MINISTRY OF HEALTH CARE
OF THE REPUBLIC OF BELARUS
VITEBSK STATE MEDICAL UNIVERSITY
THE GENERAL HYGIENE AND ECOLOGY DEPARTMENT

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LABORATORY CLASSES ON ENVIRONMENTAL MEDICINE

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on the specialty 1-79 01 01 «General medicine»

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The content of the manual « Laboratory classes on environmental medicine » for students of high medical educational establishments corresponds with the basic educational plan and program, proved by Ministry of Health Care of the Republic of Belarus.

The manual is prepared for students of medical, pharmaceutical, stomatological, medical-preventive, medical-diagnostic faculties of institutes of higher education.

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Theme 1. INTRODUCTION IN ENVIRONMENTAL MEDICINE

The theme has important meaning in preparation of students for prevention of environmental pathology.

Purpose of the Lesson: to be able to determine the environmental pathology and to develop measures for its prophylactic.

Laboratory Work.

- 1. Reveal the patients with complaints on general weakness, headache, dyspnea, fatigue, cyanoses, increasing with physical activity**,** determine the nitrates content in potable water of centralized and decentralized water sources, calculate the correlation factor.
- 2. Estimate the received results.
- 3. Offer optimization ways for prophylactic of the environmental pathology, related to nitrates content in potable water.
- 4. Record the laboratory work report.

Situational Tasks.

1. In the city 2000 patients with complaints on pains in joints were registered. There are no enterprises of the chemical industry in the city. In potable water of the city the molybdenum maintenance has made 0.45 mg/dm^3. Estimate the morbidity of the environmental pathology and suggest improvement actions for its prevention.

2. In the countryside 100 patients with complaints on cyanosis were registered. There are no enterprises of the chemical industry in the city. In potable water of the city the nitrates maintenance has made 75 mg/dm^3. Estimate the morbidity of the environmental pathology and suggest improvement actions for its prevention.

3. In the city 2500 patients with complaints on anemia were registered. There are no enterprises of the chemical industry in the city. In potable water of the city the iron maintenance has made 0.05 mg/dm^3. Estimate the morbidity of the environmental pathology and suggest improvement actions for its prevention.

4. In the city 5000 patients with complaints on caries were registered. There are no enterprises of the chemical industry in the city. In potable water of the city the fluorine maintenance has made 2.6 mg/dm^3. Estimate the morbidity of the environmental pathology and suggest improvement actions for its prevention.

5. In the city 4200 children with complaints on hypogonadism were registered. There are no enterprises of the chemical industry in the city. In potable water of the city the zinc maintenance has made 8.0 mg/dm^3. Estimate the morbidity of the environmental pathology and suggest improvement actions for its prevention.

6. In the city 400 children with complaints on curvature of bones of a skeleton were registered. There are no enterprises of the chemical industry in the city. In potable water of the city the strontium maintenance has made 12.0 mg/dm^3. Estimate the morbidity of the environmental pathology and suggest improvement actions for its prevention.

7. In the city 6000 patients with complaints on thyroid gland increase were registered. There are no enterprises of the chemical industry in the city. In potable water of the city the iodine maintenance has made 0.12 mg/dm^3. Estimate the morbidity of the environmental pathology and suggest improvement actions for its prevention.

8. In the countryside 200 patients with complaints on cyanosis were registered. There are no enterprises of the chemical industry in the city. In potable water of the city the nitrates maintenance has made 95 mg/dm^3. Estimate the morbidity of the environmental pathology and suggest improvement actions for its prevention.

9. In the city 3500 patients with complaints on anemia were registered. There are no enterprises of the chemical industry in the city. In potable water of the city the iron maintenance has made 0.03 mg/dm^3. Estimate the morbidity of the environmental pathology and suggest improvement actions for its prevention.

10. In the city 7000 patients with complaints on caries were registered. There are no enterprises of the chemical industry in the city. In potable water of the city the fluorine maintenance has made 2.0 mg/dm^3. Estimate the morbidity of the environmental pathology and suggest improvement actions for its prevention.

11. In the city 2100 patients with complaints on pains in joints were registered. There are no enterprises of the chemical industry in the city. In

potable water of the city the molybdenum maintenance has made 0.55 mg/dm^3. Estimate the morbidity of the environmental pathology and suggest improvement actions for its prevention.

12. In the countryside 200 patients with complaints on cyanosis were registered. There are no enterprises of the chemical industry in the city. In potable water of the city the nitrates maintenance has made 85 mg/dm^3. Estimate the morbidity of the environmental pathology and suggest improvement actions for its prevention.

13. In the city 2700 patients with complaints on anemia were registered. There are no enterprises of the chemical industry in the city. In potable water of the city the iron maintenance has made 0.08 mg/dm^3. Estimate the morbidity of the environmental pathology and suggest improvement actions for its prevention.

14. In the city 5500 patients with complaints on caries were registered. There are no enterprises of the chemical industry in the city. In potable water of the city the fluorine maintenance has made 2.9 mg/dm^3. Estimate the morbidity of the environmental pathology and suggest improvement actions for its prevention.

