temperature amplitude (range);
- the average temperature of January;
- the average temperature of July;
- the average annual temperature.

2. Air humidity is characterized by the following parameters:

- the minimum humidity;
- the maximum humidity;
- the average annual humidity;
- the annual amount and character of precipitations (rain, snow);
- the average mouth precipitations;
- the total days with precipitations;
- the average days with precipitations during the month;
- the total number of „dry-days" (without the precipitations) during the year;
- the total number of „moist-days" (rainy, snowy) during the year.

3. Atmospheric pressure is characterized by the following parameters:

- the minimum pressure;
- the maximum pressure;
- the average annual pressure;
- the amplitude of pressure difference.

4. Air movement direction and speed is characterized by the following parameters;

- the region of "wind rose", the windy and calm days ratio during the year;
- the maximum air movement speed;

- the average annual wind speed.

5. The light climate is characterized by the following parameters:

- the monthly average minimum horizontal illumination;
- the monthly average maximum horizontal illumination;
- the average annual horizontal illumination;
- the total annual number of sunny days;
- the month with maximum sunny days;
- the month with minimum sunny days;
- the monthly average minimum intensity of the solar radiation;
- the monthly average maximum intensity of the solar radiation;
- the average annual intensity of the solar radiation.

6. The soil:

- soil types: dry, swamped soils;
- the frost zone of the soil;
- the duration of snow cover deposition;
- the duration of heating season.

The Earth climate classification

Name of the climate zone	*Geographical latitude*	*Average annual temperature*	*Surface type**
1. Tropical	±13° latitude	+20-24°C	Evergreen forests, jungle
2. Hot	13-26° -„-	+16-20°C	Forests, steppe, desert
3. Warm	26-39° -„-	+12-16°C	Forests, steppe, desert
4. Moderate	39-52° -„-	+8-12°C	Forest-steppe
5. Cold	52-65° -„-	+4-18°C	Forests
6. Inclement	65-78° -„-	0-4°C	Forests, tundra
7. Arctic (polar)	69-90° -„-	-4° and below	Tundra

The five climate zones can be defined in the Ukraine: the marshy woodlands, forest-steppe, steppe, the Carpathian Mountains, the south coast of the Crimea.

The zoning of the Ukraine territory is used for weather forecast in weather bureau: the north part (Zhytomyr, Kyiv, Chernihiv and Sumy regions), the west part (Lviv, Zakarpattya, Ivano-Frankivsk, Ternopil, Khmelnytskyy and Chernivci regions), the central part (Vinnytsya, Cherkasy, Poltava, Kirovograd and Dnipropetrovsk regions), the east part (Kharkiv, Lugansk and Donetsk regions) and the south part (Odesa, Mykolayiv, Kherson and Zaporizhzhya regions) and

the Crimea the steppe part of the Ukraine. The south coast of the Crimea is considered as a separate climate zone.

Medical weather classification by V.F. Ovcharova

The weather characteristics from the medical view	*The weather pattern characteristics*
Stable indifferent	The slow-moving anticyclone without atmospheric fronts
Unstable, passing from indifferent to „spastic" type	Destruction of the anticyclone. An approach of an inclination, a crest, a non-gradient region with increased pressure.
	An approach of a cold front or an occlusion front as a cold type.
„Spastic" type	An establishment of an inclination (ridge), a crest, a non-gradient region with increased pressure.
	A cold frontal passage or an occlusion frontal passage as a cold type.
Unstable „spastic" type with elements of „hypoxic"type	The retreat of a cold front or an occlusion front as a cold type
	An approach of a cyclone, a saddle, a dish, a non-gradient region with low pressure
	An approach of a warm front or an occlusion front as a warm type
„Hypoxic" type	The retreat of a cyclone, a saddle, a dish, a non-gradient region with decreased (reduced) pressure
	A warm front passage of an occlusion frontal passage as a warm type
Unstable „hypoxic" type with elements of „spastic" type of weather	An establishment of a cyclone, a saddle, a dish, a non-gradient region with decreased pressure
	The retreat of a warm front or an occlusion front as a warm type
	An approach of a inclination (ridge), a crest, a non-gradient region with increased pressure
„Spastic"type weather passing to stable indifferent	An establishment of an anticyclone after a cold front
	A formation of a local anticyclone

Topic №5

Methods for measuring speed of air and its influence

1.Learning objective

1.1. Master, complement and systematize student's knowledge about the hygienic significance of the atmospheric and indoor air movement direction and speed as the microclimate factor in residential, public and industrial premises.

1.2. Master the methods of determination and hygienic assessment of the air movement direction and speed.

2.Basics

2.1. You should know:

2.1.1. Hygienic significance of the atmospheric and indoor air, its role in the microclimate formation and mechanisms of the organism heat exchange.

2.1.2. Methods and devices for determination of the air movement direction and speed outdoors and indoors.

3.Self-training questions

3.1. Physical basics of the air movement. The significance of solar radiation and the type of underlying Earth surface for the formation of winds.

3.2. Hygienic significance of the atmospheric air movement, its influence on the purity of atmosphere, formation of the climate and the weather. The influence of strong winds on the environment, physiological state of organism, its psycho-emotional activity.

3.3. Usage of the dominant wind direction for the preventive sanitary inspection during the projection of the residential settlements, industrial premises, recreation areas.

3.4. Significance of the air movement for microclimate formation, its influence on the organism heat exchange, convective and evaporative heat loss.

3.5. Systems for the indoor air movement improvement. The natural and artificial ventilation.

3.6. Classification and properties of devices for the air movement direction and speed determination.

GENERAL INFORMATION FOR PREPARATION TO THE PRACTICAL CLASS

The *wind direction* is defined as a side of horizon from which the wind blows and is pointed with rhumbs - 4 basic (North, South, East, West) and 4 intermediate (N-W, N-E, S-W, S-E).

"Wind rose" is used in meteorology, aero- and hydronavigation, hygiene. In hygiene the „wind rose" is used for the following purposes: rational building planning and correct location of the buildings relatively to each other during the regular sanitary inspection of the construction of settlement, industrial, health-improving objects and recreation areas.

The atmospheric air movement direction is determined using the streamer (on ships), weather vanes of different constructions or fabric cones (on aerodromes).

The indoor air movement is quite slow, so the indoor air direction may be determined using fumigator (fume synthesized by some means) or the candle flame inclination.

TRAINING INSTRUCTION

on the determination of the air movement speed using anemometers

The atmospheric air movement (and air movement in ventilation openings) is determined using such anemometers as revolving-cup/cup (is air velocity is from 1 to 50 m/sec) and revolving-vane (air velocity 0.5 - 10 m/sec) (fig. 7.2). The measurement procedure of vertically posed revolving-cup anemometer does not depend on the wind direction; axis of revolving-vane device needs to be oriented accurately to the wind direction. The counter has to be disconnected from the turbine and then the counter dial initial data (thousands, hundreds, tens and numbers) is written down to start the air movement speed determination. Then the anemometer is exposed at the measurement site (e.g. in the open window aperture, ventilation opening, outdoors). The revolution counter and the stopwatch are switched on simultaneously after 1-2 minutes of blank run. The counter is switched off 10 minutes later and new data are read from the counter dial, and the number of impeller revolutions is calculated (number of scale marks per second -A) using the following formula:

$$A = \frac{\mathrm{N2} - \mathrm{N1}}{\mathrm{t}}$$

where: N_1 - indices of the device scale before measurement; N_2 - indices of the device scale after measurement;t - measurement duration in seconds.

Wind strength is determined using the 12-mark scale: from calm - 0 marks (air movement speed is 0 -0.5 m/sec.) to hurricane - 12 marks (air movement speed is 30 m/sec and above).

Scale of air movement speed in marks

Mark	*Wind strength*	*Air movement, m/sec.*
0	Calm	0.0 - 0.5
1	Barely perceptible breeze	0.6- 1.7
2	Gentle breeze	1.8 - 3.3
3	Light breeze	3.4 - 5.2
4	Minor wind	5.3- 7.4
5	Fresh wind	7.5- 9.6
6	Strong wind	9.7-12.4

7	Very strong wind	12.5-15.2
8	Extremely strong wind	15.3-18.2
9	Storm	18.3 - 21.5
10	Strong storm	21.6 - 25.1
11	Very strong storm	25.2 - 29.0
12	Hurricane	29.0 and above

TRAINING INSTRUCTION

on determination of the indoor air movement in different premises using catathermometer

Catathermometer allows to determine very low air movement speeds (from 0.1 to 1.5 m/sec). The device consists of the alcohol thermometer with cylindrical or ball reservoir. The scale of cylindrical catathermometer is graduated from 35 to 38°C, ball catathermometer - from 33 to 40° C.The catathermometer operation principle is the following. Pre-heated device loses its heat to not only due to the air and the radiant temperature influence, but also due to the air movement proportionally to its speed. Catathermometer is used for determination of the air cooling capability. Based on its value the air movement speed is calculated.

Assessment of the wind strength and speed according to the Beaufort scale

Mark	*Weather vane points*	*Wind speed, m/sec*	*Wind description*	*Characteristics and observed effects*
0	0	0 ... 0,5	Calm	Smoke rises vertically, leaves are still
1	0-1	0.6 ... 1.7	Light air	Direction shown by smoke
2	1-2	1.8 ... 3.3	Light breeze	Wind is felt on the face; wind vane moves
3	2 and 2-3	3.4 ... 5.2	Gentle breeze	Wind extends a light flag, leaves and twigs move
4	3 and 3-4	5.3 ... 7.4	Moderate breeze	Raises dust and loose paper, move small branches on trees
5	4 and 4-5	7.5 ... 9.8	Fresh breeze	Small trees in leaf start to sway; flag ripple
6	5 and 5-6	9.9 ... 12.4	Strong breeze	Large trees sway; flags beat; umbrellas used with difficulty
7	6	12.5 ... 15.2	Moderate gale	Whole trees sway; walking into the wind is difficult
8	6-7	15.3 ... 18.2	Fresh gale	Twigs break off trees; walking is hindered
9	7	18.3 ... 21.5	Strong gale	Slight damage
10		21.6 ... 25.1	Whole gale	Trees uprooted; severe damage
11		25.2 ... 29.0	Storm	Widespread damage
12		29 and above	Hurricane/tornado	Extremely violent; devastation

Topic №6

Natural lighting, methods of measurement

1. Learning objective

1.1 Learn the hygienic requirements for natural lighting in different premises.

1.2 Master the geometrical, lighting engineering methods of natural lighting indices determination, to learn how to assess the results of instrumental measuring, and to draw a hygienic conclusion about natural lighting in differing premises.

1.3 Determination of the surface brightness.

2. Basics

2.1. You should know:

2.1.1. Physical characteristics and hygienic significance of natural lighting, tasks and criteria of its assessment considering the type of visual works and functions of the premises.

2.1.2. Physiological functions of the visual analyzer, their dependence on illuminance.

2.1.3. Main harmful effects of insufficient and excessive lighting on human health and work capacity. The influence of lighting on shortsightedness development.

2.1.4. Measuring methods and indices of the natural lighting.

3.Self-training questions

3.1. Physical nature and the hygienic significance of lighting in different premises (residential, classrooms, workshops, medical and other).

3.2. Basic lighting engineering values (light power, light flow or luminous flux, spectrum, illumination, brightness, light transparency coefficient, and luminous emitance) and their measurement units

3.3. Internal and external factors that influence the level of natural lighting in different premises.

3.4. Hygienic requirements for the natural lighting in different premises.

3.5. Indices and standards of natural lighting in different premises.

3.6. Geometrical methods of assessment of lighting in premises during preventive and regular sanitary control (lighting coefficient, angle of incidence, angle of aperture, depth, and premises depth coefficient determination).

3.7. Lighting engineering methods of lighting assessment in different premises. Lighting measurement by luxmeter. Determination of the daylight factor factual value during the regular sanitary control.

3.8. Methods of insolation regimen assessment in different premises.

GENERAL INFORMATION FOR PREPARATION TO THE PRACTICAL CLASS

1. **External factors that influence natural lighting:**

- the territory latitude and its climate (number of sunny and cloudy days);

- season of the year and time of the day, when the premises are being used, existence of objects producing shadow (buildings, trees, hills, mountains).