15. In the city 4300 children with complaints on hypogonadism were registered. There are no enterprises of the chemical industry in the city. In potable water of the city the zinc maintenance has made 8.5 mg/dm^3. Estimate the morbidity of the environmental pathology and suggest improvement actions for its prevention.

For the lesson the student should know:

1. Methodical instructions on performance of laboratory work, characteristic of the environmental pathology, measures for prophylactic of the environmental pathology.
2. Algorithm of the situational task decision.
3. Explanation of Multiple choice questions.
4. Answers on the study questions:

Study Questions.

4.1. An organism and environment, their interrelation.
4.2. Ecosystem, biogeocenose, biosphere concept.
4.3. Environmental factors. The laws of their influence on an organism.

4.4. Environmental medicine as a science, its differentiation, purpose, tasks, methods, studying subject, connection with other sciences.
4.5. The brief outline of history of environmental medicine development.
4.6. The value of environmental medicine for a doctor.

For the lesson the student should be able to:
1. Work with the microcalculator.

Methodical Instructions on Performance of Laboratory Work.

Determination of the environmental pathology, related to nitrates content in potable water.

1. Determination of the environmental pathology at the patients, living in different regions

The patients with complaints on
- general weakness,
- headache,
- dyspnea,
- fatigue,
- cyanoses on skin and mucous, increasing with physical activity

are revealed in the survey and examination.

2. Determination of nitrates content in potable water, consumed by the patients

Equipment: porcelain cup, pipettes, conical flasks.
Reagents: concentrated sulfuric acid, diphenylamine.
Work performance:

a. 2 ml of the investigated water is taken into porcelain cup;

b. some drops of concentrated sulfuric acid with diphenylamine are added.

Ecological estimation of nitrates content in drinking water is made by change of color (there is the dark blue or violet coloring at presence of nitrate-ions in water).

MPC of nitrates content in water is 45 mg/dm^3.

3. *Diagnosis acknowledgement of environmental pathology is spent by calculation of the correlation factor of Pirson's* under the following formula:

$$r = \frac{\Sigma(d_x \cdot d_y)}{\sqrt{\Sigma d_x^2 \cdot \Sigma d_y^2}}$$

where x and y – signs between which correlation is defined,

d_x and d_y – deviations of everyone variant from the average size calculated among the signs x and y,

Σ – a sign sum.

The table 1.1 is filled on the received results.

Table 1.1. The calculation of correlation factor.

№	*nitrates content (x)*	*amount of cases (y)*	d_x	d_y	$d_x \times d_y$	d_x^2	d_y^2
1							
2							
	average	*average*			$\Sigma(d_x \cdot d_y)$	Σd_x^2	Σd_y^2

The table 1.2 is used to estimate the force and character of correlation.

Table 1.2. The estimation of force and character of correlation.

Force of correlation / Character of correlation	direct (+)	inverse (-)
Full	+1	-1
Strong	+1 … + 0,7	-1 … -0,7
Average	+0,7 … + 0,3	-0,7 … -0,3
Weak	+0,3 … 0	-0,3 … 0
No	0	0

If the correlation factor +1 there are full force of correlation and direct character of correlation between the nitrates content in the consumed drinking water and amount of patients with blue baby syndrome or methhemoglobinemia.

Preliminary diagnosis: blue baby syndrome or methhemoglobinemia.

Solve a problem, estimate the obtained data and request actions for their improvement

Situational Task.

In the city with the population 300000 persons 20000 patients with arthritis were firstly registered. There are no enterprises of the chemical industry in the city. In potable water of the city the molybdenum maintenance has made 0.50 mg/dm^3. Estimate the morbidity of the environmental pathology and suggest improvement actions for its prevention.

The algorithm of task's decision:

The potable water mismatches MPC on molybdenum which is equal 0.25 mg/dm^3. Taking into account the population complaints on arthrosis it is possible to assume the environmental pathology, caused by the long use of the water containing molybdenum.

Preliminary diagnosis: endemic molibdenosis.

Treatment includes detoxication, restoration of the broken food status, immunocorrection, antioxidant therapy, symptomatic therapy.

Individual prevention includes the formation of healthy lifestyle with a stress on rational and preventive nutrition, drinking mode, consumption of less amount of water with high content of molybdenum, performing of water purification, usage of the bottled water, reception of phytopreparations, adaptogens.

Multiple Choice Questions.

Choose proper answers

1. Environment is:
    1. is a combination of natural and changed by person's activity nature factors which show effect of influence on organism;
    2. all forces and phenomena of nature, the origin of which is not directly related to the activity of living organisms;
    3. the forces and phenomena of nature, the origin of which is directly related to the activity of living organisms;
    4. an environment of human caused by a set of objects, phenomena and factors that determine the conditions of his life;
    5. the results of development of any organism are determined by the ratio of its internal characteristics and characteristics of the environment in which it is located.
2. Environmental factor is:
    1. any factor, abiotic or biotic, that directly or indirectly influences living organisms;
    2. living (biotic) components of the planet;
    3. nonliving (abiotic) components of the planet;
    4. optimum factor;
    5. the combined effect of two or more factors when their joint biological activity is much higher than the effect of each component and their sum.
3. Abiotic factors are:
    1. geological, geographical, hydrological and climatological parameters;
    2. biotope;
    3. any living components that affects another organism;

4. opposed to natural factors;
5. external (exogenous) and internal (endogenous).