2. **Internal factors:**

- name and function of premises;

- window orientation, floor;

- type of natural lighting, (light aperture location), (one-side, two-side, upper and combined);

- number of windows, their construction (one-framed, two-framed, combined);

- clarity and quality of glass, existence of objects producing shade (flowers and curtains);

- the window-sill height, distance from the window top edge to the ceiling;

- brightness (reflection ability) of the ceiling, walls, equipment and furniture

Types of premises insolation regimen

Premises insolation regimen	*Orientation of windows*	*The duration of insolation, hours*	*The insolated area of the floor,%*
Maximum	South-East, South-West	5-6	80
Medium	South, East, West	3-5	40-50
Minimum	North-East, North-West, West	less than 3	till 30

Factors that influences on intensity and duration of daylight of rooms are:

1. The *size of the windows,*
2. *Form of the windows,*
3. *Disposition of the windows.*

Orientation of the windows on the world sides in some rooms:

- *hospital wards* (*patient room*) - on the South or South-East ;
- *operation room* - on the North;
- *reanimation room* - on the North, North -West, North-East;
- *classroom*-on the South, South- East or East

The day lighting in room depends on:

- distance between buildings,
- height of the building,
- proximity and height of green plantations.
- colorings of a ceiling, floor, walls
- angle of opening
- angle of incidence of light rays
- coefficient of depth
- coefficient of natural illumination
- light coefficient

The *size of the windows*

Hygiene has established standards of a glass area of windows to regulate amount of day light in rooms. It is recommended to have a glass area of windows (not windows area) which would be equal, for dwelling, not less than ⅛ of area of a floor.

Light coefficient (LC) *is a ratio of a glass area of windows to area of a floor*.

For living rooms LC = 1:6 - 1:8,

For hospital wards, the doctor's rooms, study rooms 1:5 - 1:6,

for operation rooms, laboratory 1:3 - 1:4,

for corridor 1:10 - 1:12.

Coefficient of Depth (DC)

This is an attitude of distance from the window to the opposite wall to distance from the upper edge of the window to a floor. The hygienic norm DC is not than 2.

DC = distance from the window to the opposite wall / distance from the upper edge of the window to a floor

Coefficient of natural illumination

The basic lighting engineering parameter for a normalization of daylight is coefficient of natural illumination (CNI). CNI = lighting indoors / lighting outdoor. This ratio of lighting indoors to simultaneous lighting outdoor, is expressed in %.

For living rooms CNI should be not less than 0,5 %,

for hospital wards not less than 1 %,

for study room - not less than 1,5 %,

for operational room - not less than 2,5 %.

The angle of opening

The angle of opening of light rays is an angle between a horizontal surface of a table, and line conducted from this surface to the upper edge of the object with darken the window (building or tree). Hygienic norm for the angle of opening is not less than 5°.

Topic №7

Artificial lighting, methods of measurement

1.Learning objective

1.1. Learn the role and the meaning of the rational artificial illumination as the means of lengthening the activity period of the people, and the disease and fatigue prevention.

1.2. Master the methods of the measurement and hygienic assessment of artificial illumination in different premises with the help of a luxmeter and calculation methods. Determination of the surface brightness.

2.Basics

2.1. You should know:

2.1.1. Physical basis of illumination, concepts and measurement units for light.

2.1.2. Physiological functions of the visual analyzer, their dependence on illuminance.

2.1.3. Hygienic requirements and significance of artificial illumination in different premises.

2.1.4. Types of artificial illumination and their comparison (advantages and disadvantages).

2.1.5. Factors that influence the level of artificial illumination.

2.1.6. Methods of artificial illumination assessment and the principles of its hygienic regulation.

3.Self-training questions

3.1. Hygienic significance of artificial illumination as an environmental factor in the modern world.

3.2 Influence of artificial illumination on the functional state of the central nervous system and on the work capacity.

3.3. Influence of artificial illumination on human vision.

3.4. Basic light engineering and technical concepts and units of their measurement.

3.5. Comparative hygienic assessment of different sources of artificial illumination (the advantages and disadvantages of incandescent and luminescent lamps).

3.6. Basic parameters of illumination and the factors that influence the level of illuminance.

3.7. Illuminance determination using the „Watt" calculation method, its essence and main calculation stages.

3.8. Methods of the determination of the illumination evenness, its hygienic significance.

3.9. Methods of the determination of the surface brightness, its hygienic significance.

3.10. Legislative documents that regulate natural and artificial illumination in different premises and other objects of different purpose.

GENERAL INFORMATION FOR PREPARATION TO THE PRACTICAL CLASS

1. The artificial illumination (same as natural) is characterized by:

- *light intensity* (I)- the light source capacity, measured in candles (Cd). It's a light intensity, that generates the monochrome radiation of the $540*10^{12}$ Hz frequency in certain direction, with radiant intensity in that direction of 1/683Wt/ steradian;

- *light flow (luminous flux*) (F) - the density of light, measured in lumens (lm) - light flow, radiated by the individual source with intensity of 1 cd in the solid angle of 1 steradian. The solid (spatial) angle is the cone, which, if its top is considered to be in the center of the sphere, cuts the surface, equaling to the squared radius of that sphere from it;

-*lluminance* (E)- the amount of light falling on a surface (surface density of the light flow)

$E = \frac{F}{S}$, where S is the illuminated surface area, m^2. The illuminance is measured in luxes. 1 lux is the illuminance of the 1 m^2 surface, illuminated by the light flow of 1 lumen;

- *brightness* (B) - light intensity, at which the light is radiated or reflected from the surface in certain direction

- *reflection coefficient* - the ratio of the reflected light flow to the light flow received by the surface

- *optical transmission coefficient* - is the light flow, which goes through the medium, divided by the light flow, which falls on that medium.

luminosity (M) - surface density of the light flow, expressed in lm, which is radiated from the $1m^2$ surface (lm/m^2).

Living place	Level of least illumination (lux)	
	By incandescence lamps	By luminescent lamps
Dwelling room	75	100
Kitchen	100	100
Closet, bathroom	30	50
Hall	50	50
Stairs	10	50

There are 3 types of luminescence lamps:

- daylight luminescence lamps
- white-light luminescence lamps
- warm-white-light luminescence lamps

Daylight luminescence lamps

The defect of the *daylight luminescence lamp* is that human skin in this light looks unhealthy, cyanotic.That`s why they are not used in hospital and school rooms.

White-light luminescence lamps

Comparing with daylight lamps the spectrum of *white-light luminescence lamps* is richer with yellow rays. During lighting with such lamps high workability of an eye is kept and skin looks better. Used at schools, apartments, hospitals.

Warm-white-light luminescence lamps

Spectrum of *warm-white-light lamps* is rich with yellow and pink rays and decreases eye`s workability, but considerably improves colour of skin. Used for illumination of stations, cinemes, underground.

Important advantages of fluorescent lamps

1)the light from such lamps can be made to approximate the quality of daylight

2) the efficiency of the fluorescent lamp is high

3) fluorescent tube taking 40 watts of energy produces as much light as a 150-watt incandescent bulb

4) fluorescent lamps produce less heat than incandescent bulbs for comparable light production

2. Human vision

- *visual acuity (the recognition ability)* is the ability of the visual analyzer to recognize the smallest elements of the object. It's determined by the smallest angle, under which the two adjacent spots are recognized as separate. The visual acuity is conventionally considered to equal to one angular minute. The visual acuity grows proportionally to the illuminance until it reaches 130-150 lux. When the illuminance is above that point, the visual acuity growth slows down.

- *contrast sensitivity* is the ability of the visual analyzer to perceive the minimum difference between the brightness of the object and the background. It reaches its highest level when the illuminance is 1000-2500 luxes;

- *visual perception speed* is the time, required to recognize the details of the object. This speed grows until the illuminance reaches 150 luxes. After that point, the growth slows down unproportionally to the illuminance growth;

- *visibility* is the integral function of the visual analyzer, which is the combination of its main functions - visual acuity, contrast sensitivity, visual perception speed;

- *clear vision stability* is the time, during which the object can be clearly seen to the total time of the object examination. Physiologically this function of the visual analyzer based on the destruction of the visual purple (rhodopsin) under the influence of the light and formation of the protective black pigment on those parts of the retina, where the picture is the brightest. This function reaches its optimal value at the illuminance of 600-1000 luxes. Its reduction is the evidence of the visual analyzer fatigue;

- *color recognition function.* White, black, grey - achromatic colours are only characterized by brightness and light flow intensity. Chromatic colours (monochromatic) are characterized by brightness and chromaticity. Vision is the most sensitive to the yellow and green part of the visual spectrum and the least sensitive to the violet light. During the twilight or under the artificial illumination (especially with incandescent lamps) the visual analyzer's colour recognition reduces and may distort;

- *adaptation* is visual analyzer's ability to reduce its sensitivity during the change from low to high illumination (light adaptation), (achieved very quickly, (in 2-3 minutes) and is caused by the visual purple conversion into the protective black pigment in the retina), and to increase it again when the illumination changes from high to low level (adaptation to darkness),

which takes much longer - up to 40-60 minutes and is caused by the restoration of the visual purple in the retina;

- *accommodation* is the ability of the eye to regulate the visual acuity depending on the distance to the examined object and illumination due to the changes in the light refraction in the optic system of the eye, which is mostly caused by the chrystalline lens curvature change. The curvature will increase when the illumination is less than 100-75 luxes. So, in such circumstances the object must be closer to the eye for the proper recognition;

The insufficient illumination leads to the overstrain of accommodation system, overstrain of the visual analyzer, and for children and adolescents (their eye has not yet formed completely) it may cause the myopia (short-sightedness) especially if they have the congenital disposition;

- *critical flicker frequency* is determined by the time, during which the afterimage remains in the visual analyzer: the image of an object, which has disappeared from the visual field still remains visible for some time depending on the object brightness. This visual function is based on the same processes of visual purple destruction and restoration. The cinema, one of the most important human inventions, is based on it. The frequent change of the frames and the almost similar objects (25 frames per second), and the darkening of the screen provides dynamic and continuous picture.

Topic №8

Methods for determining the concentration of CO_2 and oxidation of wind as indicators of anthropogenic pollution of air and ventilation.

1. Learning objective

1.1. Get familiar with the factors and indicators of the air pollution for indoor residence and manufacture areas.

1.2. Master the methods hygienic assessment of the air purity and efficiency of the indoor ventilation.

2. Basics

2.1. You should know:

2.1.1. Physiological and hygienic significance of the air components and their influence on the human health and sanitary conditions.

2.1.2. Sources and indicators of communal, domestic, public and industrial air pollution, their hygienic regulations.

2.1.3. Indoor air circulation. Types and classification of the indoor ventilation, main parameters of the ventilation efficiency.

3.Self-training questions

3.1. Chemical composition of the atmospheric and expired air.

3.2. Main communal, domestic, public and industrial air pollution sources. Criteria and indicators of the air pollution (physical, chemical, bacteriological).

3.3. The residential indoor air pollution sources. The air oxidability and carbon dioxide as sensitive indirect characteristics of the air pollution by people.

3.4. Influence of the various carbon dioxide doses on the organism.

3.5. Express methods of the carbon dioxide concentration determination in the air (methods by Lunge - Zeckendorf, Prokhorov, interferometrical).

3.6. Indoor ventilation and its hygienic significance. Types and classification of the ventilation of the communal, domestic and industrial premises.

3.7. Indicators of the ventilation efficiency. The required and actual volume and ventilation rate, methods of their determination.

3.8. Air conditioning. The principles of air-conditioners constructions.

GENERAL INFORMATION FOR PREPARATION TO THE PRACTICAL CLASS

Hygienic characteristics of the indoor sanitary condition and ventilation

The chemical composition of the atmospheric air is: nitrogen - 78.1%; oxygen - 21.0%; carbon dioxide - 0.03-0.04%; inert gases - 0.7-1.0%; moisture usually from 40-60% till the full saturation; dust, microorganisms, natural and anthropogenic pollutions depending on the

1. industrial development of the region, surface type (desert, forest-covered region etc.)
   The main air pollution sources of the inhabited regions and industrial areas are the production plants, motorized transport; industrial dust and gas; meteorological factors (winds) and
2. surface type of the regions (dust storms of arid settlements without green plantations).
   The main air pollution sources of the residential, communal, domestic and public premises are the products of the human metabolism, generated by skin and respiration (sweat, skin fat, necrotic epidermis degradation products and others). These products are thrown out into the indoor air proportionally to the number of people present and duration of their stay indoor and carbon dioxide volume. The carbon dioxide is accumulated in the air in proportion to the
3. listed pollutants and may be used as an indicator of the pollution with these products.
   The organic metabolic products are extracted though the skin and by respiration generally. That is why the air oxidability was suggested as the other pollution indicator for the assessment of the indoor air pollution induced by human. The oxidability index is measured as the atomic oxygen volume required for oxidization of organic products in 1B m^3 of the air.

The air is pure if this index doesn't exceed 4-6 mg/m^3. The oxidability air index may be 20 and above mg/m^3 in the rooms with the adverse sanitary state.

4. Indoor carbon dioxide concentration is increased proportionally to the number of people and duration of their stay inside. Although it normally does not reach the hazardous levels, nevertheless it does indicate the level of the air pollution with the other metabolism products. The carbon dioxide concentration may reach the hazardous for human organism or even life level only in the enclosed non-ventilated areas (dug-outs, submarines, underground openings, industrial areas, sewer systems etc.) due to fermentation, combustion, putrefaction.

The increase of the CO_2 concentration by 2-2.5% does not cause noticeable deviations in the human health and work ability, according to the research by M.P.B Brestkin and other authors. Concentrations up to 4% may cause the increase in the respiration intensity, the cardio-vascular functions and reduction of the work capacity. Concentrations up to 5% are accompanied with dyspnea, increase of the cardiac function, decrease of workability. 6% CO_2 concentration causes the mental activity decrease, the headaches, dizziness; 7% causes the inability to control oneself, fainting and even death. 10% concentration results in rapid, and in 15-20% cases - sudden death because of the respiratory paralysis. Some methods were elaborated for CO_2 concentration determination in the air: method with barium hydrate by Subbotin-Nagorskiy, methods by Reberg-Vinokurov, Kalmikov, interferometrical method. The portable express method by Lunge-Zeckendorf modified by D.V.B Prokhorov is the most widely used in the sanitary practice.

Type of premises	*Ventilation rate, per hour*	
	outlet ventilation	inlet ventilation
Building norms and rules 2.08.02-89 - patient care institutions		
Adult ward	80 m^3 per 1 bed	
Prenatal ward, dressing ward	1.5 times/hour	2 times/hour
Delivery room, preoperative and operative wards	8 times/hour	
Postnatal ward	80 m^3 per 1 bed	
Children ward	80 m^3 per 1 bed	
Box, semi-box	2.5 times/hour into corridor	2.5 times/hour
Consulting room	1 time/hour	1 time/hour
Building norms and rules 2.08.01-89 - residential premises		
Living room		3 m^3/hour on 1 m^2 of the area
Gasified kitchen		90 m^3 /hour
Lavatory, bathroom		25 m^3/hour
State building norms and rules 2.2-3-97 - Buildings and constructions of educational institutions		
Classrooms, study area	16 m^3 per 1 person	1 time/hour
Workshop	20 m^3 per 1 person	1 time/hour
Gym	80 m^3 per 1 person	1 time/hour
Teacher’s common room		1.5 times/hour

Topic №9

Technique of the sanitary inspection of water supply sources

1.Learning objective

1.1. Master the technique of sanitary inspection of water supply sources and water sampling for bacteriological and sanitary-and-chemical analysis.

2.Basics

2.1. You should know:

2.1.1. Hygienic significance of water (physiologic, endemic, epidemiological, toxicological, balneal, climate and weather-forming, economical and domestic, pertaining to national economy).

2.1.2. Classification of water supply sources and their hygienic characteristics.

2.1.3. Programme of sanitary inspection of water supply sources: sanitary-and-topographic, sanitary-and-technical, sanitary-and-epidemiological.

3. Self-training questions

3.1. Classification of natural water supply sources, conditions of water generation in them and their comparison

3.2.Artificial indoor and outdoor water reservoirs, hygienic conditions of water accumulation and storage in them.

3.3. Basic hygienic requirements for centralized domestic and drinking water supply sources.

3.4. Hygienic assessment of water clarification and decolouration. The essence of coagulation, precipitation and filtration (penetration). Facilities used for this purpose.

3.5. Water disinfection using ozonation and ultraviolet radiation, their hygienic characteristic.

3.6. Waste water purification as the procedure for sanitary control of water reservoir pollution.

3.7. Methods of determination of water volume and discharge (output) of water supply sources.

GENERAL INFORMATION FOR PREPARATION TO THE PRACTICAL CLASS

Water physiological functions:

- flexibility - about 65 % of body mass of adult person consists of water. 70 % of water is the intracellular water, 30 % - extracellular water (in blood), (7%) - lymph and 23 % - intertissue fluid. Water makes up 20 % of the bone mass, 75 %, of the muscle mass, 80% of the connective

tissue mass, 20% of blood plasma mass, 99% of vitreous body of an eye. Major part of water is a component of macromolecular complexes of proteins, carbohydrates and fats, forming the jelly-like colloid cells and extracellular structures together with them. The smaller part of it is in a free state;

- participation in metabolism and interchange of energy - all assimilation and dissimilation processes in organism occur in water solutions;

- role in support of osmotic pressure and acid-base balance;

- as a component of dietary intake and a source of macro- and microelements supply to organism;

Epidemiological and toxicological role of water

Water can participate in spread of infections in the following ways:

- as transfer factor of pathogens with the fecal-oral transfer mechanism: enteric infections of bacterial and viral origin (typhoid, paratyphoid A,B,cholera, dysentery, salmonellosis, coli-entheritis, tularaemia /deep-fly or rabbit fever/, viral and epidemic hepatitis A, or Botkin disease, viral hepatitis E, poliomyelitis and other enterovirus diseases, such as Coxsakie, ECHO etc.); geohelminthosis (ascaridiasis, trichocephaliasis, ankylostomiasis); biohelminthosis (echinococcosis, hymenolepiasis); of protozoal etiology (amebic dysentery (amebiasis), lambliasis); zooanthroponosis (tularemia, leptospirosis and brucellosis);
- as a transfer factor of pathogens of the skin and mucous membrane diseases (when swimming or having another contact with water): trachoma, leprosy, anthrax, contagious molluscum, fungous diseases (i.e., epidermophytosis);
- as the habitat of disease carriers - anopheles mosquitoes, which transfer malarial haemamoeba and others (open water reservoirs).

Symptoms of water epidemics:

- simultaneous appearance of big number of enteric infected people, i.e. jump of population morbidity - so-called epidemic outburst;
- people who used the same water source, the same pipeline of water supply network, the same water-pump, shaft well etc. will suffer from diseases;
- morbidity level will stay high for the long period of time to the extent of water contamination and consumption;
- morbidity curve will have one, two, three, or more peaks. First of all those diseases that have short incubation period will be registered (coli-entheritis, salmonellosis - 1-3 days, cholera - 1-5 days, typhoid - 14-21 days and at last - those with the longest period: virus and epidemic hepatitis A and E - 30 days and more);
- after the taking of antiepidemic measures (liquidation of the contamination source, disinfection of water supply network, sanitation of wells) the outburst fades away and morbidity goes down drastically;\
- still, for some time morbidity remains above the sporadic level вЂ“ so-called epidemic tail. This is caused by the appearance of big amount of new potential sources of infection (sick people and infection carriers) during the epidemic outburst and activation of other ways of the pathogenic microorganisms spreading from these sources.
- domestic contact (through dirty hands, dishes, children toys, personal hygiene articles), through food or by living carriers (flies) etc.

Domestic and economic role of water

Sanitary-hygienic and domestic functions of water include:

- water usage for cooking and as a part of dietary intake;
- usage of water as means of keeping body, clothes, utensil, residential and public premises and industrial areas, settlements clean;
- watering of the green areas within settlements;
- sanitary-transport and disinfection functions of water - disposal of residential and industrial waste through sewer system, waste processing on plants, self-purification of water reservoirs;
- fire fighting, atmospheric pollution clearing (rain, snow).

Economical functions of water:

- usage in agriculture (irrigation in crop and gardening, greenhouses, poultry and cattle breeding farms);
- industry (food, chemical, metallurgy etc.);
- as the route of passenger and cargo transportation.

Sanitary inspection includes three main stages:

- sanitary-topographic inspection of water source environment;
- sanitary-technical inspection of condition of water source equipment;
- sanitary-epidemiological inspection of area of water source location.

Main task of sanitary-topographic inspection of water source is to discover possible sources of water pollution (dumps, refuse pits, lavatories, livestock farms, cemeteries etc.), distances from them to water source, topography of the locality, (drain direction of rain and snow waters towards water source or in another direction, flow direction of ground.

The ***purpose of sanitary-technical inspection*** **i**s to give a hygienic assessment of condition of technical equipment of hydraulic works at water source. Thus, in case of decentralized (local) water-supply, accuracy of allocation and exploitation of the mineshaft (availability and condition of log cabin, awning, riprap, devices for water lifting, „loamy key trench"); in case of centralized water-supply from ground middle water source - accuracy of arrangement and condition of artesian well, water lifting pumps; in case of surface water source - of diversion scoop and coastal sink. In case of centralized water-supply, sanitary-technical condition of main facilities of water-pipe, water supply network and constructions on it (namely, water-pumps).

Sanitary-epidemiological inspection is aimed to discover and consider the following:

- presence of intestinal infectious diseases (cholera, typhoid, paratyphoid A, B, dysenteries, virus hepatitis etc.) among population, which uses water from this source or lives close to it;
- presence of epizootic diseases (tularemia, brucellosis, anthrax, murrain, mad cow disease (BSE) etc.) among rodents, domestic animals;

- sanitary condition of the settlement (pollution of the territory, methods of collection and disinfection of liquid and solid domestic and industrial waste etc.).

Topic №10

Methods of hygienic assessment of drinking water

1.Learning objective

1.1.Master requirements to drinking water quality and hygienic importance of some of its indices.
1.2.Acquire the method of the analysis reading and drinking water quality assessment for local and centralized water supply.

2.Basics

1.1.You should know:

1.1.1.Hygienic indices and standards of drinking water quality (physical, organoleptic, chemical composition) and pollution indices (chemical, bacteriological - both direct and indirect), their scientific substantiation.
1.1.2. Concept and characteristics of centralized (domestic and drinking water pipeline) and decentralized (wells, groundwater intake structures, catchments) water supply systems.
1.1.3. Hygienic characteristic of conventional and special methods of water quality improvement, technology of their implementation on main facilities of water pipeline at centralized water supply systems.
1.1.4. Scope of measures during sanitary inspection of exploitation of main facilities of water pipeline (individual components of water pipeline and water supply network) as well as wells and groundwater intake structures (catchments).

3.Self-training questions

1.1.Influence of drinking water quantity and quality and water supply conditions on the population health level and the sanitary conditions of living.

1.2 Water supply rates and their substantiation.

1.3.Waterborne infectious diseases. Peculiarities of waterborne epidemics, their prophylaxis.

1.4. Diseases of noninfectious origin, which are caused by use of poor quality water and methods of their prevention.

1.5. Problem of waterborne macro- and microelementoses of water origin. Hygienic importance of water hardness. Endemic fluorosis and its prevention.

1.6. Standard methods of water purification for centralized water supply system
. (coagulation, precipitation, filtration).

GENERAL INFORMATION FOR PREPARATION TO THE PRACTICAL CLASS

Hygienic characteristics of water supply systems of settlements

There are centralized and decentralized water supply systems.

Centralized system (water pipeline) includes: source of water (middle water with or without pressure, open natural water reservoir or artificial storage reservoir), water intake facility (artesian well, artificial flooding with waterside intake well equipped with filter system), water-lifting facility (water-engines or pumps of the first lifting), main facilities of water supply station, where water clearing, discolour, disinfection are executed, and sometimes there also takes place special water treatment (fluorination, defluorination, deferrization etc.) to improve water quality, reservoirs for water storage (reservoirs of pure water), water-pumping station of the second lifting and water supply network вЂ“ system of water pipes, which provide consumers with water.

Artesian water (middle water with pressure) often does not need purification, sometimes - only disinfection, rarely application of special methods of the water quality improvement. In case of use of water from open reservoirs in water pipeline, it should obligatory undergo purification, which is performed at treatment facilities of water supply station and provides for water clearing, discolour and disinfection.

Coagulation is used to purify the water - chemical treatment of water with aluminium sulphate according to the following reaction:

$$Al_2(SO_4)_3 + 3Ca(HCO_3)_2 = 2Al(OH)_3 + 3CaSO_4 + 6CO_2$$

After coagulation water comes to sedimentation tanks, then through filters to reservoirs for pure water and by means of pumps of the second lifting it is pumped into water supply network. After the filtration water is obligatory disinfected using ozone treatment, UV radiation or chlorination methods.

Chlorination is the simple, effective and cheapest method of water disinfection, but chlorine imparts unpleasant odour to water, and if there is any chemical pollution (due to discharge of industrial sewage water to reservoirs) chlorination facilitates formation of chlorine-organic compounds, for which carcinogenic action, and formation of chlorophenol compounds having unpleasant odour are inherent. As a result of this method of chlorination with pre-ammoniation has been worked out: preliminary introduction of ammonia solution into water binds chlorine in the form of chloramines, which disinfect water, at the same time chlororganic and chlorophenol compounds do not form.

Most often ***decentralized (local) water supply*** is realised using shaft or tube wells, and more rarely using groundwater intake structures (catchments). Underground (subterranean) water, which accumulates in waterbearing aquifer over the first water-holding horizon, is used in wells. Such water laying depth amounts to some dozens of meters. A well in the conditions of local water supply serves as water intake, water-lifting and water-dispensing facilities simultaneously.

The distance from the well to a water consumer should not exceed 150 m. It is necessary

to place wells considering relief, because wells should be placed higher on slope than all sources of pollution (cesspool, underground filtration area, compost pit etc.) at a distance more than 30 - 50 m. In cases when a potential source of pollution is situated higher on slope than a well due to relief, the distance between them should not be less than 80 - 100 m, and in some cases - even not less than 120 - 150 m.

A well is a vertical shaft of square or circular cross-section that reaches the water-bearing aquifer. Sidewalls of the shaft are fortified with impervious material (concrete, iron concrete, bricks, wood and others). Layer of gravel about 30 cm in height is thrown up onto the bottom. Overground part of the well, which is called the log cabin, should not be less than 1.0 m in height above ground level. When making the well we should build ”loamy key trench” of 2 metres deep and 1 metre wide around the well and a riprap within a radius of 2 m with slope directed away from the well. Drainage ditch should be provided for rainwater drain. There should be a fence within a radius of 3-5 metres around the common wells. Water from the well is pumped up or lifted using winch with public dip-bucket. A log cabin should be tightly covered and a shed should be built over the cover and the winch.

Hygienic characteristics of water quality

General hygienic requirements to drinking water include the following:

-good organoleptic properties (transparency, comparatively low temperature, good refreshing taste, absence of odours, unpleasant aftertastes, colour, apparent to the naked eye inclusions and so on);
- optimal natural mineral composition, which guarantees good taste properties of water, the receiving of some necessary for organism macro- and microelements;
- toxicological safety (absence of toxic substances in hazardous to organism concentrations);
- epidemiologic safety (absence of agents of infectious diseases, of helminthiasis etc.);
- water radioactivity - within the limits of set levels.

Technique (algorithm) of water analysis reading consists of 7 stages.

At the ***first stage*** we define the type of requirements to water quality:

The first type includes requirements to drinking tap water quality when having centralized domestic and drinking water supply. This water should be high quality water and satisfy the required criteria of the active standard (State Standard 2874-82 „Drinking water”.

The second type includes requirements to quality of well (spring) water. It should also be high quality water and satisfy the requirements of Sanitary regulations on arrangement and maintenance of wells and catchments used for decentralized domestic and drinking water supply– 1226-75.

The third type includes requirements to quality of water from sources (underground and surface) of centralized processing and drinking water supply. It is regulated by the State Standard 2761-84 Sources of centralized domestic and drinking water supply. Hygienic, technical requirements and selection regulations.

The fourth type includes requirements to quality of hot water, which should satisfy the requirements of В«Sanitary regulations for design and exploitation of centralized hot water supply systems в„– 2270-80В».

At the ***second stage*** we assign the task: to make up a conclusion about the quality of drinking water from water pipeline or from well, to assess quality and effectiveness of water treatment at the facilities of water supply stations, to define the cause of caries or dental fluorosis initiation among the population, to define the cause of methemoglobinemia progress among children and people of declining years, to ascertain the cause of case of mass infectious disease, to evaluate effect of the new reagents, which are used at water supply stations, or effect of the new polymeric materials, which are used for construction of the facilities of water purification plants or water pipes etc., on drinking water quality.

At the ***third stage*** we assign the programme and the extent of laboratory analyses. To draw a conclusion about the quality of drinking tap water (from pipes or street water intake standpipe) according to State Standard 2874-82 we must make analyses of the physical and organoleptic (odour, taste and aftertaste, spectral colour, turbidity) and the sanitary and microbiological (microbial number and coli index) indices.

At the ***fourth stage*** we check-up the completeness of entered information and period of carrying out of the analyses.

If water sample was taken at a water supply station, from a water intake standpipe or from a shaft well, there should be presented data of sanitary (sanitary and topographic, sanitary and technical, sanitary and epidemiologic) inspection and the results of the laboratory analysis of water according to the programme of the analyses.

If tap water sample was taken, there should be presented the results of the laboratory analysis of water according to the proper programme of the analyses.

Bacteriological analyses should be made during 2 hours after the sampling or not later than in 6 hours only if the sample is kept in cooler at the temperature range 1-8 C.

At the ***fifth stage*** we analyze the data of sanitary inspection and make up the following preliminary conclusions: if there are any reasons to suppose that water is polluted, of poor quality, epidemically dangerous, and if there are conditions for water pollution in the source of water supply, in the well, in the water intake standpipe.

At the ***sixth stage*** we analyze the data of the laboratory analysis of water according to each group of criteria in the following order: 1) physical and organoleptic, 2) chemical and organoleptic, 3) indices of safety according to chemical composition, 4) sanitary and microbiological and 5) sanitary and chemical criteria of epidemic safety. Here we make qualitative and quantitative assessment for each criterion.

At the ***seventh stage*** a doctor draws a general conclusion about water quality according to the task and makes recommendations for the improvement of water quality if it is necessary.

Topic №11

Methods of hygienic assessment of soil

1. Learning objective

1.1. Understand hygienic, epidemic and endemic importance of soil.

1.2. Master the methods of sanitary examination of the territory and soil sampling for laboratory analysis.

1.3. Master the method of assessment of the soil pollution level and degree of its danger for people's health based on the sanitary examination of the land parcel, and the results of soil samples' laboratory analysis.

2. Basics

2.1. You should know:

2.1.1. Hygienic, epidemic and endemic importance of soil.

2.1.2. Indices and the scale for assessment of sanitary condition of soil.

2.1.3. Importance of soil as the medium for domestic and industrial waste treatment.

3. Self-training questions

3.1. Soil, its definition. Hygienic, epidemic and endemic importance of soil.

3.2. Main physical properties of soil (texture compound, humidity, porosity, permeability, filtration ability, air permeability, capillarity, moisture) and their hygienic importance.

3.3. Main abiotic components of soil (solid substance, soil moisture, soil air), their natural chemical compound and hygienic characteristic.

3.4. Soil biocenoses, their classification and hygienic characteristic.

3.5. Soil as a factor in transmission of infectious pathogens.

3.6. Soil pollution sources, their classification and hygienic characteristic.

3.7. Factors and mechanisms that take part in the natural purification of soil.

3.8. Usage of soil for treatment of domestic and industrial waste.

GENERAL INFORMATION FOR PREPARATION TO THE PRACTICAL CLASS

Lithosphere (the earth's crust) - mineral and organic covering of the Earth, which extends from its surface to magma. It consists of lithosphere itself, which is formed from magma rocks destroyed by physical, physicochemical and chemical processes before beginnings of life on Earth, and soil.

Soil is a surface layer of lithosphere (from few millimeters in mountains and up to 10 kilometers in lowlands), which was formed after beginnings of life on Earth as the result of climate, flora and life (microorganisms and roots of higher plants) influence. Soil consists of the surface or fertile layer (0-25 cm) or humus layer, which is characterized by fertility and which is cultivated at growing plants, and of soil itself.

Soils are very different depending on conditions of their formation, first of all on climate and flora. In Ukraine most common are chernozem (black earth soils) (54.0% of territory), then - grey forest soils (18.2% of territory) and sod-podsol soils (7.8% of territory). Soils are composed of mineral matter, air, water, organic matter, and organisms. There are two general types of soils, mineral soils and organic soils. Mineral soils form from decomposed rocks or sediment derived from rocks. Organic soils form from the accumulation of plant material, usually in water-saturated, anaerobic conditions that retard decomposition. Mineral matter is described as texture and comprises half the volume of mineral soils. The other half of the soil volume is composed of voids or holes. These voids fill with water as the soil soaks up rain or flood waters, then are displaced with air as the water drains away, evaporates, or is absorbed by roots.

Soil is necessary for:

- dwellings
- highways
- airports
- recreation areas
- it also provides road fill
- material for water retention structures
- and fulfils many other essential functions.

Waste - these are remains of substances and articles that have been created as the result of domestic, economic and industrial human activity, and cannot be used at the scene of their creation so that their accumulation and keeping make the sanitary condition of the environment worse. They are divided into ***liquid***: 1) sewage from cesspool toilets; 2) ***slops*** (from cooking and dish and floor washing etc.) and 3) ***waste waters***: domestic, industrial, runoffs, municipal waste water and ***solid:*** 1) garbage (domestic refuse); 2) rubbish (kitchen waste products); 3) waste from patient care and prophylaxis institutions (including specific ones - used dressing, used disposable autotransfusers and syringes, remains of medicines, remains of organs and tissues after surgical operations, dead bodies of laboratory animals etc.); 4) institutional waste (schools, preschool institutions, high schools and academies, offices, etc; 5) waste of public catering establishments; 6) waste of animal origin (dead bodies of animals, pus, forfeit foodstuff); 7) waste of commercial facilities; 8) industrial waste; 9) slags from boiler houses; 10) construction waste, urban soil; 11) street sweepings.

There are ***three different systems of waste disposal*****:** „flushing" removal, „pick-up" removal and combined removal.

Flushing system is used in the settlements, which are provided with sewerage (pipe) system through which liquid and partially fine solid waste float to waste disposal plants; the rest of solid waste is removed by special motor transport.

Pick-up system is used in the settlements without sewerage systems. At that both liquid and solid domestic waste (SDW) is removed to areas of disposal and utilization by special motor transport. Such method of disposal of solid waste is called purification, and of liquid wastes - sanitation.

Combined system is used in the settlements that are partially provided with sewerage system. According to combined system liquid waste from the part of settlement, provided with sewerage system, is removed through this system, and from the part of the settlement where there is no sewerage system - with the help of cesspoolage transport. All solid waste is removed by sanitary purification transport.

All indices are divided into ***direct*** (allow to assess the level of soil contamination and level of danger for population health directly from the results of laboratory analysis of taken samples and ***indirect*** (allow to draw a conclusion of the existence of soil contamination, its prescription and duration by comparison of the results of soil laboratory analysis with test clean soil of the same type, which was taken as a sample from non-contaminated areas).

Sanitary number of Khlebnikoff - is a ratio of humus nitrogen (pure soil organic substance) to total organic nitrogen (consists of humus nitrogen and nitrogen of strange for soil organic substances that contaminate it). If soil is pure, sanitary number of Khlebnikoff equals to 0.98-1.

Soil coli-titer - is a minimal amount of soil in grammas, in which one bacteria of colibacillus group is found.

Soil anaerobe titer (perfingens-titer) - is a minimal amount of wastes in grammas, in which an anaerobic clostridia is found.

Soil microbial number - is a number of microorganisms in one gram of soil that grew up on 1.5% beef-extract agar at temperature 37^0C during 24 hours.

Soil sanitary state	*O_2 and CO_2 content in soil air. %*	
	O_2	CO_2
Pure	19.75-20.3	0.38-0.8
Slightly polluted	17.7-19.9	1.2-2.8
Averagely polluted	14.2-16.5	4.1-6.5
Heavily polluted	1.7-5.5	14.5-18

Soil classification according to texture (according to N.A. Kachinskiy)

Names of soils according to texture	*Content of particles, %*	
	Clay particles of a diameter smaller than 0.01 mm	Sand particles of a diameter larger than 0.01 mm
Heavy clay soils	larger than 80	smaller than 20
Clay soils	from 80 to 50	from 20 to 50
Heavy loamy soil	from 50 to 40	from 50 to 60
Medium loamy soil	from 40 to 30	from 60 to 70
Light loamy soil	from 30 to 20	from 70 to 80
Clay sands	from 20 to 10	from 80 to 90
Sandy	from 10 to 5	from 90 to 95
Light sandy	smaller than 5	larger than 95

Topic №12

Principles of methodology, technique and basic assessment scheme of environmental factors impact on population health

1.Learning objective

1.1. Master theory fundamentals and basic assessment scheme of environmental factorsв-influence on population health.

2.Basics

2.1. You should know:

2.1.1. Methodological and technique principles of common hygiene (in the extent of the previous lecture courses and practical studies on given discipline).

2.1.2. Elements of theory of probability, mathematical statistics, principles of information science and computer engineering (from the course of biological and medical physics).

3.Self-training questions

3.1. Methodology and methodic study principles of environmental factorsв- influence on population health.

3.2. Population health as an integral environmental factor. Health indices that characterize it.

3.3. Principal scheme of work conditions, way of life and environment factors sanitation control.

3.4. Basic study and assessment scheme of environment factors and population health relation.

3.5. Health concepts and criteria (pathologic-wide, individual theoretical, individual actual population health).

3.6. Quantitative (conceptual) technique of population health level analysis and its usage in medical practice.

GENERAL INFORMATION FOR PREPARATION TO THE PRACTICAL CLASS

Population health on Earth in past times was characterized by epidemics. Significance of population health problem has recently increased as a result of intensive anthropogenic denaturizing of environment because the state of people health has changed sufficiently and new regularities of people pathology spread and character has appeared. Demographic processes have changed the course of their running.

In order to define the health one must consider the following „**fundamentals":**

1. there is no absolute health;
2. individual and population health are inseparable;
3. health is not characterized by only one factor but by a complex of characteristics; definition of health is impossible without estimate of correlation between an
4. individual and the environment;

5.health rating is impossible without load, required tests

At the same time individual health should be considered from two viewpoints:

First viewpoint - theoretical, as the highest possible optimum for a person, which is to be aspired to ideally, but which is actually very difficult to be achieved.

Individual theoretical health is a state of full social, biological and psychological well-being, when functions of all organs and systems of human organism and environment are balanced; any diseases, disease states and physical states are absent.

Another viewpoint is practical, as the actual characteristic of health level of a definite person.

Individual real health is a state of organism at which it can valuably fulfill its social and biological functions.

Three basic groups of health rate are used for health characterization:

First group - *medical indices*.

Second group - *indices of social well-being*.

Third group - *indices of mental health.*

First group of medical indices includes:

1) morbidity rate;
2) death-rate (common and infantile);
3) physical development;
4) disablement.

Second group of social well-being indices includes:

1) demographic situation;
2) state of environment;
3) way of life;
4) medical care level;
5) social and hygienic factors.

Third group of mental health indices includes:

1) mental disease morbidity;
2) occurrence frequency of neurotic states and psychopathies;
3) psychological microclimate

Population division into health groups

Health group	*Specific weight of population in group, %*	
	Men	Women
I	27-28	20-21
II	20-21	16-17
III	39-40	47-48
IV	11-12	14-15
V	1	0.8

First group - healthy people.

Second group - healthy people with functional deviations and some morphological defects.

Third group - ill people with long-term chronicity at retain of organism functional potential (compensated state).

Fourth group - ill people with long-term chronicity or individuals with corporal defects, development defects, aftereffect of traumas, lowered functional potential of organism (subcompensated state).

Fifth group - infirm people (decompensated state)

There is **health complex approach as to a statistical average**, which may be characterized by following theses:

1. State of health is defined in groups with identical socio-economic conditions.

2. „Normal" state of health is a state of those people who form 95% of confidence interval of population.

3. Confidence interval is considered also as an optimal area, within which organism doesn't move to pathological level of self-regulation.

Technique of integral assessment of the state of environment includes qualitative and quantitative analyses.

Content of qualitative analysis of the state of environment is based on comparison results of instrumental or laboratory analysis to hygienic standards and their further assessment.

The assessment results may be the following:

- within standards;
- at standard level;
- exceeding the acceptable levels;
- the ratio of exceeding the acceptable levels.

This is a traditional assessment of the state of environment.

Topic №13

Methods of assessing the nutritional status of people

1. Learning objective

1.1. Master the human nutritional status research and assessment methods as a measure of detection and prevention of health disturbances caused by malnutrition.

1.2. Master the methods of detection and assessment of the vitamin sufficiency in the organism and the methods and measures of hypo- and avitaminosis prevention.

2. Basics

1.1. You should know:

1.1.1. The rational nutrition principles and conditions.

1.1.2. The factual nutrition assessment methods among different social and professional, age and sex population groups.

1.1.3. Research and assessment methods of nutritional stare as the complex medical control of both the organized collectives' and individuals' nutrition.

1.1.4. Classification and physiological significance of the vitamins in the organism.

1.1.5. The most frequently occuring hypovitaminosis states in cases of both individual and collective nutrition. Their causes.

1.1.6. Avitaminosis and their clinical characteristics.

1.1.7. Causes of the hypovitaminosis development.

3. Self-training questions

3.1. The rational nutrition concepts, principles and conditions.

3.2. The human nutritional status definition and indices.

3.3. The indices of plastic and energetic adequacy of nutritional status

3.4. The protein adequacy indices of the organism nutritional status.

3.5. The organism nutritional status adipose and carbohydrate adequacy indices. The inedible carbohydrates sufficiency signs in the organism.

3.6. The macro- and microelements and vitamins sufficiency signs and indices.

3.7. The human nutritional status biochemical indices.

3.8. The method of medical control of human nutritional status.

3.9. Vitamins as a human dietary intake component, their classification, physiological significance in organism.

GENERAL INFORMATION FOR PREPARATION TO THE PRACTICAL CLASS

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

The rational nutrition has to follow such basic principles:

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

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

3. The rational dietary pattern must be followed: food intake hours must correspond to the organism biological rhythms: adults must have 3-4 meals a day and children of different

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

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

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

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

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

These diseases may be determined as:

- diseases caused by starvation, quality and quantity malnutrition (marasmus, protein starvation, hypovitaminosis, avitaminosis and others);

- diseases caused by the dietary intake irregularity (gastritis, stomach and duodenal ulcers, constipation or coprostasis and others);

- diseases caused by overeating (obesity, gout or podagra, hepatitis, cholecystitis, pancreatitis, gall-stone disease and etc.);

- diseases caused by inadequate culinary processing of the product (also gastritis, ulcers, hypovitaminosis etc.);

- food poisonings: bacterial origin (toxic infection, bacterial toxicosis, mycotoxicosis), non-bacterial origin (poisonous by nature products, products which became toxic after storage conditions disturbance and others); products contaminated by toxic substances (pesticides, heavy metals salts and etc.);

- enteric bacterial, virus, zoogenous infections (typhoid fever, paratyphoid A, B, dysentery; hepatitis A, poliomyelitis, enterovirus diseases; brucellosis, foot-and-mouth diseases, tuberculosis and others); geo- and biohelminthes (ascarid, whipworm, beef, pork tapeworm, trichina, fish tapeworm, flukes and etc.);

- effects, caused by the products, contaminated with mass destruction weapon in modern war - nuclear explosion radioactive products, battle poisonous substances (chemical agents), especially particularly dangerous bacterial agents.

The study of the nutritional status of the individual or organized collective with similar physical load, emotional stress and general nutrition allows the objective nutrition assessment and timely detection of the alimentary caused health disorders and diseases (energy-protein, vitamin, macro-, microelement deficiency and etc.). The nutritional status

assessment together with the energy consumption and 24/7 intake validity is one of the first and basic control methods of different sex and age, social and professional groups of people.

The following categories are determined in the nutritional status classification:

1. *Optimal*: the physiological state and body weight correspond to the height, age, sex, physical activity gravity, intensity and load.
2. *Excessive*: may be due to the hereditary tendency, overeating and deficient physical activity. It's accompanied with body weight increase, obesity. The obesity has four levels (I -adipopexis 15-20% greater than normal body weight; II - 30-49%; III - 50-99%; IV - 100% and more);
3. *Insufficient*: when body weight is behind the age and height. It may be caused by the undernutrition (quantitative and qualitative), by hard and intensive physical work, emotional and psychological stress etc. Except the categories above, professor P.E. Kalmycov (St. Petersburg, Russia) suggests to add the following.
4. *Pre-disease (premorbid*), caused (in addition to the abovementioned) by the different organism physiological disorders or the most evident intake defects (energy, protein, fat, vitamin, macro and microelement deficiency);
5. *Morbid (unhealthy)* - weight loss caused by the disease, starvation (strong intake defects both quantitative and qualitative). The starvation may take two forms - alimentary cachexia (severe weight loss, marasmus), edematous which may be caused mostly by the protein lack at the intake. The vitamin deficiency - in avitaminosis (scorbutus, beriberi, rachitis and others), other nutrient deficiencies show themselves in corresponding pathology forms.

The most important and informative among the objective indices are the following:

1. **Somatoscopic:** medical examination of the individual body or (selectively) the collective under inspection allows to detect a lot of signs which characterize their nutrition by quality and quantity.The constitutional type (normosthenic, hyposthenic), figure harmonicity, skeleton and ribs deformation, platypodia (flat-foot), leg curvature (signs of suffered before rachitis), fatness (normal, thinness, obesity), skin, mucous membranes and nails paleness, cyanosis, nail deformation and frailness as signs of protein, vitamin, microelement deficiency in nutrition may be detected during general medical body examination. The xerosis, keratomalacia, blepharitis, conjunctivitis, photophobia as A and other vitamin hypovitaminosis signs may be detected during the physical examination of mucous membranes of the eyes.

2. **Somatometric:** measuring of the body height, weight; chest, shoulder, waist, pelvis, hip girths and subcutaneous fat thickness (under inferior angle of the scapula, on the middle backside of the shoulder, lateral surface of the thorax, abdomen).The weight-height indices may be calculated based on this measuring:.

2.*1.Brock index* - normal body weight (BW) in kg is body height (BH) in cm minus 100 (105 or 110):

for males: with height 155-165 cm	BW = BH - 100
with height 166-175 cm	BW = BH - 105
with height above 175 cm	BW = BH – 110

The body weight for females has to be 5% less than for males in all cases.

3. **Physiometric indices** of the nutritional status. The energy and plastic nutrition adequacy may be assessed using the muscular strength (hand, torso dynamometry, ergometry), the pulse and breath rate registration after physical activity and both by using the fatigue indices such as tremometry, chronoreflectometry, number search etc.
4. **Clinical indices** are the symptoms of the alimentary origin diseases (gastritis, stomach and duodenal ulcers, liver and gallbladder diseases, podagra, gout, hypo-, avitaminosis etc.).
5. **Biochemical indices** include hematological, urological and other indices of the nutritional status

Topic №14

Methods of medical control of vitamins in organism

1.Learning objective

1.1.Master the methods of detection and assessment of the vitamin sufficiency in the organism and the methods and measures of hypo- and avitaminosis prevention.

2.Basics

2.1. You should know:

1.1.1. Classification and physiological significance of the vitamins in the organism.
1.1.2. The most frequently occuring hypovitaminosis states in cases of both individual and collective nutrition. Their causes.
1.1.3. Avitaminosis and their clinical characteristics.
1.1.4. Causes of the hypovitaminosis development.

3.Self-training questions

1. Vitamins as a human dietary intake component, their classification, physiological significance in organism.
2. The most frequent hypovitaminosis states in cases of both individual and collective nutrition and their causes.
3. Symptomatic, clinical and biochemical signs of the hypovitaminosis C, its diagnostic functional tests.
4. Hypovitaminosis A, methods of its detection

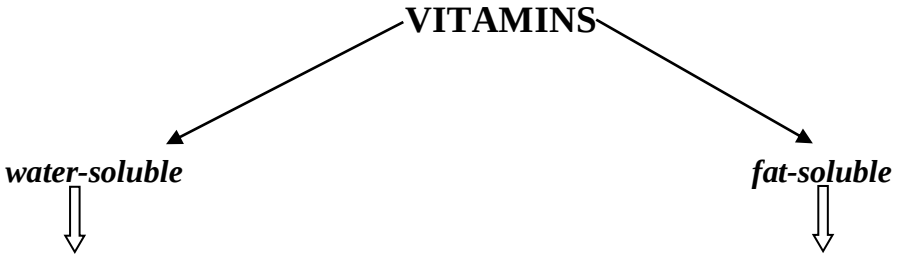
5. Hypovitaminosis B, methods of their diagnosis.
6. Main sources of water-soluble vitamins.
7. Main sources of liposoluble vitamins
8. Prevention methods and measures of hypovitaminosis. The influence of the storage conditions, foodstuff culinary handling, and sale conditions on preservation of the vitamins in them.
9. Comparative hygienic characteristics of the natural and artificial vitamin medical preparations as hypovitaminosis prevention measures.

GENERAL INFORMATION FOR PREPARATION TO THE PRACTICAL CLASS

The indices of the organism nutritional state include also the signs of vitamin sufficiency in organism.

Biocatalytic activity determines the vitamin physiological role вЂ“ participation in metabolic control of the organism. Hypovitaminosis C, A and in less occasions - B are widely spread among the population especially in early spring period when the vegetable supply and the carotene and ascorbic acid content in them is decreased.

Psychoemotional stresses characterizing the modern living conditions promote the increase in the organism vitamin requirement and may cause the development of hypovitaminosis states throughout the year.



1. **Thiamine (B_1)**
2. **Riboflavin (B2)**
3. **Niacin (B3)**
4. **Pyridoxine (B6)**
5. **Pantothenic acid**
6. **Cobalamin (B12)**
7. **Ascorbic acid**

1. **A (retinol)**
2. **E (tocopherol)**
3. **D (calciferol)**
4. **K(menadione)**

Recommended daily dosages

Vitamin	*Daily requirement*
Vitamin A	600 mg
Vitamin B1	men- 1.2 mg, women-1 mg
Vitamin B2	1.6 mg
Vitamin B3	18 mg
Vitamin B5	6 mg
Vitamin B6	2 mg
Vitamin B7	7 mg

Vitamin B9	400 mg
Vitamin B12	6 mg
Vitamin C	75 mg
Vitamin D	5 mg
Vitamin E	10 mg
Vitamin K	80 mg

Essential vitamin functions and sources

Vitamins	***Functions***	***Sources***
Vitamin A	Form and maintain teeth, bones, tissue, and skin.	Ripe yellow fruits, carrots, oranges, paprika, squash, red peppers, leafy green vegetables, cayenne, pumpkin, chili powder, spinach, soy milk, and sweet potatoes
Vitamin B1 (thiamine)	Essential to help cells turn carbohydrates into energy.	Whole grains, enriched cereals, brown rice, sesame seeds, sunflower seeds, dried herbs and spices, pine nuts, pistachios, macadamia nuts, pecans, legumes, wheat germ, bran, brewer's yeast, and blackstrap molasses.
Vitamin B2 (riboflavin)	Maintains red blood cells and body growth	Bananas, dried herbs, asparagus, almonds, wheat bran, dried spices, green beans, sesame seeds, dried roasted soybeans, sun-dried tomatoes, dried peppers, and popcorn.
Vitamin B3 (niacin)	Maintains healthy skin and nerves	Rice bran, wheat bran, paprika, peanuts, sun-dried tomatoes, mushrooms, and tree nuts.
Pantothenic acid (B5)	Essential for metabolism of food.	Broccoli, wheat bran, avocado, rice bran, sunflower seeds, whey powder, mushrooms, cheese, corn, broccoli, caviar, sun-dried tomatoes, squash, and fish.
Vitamin B6	Form and maintain red blood cells and brain function	Tree nuts, dried spices, wheat bran, sesame seeds, bananas, rice bran, dried herbs, pistachios, raw garlic, sunflower seeds, molasses, sorghum syrup, filberts, and hazelnuts
Biotin (B7)	Essential for metabolism of	Oil-roasted peanuts, oil-

	protein and carbohydrates	roasted sunflower seeds, soy beans, dried yeast, oatmeal, walnuts, baker's yeast, mustard powder, salted peanut, salted sunflower seeds, salted hazelnuts, dried peanuts
Folate (folic acid or B9)	Forms red blood cells and essential to production of DNA.	Leafy green vegetables, pasta, bread, cereal, spinach, dark leafy greens, asparagus, turnip, beets, mustard greens, Brussels sprouts, lima beans, soybeans, brewer's yeast, root vegetables, whole grains, wheat germ, bulgur wheat
Vitamin B12 (cyanocobalamin)	Forms red blood cells and maintains central nervous system.	Clams, oysters, mussels, liver, caviar, octopus, fish, crab, lobster, beef, beef, mutton (especially shoulder), cheese (especially Swiss), and eggs
Vitamin C	An antioxidant that promotes healthy teeth and gums	Red chili peppers, guava, green chili peppers, bell peppers, fresh herbs (thyme and parsley), dark leafy greens (garden cress, kale, and mustard), broccoli, cauliflower, Brussels sprouts, kiwi, papaya, strawberries, oranges, and clementines.
Vitamin D	Essential for development of healthy teeth and bones	Fish, eggs, liver, mushrooms, and sunshine
Vitamin E	Helps form red blood cells and process Vitamin K.	Corn oil, sunflower seeds, paprika, soybean oil, margarine, safflower oil, wheat germ oil, sunflower oil, red chili powder, cooked taro root, almonds, pine nuts, peanuts, dried herbs (basil and oregano), dried apricots, pickled green olives, and cooked spinach.
Vitamin K	Essential for blood coagulation and bone health.	Dried herbs, prunes, pickled cucumber, dark leafy herbs, spring onion, Brussels sprouts, broccoli, chili powder, curry, paprika, cayenne, asparagus, and cabbage.

Deficiency of vitamins

1. Vitamin A--------- Night blindness
2. Vitamin B1---------Beriberi
3. Vitamin B2-------- Ariboflavinosis
4. Vitamin B3 --------Pellagra
5. Vitamin B5 --------Paresthesia
6. Vitamin B6 --------Anemia
7. Vitamin B7 ------ Dermatitis, enteritis
8. Vitamin B9 & Vitamin B12 ----- Megaloblastic anemia
9. Vitamin C ------ Scurvy, Swelling of Gums
10. Vitamin D ------ Rickets & Osteomalacia
11. Vitamin E ------ Less Fertility
12. Vitamin K ------ Non-Clotting of Blood.

The Overdose risks of vitamins

Vitamin A overdose- efers to the toxic effects of ingesting too much preformed vitamin A. Symptoms arise as a result of altered bone metabolism and altered metabolism of other fat-soluble vitamins. Hypervitaminosis A is believed to have occurred in early humans, and the problem has persisted throughout human history.

Toxicity results from ingesting too much preformed vitamin A from foods (such as fish or animal liver), supplements, or prescription medications and can be prevented by ingesting no more than the recommended daily amount.

Diagnosis can be difficult, as serum retinol is not sensitive to toxic levels of vitamin A, but there are effective tests available. Hypervitaminosis A is usually treated by stopping intake of the offending food(s), supplement(s), or medication. Most people make a full recovery.

Symptoms- drowsiness, irritability, abdominal pain, nausea, vomiting, increased brain pressure.

Vitamin D overdose- vitamin D toxicity is usually caused by megadoses of vitamin D supplements — not by diet or sun exposure. That's because your body regulates the amount of vitamin D produced by sun exposure, and even fortified foods don't contain large amounts of vitamin D.

The main consequence of vitamin D toxicity is a buildup of calcium in your blood (hypercalcemia), which can cause nausea and vomiting, weakness, and frequent urination. Symptoms might progress to bone pain and kidney problems, such as the formation of calcium stones.

Treatment includes stopping vitamin D intake and restricting dietary calcium. Your doctor might also prescribe intravenous fluids and medications, such as corticosteroids or bisphosphonates.

Vitamin E overdose- overdoses of vitamin E are rare. It’s virtually impossible to overdose

through diet alone. But, if you take supplements, and if you take more than the tolerable upper intake level for your age, you might risk blurred vision, weakness, dizziness, nausea and diarrhea. If you're also taking an anticoagulant medication, such as warfarin, bleeding can result. Repeated daily doses of vitamin E of 400 IU or more, or above 267 milligrams per day, are associated with an increased risk of death, according to the researchers at Johns Hopkins University. This is well below the ULs issued by the Office of Dietary Supplements.

Vitamin K overdose- n exceded intake of vitamin K (over 500 micrograms per day) it may occur some allergic reactions such as skin rashes, itching and redness. Also occur liver problems, but they are not very common.

There is the potential toxicity of large doses of vitamin K, which can cause hemolysis in newborns and exacerbate hyperbilirubinemia.

Vitamin C overdose- diarrhea,nausea,vomiting, heartburn, abdominal cramps, headache, insomnia.

Overdose of B group vitamins

1.Thiamine overdose(B1)

Overdosing on thiamine, or vitamin B-1, is rare but can cause severe symptoms. Mild symptoms of an overdose include weakness and a headache, the American Pregnancy Association reports. In some cases, high vitamin B-1 levels can cause a rapid, irregular heart beat and low blood pressure. These symptoms can lead to cardiac problems. Some patients will develop a low blood pressure and convulsions.

2. Riboflavin overdose(B2)

There are few potential side effects from high doses of riboflavin. The most serious side effects concern an increased rate of allergic reactions in patients taking high doses of riboflavin. Symptoms of allergic reactions include swelling of the face or tongue, hives and difficulty breathing, Drugs.com states. Consult a doctor if you develop these symptoms after taking vitamin B-2. Riboflavin can also cause a harmless yellow-orange discoloration of your urine.

3. Niacin overdose(B3)

Overdosing on niacin, also called vitamin B-3, can lead to rare side effects. The most apparent symptom of a niacin overdose is a blurring of vision, the American Cancer Society says. This can be a sudden symptom that is disorienting and frightening. You may also experience gastrointestinal symptoms such as nausea, stomach pain and vomiting.

4. **Pantothenic acid and biotin overdose(B5)**

Pantothenic acid, vitamin B-5, and biotin, vitamin B-7, are necessary for normal metabolism and the breakdown of proteins and carbohydrates. High doses of vitamin B-5 can cause severe diarrhea according to Medline Plus, a service of the National Institutes of Health. However, there are no known toxicities associated with biotin intake.

5. Pyridoxine overdose(B6)

Toxic levels of pyridoxine have been known to cause a variety of muscular or nerve problems. You may experience burning pains, clumsiness, a loss of muscle coordination and even paralysis, the American Pregnancy Association reports. Vitamin B-6 toxicity can also cause rapid breathing and dyspnea.

6.Folic acid overdose(B9)

Folic acid, or vitamin B-9, is dangerous when taken in high dosages. Normally, folic acid is given to help keep nerves healthy and ensure a healthy pregnancy. However, in doses greater than 15,000 ug per day, vitamin B-9 can cause damage to your central nervous system, the American Pregnancy Association warns. This may manifest as movement disorders, paralysis, pain or numbness.

7. Cobalamin overdose(B12)

Excess intake of cobalamin, or vitamin B-12, may cause some symptoms in patients. You may develop blood clots, itching, diarrhea and serious allergic reaction, Medline Plus says. To avoid these symptoms, take vitamin B-12 as recommended by your doctor.

Topic №15

Methods of assessing the adequacy in organized collectives

1.Learning objective

1.1. Master methods of determination of individual or organized collective actual nutrition and its adequacy to the energy expenditure and nutrient needs.

2. Basics

2.1. You should know:

2.1.1. Social-economic and sanitary-hygienic basics of individual and collective nutrition.

2.1.2. Calculative, laboratory and other methods of determination of the individual or organized collective nutrition sufficiency.

3.Self-training questions

3.1. Methods of balance and budget research of nutrition, their goals, advantages and disadvantages for the assessment of the individual and collective nutrition.

3.2. Questionnaire methods of the nutrition assessment, their goals, advantages and disadvantages for the assessment of the individual and collective nutrition.

3.3. Laboratory methods of determination of energetic value and nutrient composition of the daily intake.

3.4. Calculation methods of determination and assessment of the daily intake quantitative and qualitative composition.

3.5. Medical, sanitary and hygienic optimization measures in the collective and individual nutrition.

GENERAL INFORMATION FOR PREPARATION TO THE PRACTICAL CLASS

The balance and budget methods of nutrition research are based on the nutrition appropriations for organized collectives or family, individual profits and allow to assess the group nutrition only approximately.

The questionnaire, weight methods allow to determine the quantity of used nutrients more exactly, but these methods don't also give a possibility to assess the daily intake quantitative composition.

The laboratory methods of determination of the daily intake energy value and nutrients are more accurate, but require the complicated and long-lasting research and considerable expenses. That is why these methods can not be used systematically during medical control of nutrition for different population groups.

The calculation methods are very accurate, available for the permanent systematic medical control of nutrition for different population groups, don't need additional expenses and too much time for calculation if the technical calculation devices are available.

The following data are required for the assessment of the actual nutrition of organized collectives using the **calculative methods**:

- physiological norms of nutrition with scientific background and designed for different population groups;

- based on this data, the food menu schedule (the nutrition plan for collective) usually for a week is worked out;

- tables of food products chemical composition вЂ“ reference source about energy value and nutrients for each food product.

The need in the variety of nutrition and its daily sufficiency have to be taken into consideration during the design of the menu schedule. The daily sufficiency is assessed by the multiplication of the one-day quantity of each food product (except daily equally used products, e.g. bread) by 7 days. After that different meals are planed for the whole week. The same meal has not to be repeated more than three times per week in this case.

E.g. the one-day norm of cereals is 40 g, macaroni - 60 g. It is 280 g and 420 g respectively per week. It allows to plan different meals for different days. The variety of nutrition and prevention of the monotonous intake may be reached by this.

The duties of the doctor responsible for medical monitoring of the nutrition in a certain collective during the formation of the menu schedule include:

- the assessment of meals in respect to the energy value and nutrient composition - proteins, fats, carbohydrates, vitamins, mineral and flavoring agents/substances;
- providing the variety of meals during the week;
- control of the adequate replacement of certain food substances because of their absence;
- correct registration of food products waste (which is adjusted in special tables);
- even distribution of meals and certain food products according to their energy and nutrient content by the different food intakes and other.

The energy value and nutrient composition of each product in accordance to the menu schedule is calculated by proportion using "Tables of food products chemical composition" (appendix 3) on which all the food substances and their caloricity per 100 g of product are presented.

The quantity of proteins and fats is calculated separately, or only the quantity of animal proteins is

determined for the animal and vegetable food substances ratio calculation. The quantity of vegetable proteins is then found by substracting the quantity of animal proteins from the general protein quantity.
The daily intake distribution by separate food intakes is determined in percentage according to its energy value. The following distribution is recommended for three meals per day: 30% of the value for breakfast, 40-45% - for lunch, 20-25% - for dinner. The second breakfast with 10-12% of value, including a part of the first breakfast and a part of dinner is added in case of four meals per day.

Such main aspects have to be represented in the conclusion about the **assessment of the collective nutrition:**

1) Adequacy of the energy value and all food substance quantities (proteins, fats, carbohydrates, vitamins, mineral substances, microelements) to the energy expenditure, physiological need in them (calculated by the students on the previous lesson) and norms of nutrition.
2) Adequacy of the ratio between the vegetable and animal proteins and fats, polysaccharides and disaccharides to the physiological need. As mentioned above based on their energy value the animal proteins have to constitute no less than 55%, the vegetable fats вЂ“ no less than 30%, mono-, disaccharides - no more than 18-20% of their general quantity according to the physiological norms.
3) The vitamin sufficiency in the intake, correct ratio between the vitamin A and carotene considering their inevitable loss during food products culinary processing.
4) The mineral substances especially Ca, P and their ratio, Fe, and microelements sufficiency. Spices and flavoring agents presence.
5) The repeating of meals during the week (the variety of nutrition).
6) Based on the discovered defects the recommendations for optimization of products menu are made considering the foreseen changes in physical activity of controlled collective.

Topic №16

The nutrition peculiarities of people of different age groups and occupations

1.Learning objective

1.1. Extend the students knowledge on the nutrition peculiarities of different age groups and occupations people, sportsmen, pregnant women and nursing mothers.

2. Basics

1.1. You should know:

1.1.1. Physiological peculiarities of metabolism of children and adolescents, people of elder age group and their health status.
1.1.2. Nutrition peculiarities of people involved in mental and physical activity, sportsmen, pregnant women and nursing mothers.

3.Self-training questions

1.1. Physiological peculiarities of metabolism of children and different age adolescents, medical-biological demands on their nutrition.

1.2. Peculiar demands to the nutrition of geriatric patients and people of declining years.

1.3. Principles of nutrition of workers involved in mental and operating activity, with high psycho-emotional stress.

1.4. Principles of nutrition of physical workers and sportsmen.

1.5. Methods of medical control of different age and working activity groups of population nutrition.

1.6. Dietary nutrition principles of people with different nosological forms of diseases and during the rehabilitation.

1.7. Organization and hygienic peculiarities of nutrition of the patients in the hospital.

1.8. Medical control of the nutrition of the organized collectives, patients at the health care institutions.

GENERAL INFORMATION FOR PREPARATION TO THE PRACTICAL CLASS

1. Peculiarities of the children and adolescents nutrition

In view of body growth and development children of different age groups require relatively bigger amount of plastic nutrients, first of all proteins, mineral salts, more fats, carbohydrates - the energy sources, and also the catalytic substances - vitamins, microelements as the metabolism of the growing organism is far more intensive.

If an adult requires 1.5 g of proteins per 1 kg of his body weight, a child before 1 year of age - more than 4 g/kg, 1-3 years of age - 3.8-4 g/kg, 4-6 years of age - 3.5 g/kg, 7-10 - 3.0 g/kg and so on. Moreover, 60-75 % of all proteins should be of animal origin with obligatory contain of milk and milk products in the diet.

The general amount of nutrients and their daily energy value for children and different age groups adolescents are given in the „Norms of the physiological requirements of the Ukrainian population for the essential nutrients and energy", № 272-99 . It becomes clear from these Norms that the absolute amount of nutrients and their energy value increases, thus, from the calculation of body mass unit it naturally decreases, approaching to the norm of adult population.

2. Peculiarities of the geriatric people nutrition

This category of population has the decreased metabolism intensity, decreased physical activity and workload, these people usually suffer from development of different geriatric diseases or their complex; therefore the requirement for nutrients and energy also gradually decreases, all this is taken into account in the same" Norms of the physiological requirements of the Ukrainian population for the essential nutrients and energy", № 272-99.As it can be understood from these Norms, the content of mineral salts and the majority of vitamins remains the same in the daily ration; it is connected with the necessity of the skeleton calcination (bone fragility increases with age) and the support of catalytic substances (enzymes, hormones) at the same level as their synthesis also decreases at this age.

3. Peculiarities of nutrition of people involved in mental and physical activity with different level of emotional and physical stress.

People involved in mental and operating activity usually work in conditions of hypodynamia. It influences their health and body resistance to different diseases unfavorably. Therefore for the purpose of these diseases prophylaxis, it is recommended, that these people are engaged in permanent physical training. But not all people can afford it because they need subjective will stimulus and extra time.

Energy value and content of proteins, fats and carbohydrates for this adult working population group is far lower than for people involved in physical activity. But the content of mineral salts and the majority of vitamins remains the same as for the previous group. It can be explained by the fact that mental activity needs enough enzymes and hormones, the synthesis of which is connected with the supply of the body with full-value proteins, mineral salts, microelements and vitamins. People involved in physical activity or sportsmen who expend more muscular energy related to the hardness and intensity of their work (or training) require more proteins, fats, carbohydrates and also energy in the diet according to the groups of physical work intensity.

4. The dietary nutrition peculiarities of people with different nosological forms of diseases.

The dietology course suggests 15 (with same variations) worked out and scientifically substantiated diets for different nosological groups of diseases. These diets differ in the products variety and the way of their cooking.

The main peculiarity of the nutrients composition of these diets is the same or even increased content of proteins (up to 100-120 g) except such diseases as gout, urine acid diathesis, glomerulonephritis. The amount of fats and carbohydrates usually is decreased, but the content of mineral substances, microelements, vitamins remains the same and in case of some diseases like infectious ones - increased, as a part of them is wasted with perspiration.

In detail the patient's nutrition is studied in the course of diet therapy.

Daily requirements of the children population for proteins, fats, carbohydrates and energy

Age groups	*Energy, kcal*	*Proteins, g*		*Fats, g*	*Carbohydrates, g*
		total	animal		
0-3 months	120	2.2	2.2	6.5 (0.7**)	13
4-6 months	115	2.6	2.5	6.0 (0.7**)	13
7-12 months	110	2.9	2.3	5.5 (0.7**)	13
1-3 years	1B 540	53	37	53	212
4-6 years	2B 000	65	33	58	305

6 years (pupils)	2B 200	72	36	65	332
7-10 years	2B 400	78	39	70	365
11-13 years (boys)	2B 800	91	46	82	425
11-13 years (girls)	2B 550	83	42	75	386
14-17 years (boys)	3B 200	104	52	94	485
14-17 years (girls)	2B 650	86	43	77	403

**For children of 0-12 months of age the requirements are given per 1 kg of body weight*

***0.7 - the daily requirement for vegetable oil (per 1 kg of body weight)*

Daily requirements of the adult population for proteins, fats, carbohydrates and energy (men)

Work intensity groups	*Physical activity coefficient*	*Age, years*	*Energy, kcal*	*Proteins, g*		*Fats, g*	*Carbohydrates, g*
				total	animal		
		18-29	2450	67	37	68	392
I	1.4	30-39	2300	63	35	64	368
		40-59	2100	58	32	58	336
		18-29	2800	77	42	78	448
II	1.6	30-39	2650	73	40	74	424
		40-59	2500	69	38	69	400
		18-29	3300	91	50	92	528
III	1.9	30-39	3150	87	48	88	504
		40-59	2950	81	45	82	472
		18-29	3900	107	59	108	624
IV	2.3	30-39	3700	102	56	103	592
		40-59	3500	96	53	97	560

Daily requirements of the adult population for proteins, fats, carbohydrates and energy (women)

Work intensity groups	*Physical activity coefficient*	*Age, years*	*Energy, kcal*	*Proteins, g*		*Fats, g*	*Carbohydrates, g*
				total	animal		
		18-29	2000	55	30	56	320
I	1.4	30-39	1900	52	29	53	304
		40-59	1800	50	28	51	288

		18-29	2200	61	34	62	352
II	1.6	30-39	2150	59	33	60	344
		40-59	2100	58	32	59	336
		18-29	2600	72	40	73	416
III	1.9	30-39	2550	70	39	71	408
		40-59	2500	69	38	70	400
		18-29	3050	84	46	85	488
IV	2.2	30-39	2950	81	45	82	472
		40-59	2850	78	43	79	456

Norms of physiological requirements for the essential nutrients and energy of the geriatric patients

Nutrients and energy	*Men*		*Women*	
	60-74 years of age	75 and more	55-75 years of age	75 and more
Proteins, g	65	53	58	52
Fats, g	60	54	54	48
Carbohydrates, g	300	270	270	240
Energy, kcal	2000	1800	1800	1600
Mineral substances:				
Calcium, mg	800	800	1000	1000
Phosphorus, mg	1200	1200	1200	1200
Magnesium, mg	400	400	400	400
Iron, mg	15	15	15	15
Zinc, mg	15	15	15	15
Iodine, mg	0.15	0.15	0.15	0.15

Topic №17

Methods of expert assessment of milk, meat and fish

1.Learning objective

1.1. Master the methods of assessment of food products quality and freshness according to their organoleptic criteria and laboratory analyses results.

2. Basics

2.1. You should know:

1.1.1. Organoleptic criteria of food products quality and freshness.

1.1.2. Principles of hygienic regulation of the food products quality and freshness.

1.1.3. Full-value indices and deterioration indices of main food products

3. Self-training questions

1.1. Food products and their classification, hygienic characteristic.

1.2 State standards and hygienic regulations of food industry products, quality certificates of market products.
1.3 Causes and criteria of food products deterioration.
1.4 Storage conditions of food products, selling terms for unstable products and ready meals.
1.5 Rules of food products culinary processing for saving their high quality, vitamins, gastrointestinal diseases prevention (gastritis, gastric ulcer of stomach and others).
1.6 Quality and deterioration criteria of meat products (beef, pork, mutton, poultry etc.).
1.7 Quality and deterioration criteria of canned goods (meat, fish, vegetable and others).
1.8 Quality, deterioration and falsification criteria of milk and dairy products (sour cream, kefir, yoghurts, cheeses, butter and etc.).

GENERAL INFORMATION FOR PREPARATION TO THE PRACTICAL CLASS

The hygienic examination of food products and ready meals is made in following situations:

1. regularly, by the plan;
2. sporadically during raid control of nutrition units, catering objects;
3. urgently if the cases of food poisonings, alimentary caused diseases, severe violations of nutrition units sanitary regimen (canteens, cafes, restaurants, hospital nutrition unit and etc.) are registered;

The hygienic examination of food products may have the following purposes:

1. determination of products commercial qualities, drawing up of certificates;
2. detection of the falsification, imbalance of the productsвЂ™ chemical composition;
3. to control the realization terms of products;
4. determination of the degree of product deterioration during storage and possibility for further storage;
5. determination of epidemiological and toxicological danger of products (microbial contamination, pollution by pesticides and other toxicants, barn parasites, mold etc.);
6. determination of harmfulness of package, crockery, equipment, inventory and others.

The organoleptic research of food products (and ready meals) does not need special equipment, may be performed both in the laboratory and at the nutrition unit during sampling. At first it is necessary to get acquainted with the nutrition unit's documentation, bills, certificates for the product cargo, delivery date. Then the storage conditions, products processing, presence of refrigerators, object sanitary condition, conditions of packages, marking (terms of product sale and storage etc.) are examined. The appearance of product samples (in daylight), their color, tints as the signs of staleness, spoiling or falsification, suspected impregnation, spots, different from the color of the product etc. are also examined. The presence of barn parasites, cysticercuses is determined with the loupe and trichina grubs - with compressorius.

The constitution is determined by palpation - pressing on the product (bread-crumb, meat). The pit smoothens if the product is fresh or stays if the product is stale. If the food products are fresh their smell is pleasing, specific. The stale products have objectionable even putrefactive smell. Some fresh products have to be odor-free at all. The taste is tested the last after making sure that the product is safe. The taste is not tested if the product is suspected of spoiling or contamination with microorganisms, toxic agents. Sometimes the hearing may also be used (splashing in the cans if they are filled incompletely, no fizzing in carbonated beverages, fizzing during fermentation etc.).The boiling test of broths from research products first of all from meat is used in the laboratory during the organoleptic research.

The laboratory research of caloricity, commercial qualities and food product freshness

The following criteria among the integral food quality criteria are determined:

- moisture after drying of the previously weighed sample or distillation of it to permanent mass; the moisture of liquid products is determined using areometer, lactometer (milk).

- solid residue is also determined after drying, determination of the density with aerometer or calculation by moisture.

- ash residue is determined by burning the solid residue to light-grey ash of mineral substances.

The *protein content* in the food product or ready meal is determined as content of the total nitrogen in the product. The total nitrogen is determined according to the Kieldall's or Lourie's method (stated in the special manuals). The protein content is determined by multiplication of the nitrogen quantity by the coefficient of 6,25.

The *fat content* in products is determined according to the classical Soxlet methods after extraction of the fat from the product using ether into the Soxlet device. The other methods of determination the fat content in products are also stated in special method, educational manuals, in milk вЂ“ using the butyrometer .

The *carbohydrate content* in food products (mono-, di-, polysaccharides) is determined using the iodometric methods, by their inversion, hydrolyses. The details of these methods are also described in special manuals.

The *vitamin content* (at the first place - the ascorbic acid, carotene) is determined in

most cases during laboratory analyses of the vegetable cans, milk, ready meals.

The *mineral salts and microelements* are usually determined in special purposes (scientific purpose etc.).

Quality criteria of milk (State standard of Ukraine 3662-97)

Criterion	*Class standards*		
	Extra	First	Second
Acidity, Terner degree, not more than	16-17	19	20
Grade by ethanol	I	I	II
Bacterial contamination, thousand/cm^3, not more than	300	500	3000
Body cells content, thousand/cm^3, not more than	400	600	800
Mass part of dry substances, %, not less than	11.8	11.5	10.6
Solid fat-free residue, %, not less than	8	8	8
Relative mass of milk, g/cm^3	1.028-1.033	1.028-1.033	1.028-1.033
Fat content, %, not less than	3.2	3.2	2.5
Comment: The soda, borax (used for hiding the high acidity), starch and flour (to hide the removal of fat) presence is determined for detection of the milk falsification.			

Quality criteria of meat, fish

Criteria	*Meat*	*Fish*
Appearance, color	Pale-pink drying up crust, moistened, non-cohesive	Bright, adjacent scales, bulging and transparent eyes, pink meat, moistened gills without mucus
Consistence	Elastic, pit becomes straight quickly after press	Elastic, pit becomes straight quickly after press
Smell	Pleasant, typical for each animal	Typical („fish"), but not putrid
Fat	White, yellowish color, solid consistence, without rancidity smell and greasing	Fat color, soft, with „fish" smell, near not leave grease marks
Marrow	Yellow, elastic, fill the tubular bones lumen, do not exfoliate from the bone walls	-

Tendons, joints	Elastic, dense. Joint surfaces are smooth, bright	Muscles near the spine are not darkened
Broth during boiling	Transparent, without flakes, with tasty smell and taste. Fat on the surface is like big spots	Transparent, with big fat spots on the surfaces, tasty typical smell
pH (by lacmus)	5.8-6.4 (but not more than 6.7)	-
Ammonia	Sal ammonia - not more than "++"	-
Hydrogen sulphide	Sulfur lead has not be present, the brown staining appears if this substance is present	-
Reaction with benzidine	The fresh meat has cyan staining during this reaction	-
Reaction with sulfuric copper	The broth is transparent, without flakes	-
Trichinas	Not more than 5 in 24 meat samples	The fish is rejected if helminthes embryos are present
Cysticercuses	Not more than 3 on 40 cm^2 of cutting	The fish is rejected if helminthes embryos are present

Topic №18

Theoretical aspects and method of prophylaxis of alimentary diseases

1. Learning objective

1.1. Master the knowledge on alimentary diseases their etiology, clinic, methods of investigation, general and specific prophylaxis.

2. Basics

2.1. You should know:

2.1.1. Examine the classification of alimentary and alimentary caused illnesses.

2.1.2. Origins and prevention of alimentary caused diseases.

2.1.3. Learn the main principles of medical or dietary nutrition.

2.1.4.Examine diates of treatment-and-prophylactic nutrition their features and administration.

3. Self-training questions

1. Alimentary and alimentary caused diseases, their classification, etiology, main principles of prevention.

2. Primary diseases of insuficient and excessive nutrition. Mechanism of their development.

3. Characteristic of the main stages of frustration. Prevention of alimentary patologies.

4. Secondary (alimentari-caused) diseases that connected with violation of processes digestion of nutrients.

5. Conception of diseaese that connected with alimentary factors of risk and their prevention.

6. Methods of diagnosis and prevention of the alimentary caused diseases with metabolic and deficient genesis.

7. Hygienic principles of prescription treatment-and-prophylactic nutrition.

8. Medical and sanitary control over the organization of nutrition in medical institution.

9. Medical or dietary nutrition as a method for the treatment and secondary prevention of diseases. Its purpose and principles.

GENERAL INFORMATION FOR PREPARATION TO THE PRACTICAL CLASS

Alimentary infections represent a permanently serious health, and in their effect also economic problem all over the world. The etiologic structure of infections is wide and includes: bacteria, viruses, protozoa, and helminths. The characteristic feature of alimentary infections is the entry of an infective agent into the organism through the digestive tract and the resulting secretion by faeces and urine.

The source of infection is man or animal, usually at the end of an incubation period, in the course of an illness, but also during convalescence when the infective agent is excreted. Man as a source of infection is involved in various forms of the infection manifestations (he may be apparently healthy) it may concern a manifest, latent or atypical form of infection.

Transmission of the infection occurrs indirectly, usually through ingestion of contaminated food, water or milk products, or directly by contaminated hands when fecal-oral transmission applies. Alimentary infections in our conditions occur both sporadically and epidemically throughout the year with a higher incidence in the summer months. An epidemic incidence usually occurrs when basic hygienic rules are neglected in the sphere of personal hygiene and nutrition hygiene: an insufficient water supply,a breach of fundamental sanitary principles and food processing technology, and a disruption of an appropriate technology of food preparation, its preservation, storage and serving. It is necessary to consider that not all alimentary infections have in their clinical picture the primary sign, i.e. diarrhea with accompanying symptoms of various intensity (e.g., parasitic infections, botulism, HAV, etc.). Therefore, it is necessary to take into

consideration during epidemiological examination that diarrheal illnesses might be of a non-infective origin due to intoxication or an allergy induced by various substances.

ALIMENTARY INFECTIONS BACTERIAL ETIOLOGY

Diarrheal diseases form the largest group of alimentary infections and have a very wide etiologic structure and a common characteristic clinical sign - diarrhea. Acute diarrheal disease (ADD) is a clinical syndrome of varying etiology, its main sign is diarrhea often accompanied with fever. Under ADD salmonelloses, shigelloses, infections caused by E.coli, viruses, protozoa, helminths may manifest, but also amebic dysentry, cholera, etc. The same clinical picture is induced by a series of conditionally pathogenic microorganisms. From the epidemiological point of view we can classify ADD into the following groups:

- Epidemical diarrhea of newborns

- Epidemical diarrhea of infants (occurrence in developing countries in non-breast feeded infants)

- ADD affecting the general population - affects all age groups

- ADD connected with travelling abroad

INFECTIONS INDUCED BY E.COLI

E.coli- is a part of the normal intestinal flora in humans and animals. It is an indicator of fecal contamination of water and food. The strains pathogenic to man include 4 main groups:

Enteropathogenic - EPEC (common serotypes: 026, 055, 086, etc.). The EPEC strains induce illness in pre-term infants, sucklings, and small children. Watery stools without admixtures, often accompanied with vomiting, fever, and dehydration dominate the clinical picture.

Enteroinvasive - EIEC (serotypes: 028ac, 0124, 0143, etc.) The clinical picture resembles bacillary dysentery: tenesmus, diarrhea with phlegm and blood.

Enterotoxigenic - ETEC (common serotypes: 06, 08, 078, 0128). The ETEC strains cause diarrhea in tropical and subtropical regions - e.g., diarrhea in travellers who don´t possess antibodies against ETEC. The clinical symptomatology often resembles cholera - a profuse watery diarrhea with dehydration.

INFECTIONS INDUCED BY ENTERIC PATHOGENS

a) Bacteria - pathogenic

Salmonella typhi Gram-negative rods of the Salmonella genus with long-term survival in the environment (water). It is destroyed at temperatures over 80 C- it causes typhoid fever.

Salmonella paratyphi A, B, and C Isolated diseases whose causative agents vary. Antigenic structure types A 1, 2, 12 , B 1, 4, 5, 12, b, 1, 2. C 6, 7, Vi, 1, 5. The disease exhibits slightly or intermediately manifested typhoid fever.

Salmonella species

The most common clinical picture manifests as an acute gastroenteritis with diarrhea, abdominal pain, and elevated temperature. A part manifests asymptomatically, i.e. without clinical signs. They induce acute diarrheal diseases with a short incubation period. Animals are usually the reservoir. The disease is one of the most common anthropozoonoses. In our country these are the most common serotypes:

* S.enteritidis

* S.typhimurium, S.agona, S.bareily, S.heidelberg, S.panama, etc.

Shigella species

Gram-negative rods sensitive to drying out. The disease is one of the most contagious enteric infections, with a very low infectious dose, usually with a pronounced clinical symptomatology: watery diarrhea with an admixture of phlegm and blood and recurring tenesmus.

Vibrio cholera

A gram-negative rod sensitive to drying out and an acidic environment, it is a noninvasive microbe which by the action of cholera toxin induces secretion of fluid into the small intestine with diarrhea and vomiting, quick dehydration.

Yersinia enterocolitica serotype 03 and 09, respectively

It induces alimentary infections. The clinical picture changes according to age. In schoolchildren it induces the right iliac fossa syndrome, i.e. pseudoappendicitis.

Campylobacter jejuni, C.coli, C.fetus, C.laridis

They produce endotoxins similar to cholera toxin. They induce enteric infections in humans and animals. They apply as conditioned pathogens in humans with weakened immunity.

Vibrio parahaemolyticus

they produce a series of exotoxins, formerly named as non-agglutinative vibrios (NAG).

Citrobacter species

Bacteria of low pathogenicity, they induce manifest and latent diarrheal diseases.

Plesiomonas shigelloides

an enteric infection, sometimes similar to dysentery. It usually occurrs in tropical and subtropical regions in surface water; it produces enterotoxin. It induces enteric infections, in some cases even choleriform severe diarrhea.

Aeromonas hydrophyla

It occurrs in water, food, and soil. It produces cytotoxic enterotoxin. The microbe can colonize the human intestine and induce accute diarrhea and chronic colitis.

Topic №19

Methods of investigation of the food poisoning cases

1. Learning objective

Master the knowledge on food poisonings, their etiology, clinic, methods of investigation, general and specific prophylaxis

2. Basics

2.1. You should know:

2.1.1. Definition of "food poisoning" and their classification.

2.1.2. The food poisoning etiology, pathogenesis, clinic and prevention.

3. Self-training questions

3.1. Food poisonings, their definition and classification.

3.2. Alimentary toxicoinfections: definition, etiology, diagnostics, clinic, methods of prevention.

3.3. Bacterial toxicosis: botulism, staphylococcal, their etiology, diagnostics, clinic, prevention.

3.4. Mycotoxicosis, their etiology, diagnostics, clinic, prevention.

3.5. Food poisonings of non-microbe origin with: - products which are toxic by nature; - products which become toxic due to storage conditions; - products, contaminated with toxic substances (xenobiotics) – heavy metals, pesticides etc.

GENERAL INFORMATION FOR PREPARATION TO THE PRACTICAL CLASS

The food poisoning investigation consists of following steps:

1. To organize and carry out the first aid to affected people, organize their hospitalization if necessary.

2. To draw up the necessary documents (the emergency report to sanitary and epidemiological station, assignment to hospital, assignment to laboratory (with materials from affected people), etc).

3. To build the teams for investigation: sanitary inspector from SES, doctor from the institution where the food poisoning occurs or doctor from the hospital where affected persons apply for help, administrative agent, cook of nutrition unit.

4. To draw the plan of investigation.

5. To question the affected people and people, who ate the same meal, but were not affected, the nutrition unit staff.

6. To perform the sanitary inspection of the nutrition unit, analyze the results of laboratory analyses, draw up the documents.

7. To make the conclusion on the investigation results.

8.To organize and take health-improving and preventive measures.

The prophylactic measures of food poisonings

1. Organization and the compliance to the sanitary regulations of the food products storage by their producers, their processing at the food enterprises and other public catering establishments.

2. The compliance to sanitary regulations during the food products loading, transportation, storage at the warehouses and trading network, rodents and harmful insects control, refrigerating plant uninterrupted usage.

3.The compliance to sanitary regulations during the food processing, ready meal storage and sale.

4. Keeping the technical equipment, kitchens, crockery (plates and dishes), inventory in the proper order.

5. The regular sanitary inspection of eating establishments; the regular inspection of animal husbandry and meat supply networks by the veterinary service.

6. The medical examinations and inspections for bacilli and helminthes carriers among the personnel of catering establishments (industrial, storage, nutrition units, trading network etc.), the inspection for keeping of the personal hygiene regulations etc. by the personnel.

Types of food poisonings

1. bacterial (microbic) etiology
2. non -bacterial (non-microbic) etiology
3. unknown etiology

Food poisonings by bacterial etiology

1. Food infections (toxic-infections)

2. Food toxemia (Food toxicosis)
3. mixes (mixed etiology)

Food infections (Toxic-infections)

- are diseases caused by microorganisms, which in a great many got into organism and poisoned it by the toxins.

The cause of toxic-infection can be

- **E.coli bacteria,**
- **genus Proteus,**
- **Cl.Perfringens,**
- **Bac.Cereus,**
- **Vibrio parahaemolyticus,**
- **Enterococcus and other unstated microorganisms.**

Food toxemia

Food toxemia (Food-toxicosis) - diseases caused y toxins, produced in food products by toxic strains of *Clostridium botulinum* and *Staphylococcus aureus*.

Poisoning classification of non- microbic origin

1. Poisoning by products, poisonous by its nature : **vegetable or animal origin**
2. Poisoning by products, which become toxic for some time
3. Poisoning by admixtures of chemically toxic substances

Direct prevention steps

1. Safe shopping
2. Safe cooking
3. Safe storage of foods
4. Washing hands and keep clean preparation
5. Do not cross-contaminate. Keep raw meat, poultry, fish, and their juices away from other food. After cutting raw meats, wash hands, cutting board, knife, and counter tops with hot, soapy water.
6. Marinate meat and poultry in a covered dish in the refrigerator. Discard any uncooked/unused marinade.
7. Never leave food out more than two hours (or more than one hour in temperatures above 30°C).
8. Cook or freeze fresh poultry, fish, ground meats, and variety meats within two days

METHODICAL RECOMMENDATIONS ON “Hygiene and Ecology” for preparation to practical classes of foreign students II year of study

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