4. Environmental factors are classified:
   1. causal etiological and risk;
   2. primary and secondary periodic and nonperiodic;
   3. irritants, limiters, signals and modifiers;
   4. favorable, unfavorable, influencing of both kinds;
   5. abiotic, biotic, anthropogenic.
5. Environmental medicine is a science about:
   1. etiology, pathogenesis, clinical picture, diagnostics, treatment and prevention of environmental diseases in humans;
   2. prevention of environmental diseases and reduction of environmental morbidity;
   3. identification of the nature of interaction between man and environment, the reasons and causal relationships between the quality of the environment and morbidity;
   4. study of the mechanisms of development, clinical manifestations, diagnostic features;
   5. development of diagnostics, treatment schemes and prophylactic actions on prevention of human diseases.
6. Indicators of the state of health of the population are:
   1. demographic;
   2. physical development;
   3. morbidity;
   4. adaptation;
   5. acclimatization.
7. Methods for studying of the environment conditions are:
   1. chemical;
   2. physical;
   3. microbiological;
   4. biological;
   5. parasitological.
8. Methods for studying of the environmental diseases are:
   1. morphological;
   2. physiological;
   3. biochemical;
   4. clinical;

5. statistical.

9. The laws of influence of ecological factors on an organism are:
   1. optimum;
   2. limiting factor;
   3. interaction of factors;
   4. synergy;
   5. risk.

10. Casual etiological factors are:
   1. factors directly cause environmental disease;
   2. factors do not directly cause disease, but increase the probability of its occurrence;
   3. potentially unsafe to health factors of physical, chemical, biological and social origin, which increase the risk of diseases and their progression and adverse outcome;
   4. the most favorable intensity of environmental factors for organisms;
   5. simultaneous or sequential cumulative effect on organisms of natural and anthropogenic factors.

11. The optimum law, or the tolerance law means:
   1. multiple chemical sensitivity;
   2. any ecological factor has limits of positive influence on a live organism;
   3. the distance between minimum and maximum values of the factor;
   4. the factor which deviates from its optimum value in the largest degree is the most significant for an organism;
   5. adaptation of organisms to the environment.

12. The etiological environmental factors are:
   1. natural chemical factors of atmospheric air, water and soil of pessimal intensity;
   2. natural physical factors of atmospheric air, water and soil of pessimal intensity;
   3. natural biological factors of atmospheric air, water and soil of pessimal intensity;
   4. natural chemical, physical, biological factors of atmospheric air, water and soil of optimal intensity;
   5. artificial chemical, physical, biological factors of atmospheric air, water and soil of optimal intensity.

13. Environmental medicine is divided into:
    1. general;
    2. private;
    3. demographic;
    4. preventive;
    5. clinical.
14. Anthropoecology tasks are:
    1. revealing of individual and group person's adaptable possibilities;
    2. studying of population's development, studying of occurrence laws, existence and development of antropocenose;
    3. preservation and improvement of health;
    4. perfection of person's physical and mental possibilities;
    5. studying of life conditions and ecological communications of people.
15. A principle of environmental integrity of health means:
    1. human health and the health of the biosphere is a single organism;
    2. system of collecting, analyzing and evaluating information about the state of life and health of the population;
    3. social and hygienic monitoring;
    4. a comprehensive educational, training and upbringing activity aimed at formation of hygienic health of individuals, social groups and society as a whole;
    5. optimum law.

Literature.

1. Lecture №1.
2. Alters, S. Biology. Understanding life / Sandra Alters. – USA: Mosby-Year Book, 1996. – 845 p.
3. Enger, E.D. Environmental science. A study of relationship: Fifth edition / Eldon D. Enger, Bradley F. Smith. – USA: The McGraw-Hill Companies, 1995. – 431 p.
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Theme 2. ETIOLOGY OF ENVIRONMENTAL DISEASES

The theme is necessary for the further training at general hygiene and ecology department, department of public health and public health services and also in practical work as a doctor for the treatment and prevention of environment illnesses.

Purpose of the Lesson: to be able to determine etiology, pathogenesis, clinical picture, to diagnose the environmental pathology, to appoint the treatment and to develop measures for individual prophylactic of environmental pathology.

Laboratory Work.

- 1. Reveal the patients with complaints on hemorrhagic rash, pigment spots of brick-red, brown or dark brown color on the skin, determine the iron content in potable water, consumed by the patients.
- 2. Estimate the environmental pathology.
- 3. Offer optimization ways for prophylactic of skin pathology, related to the consumption of potable water with iron content in it.
- 4. Record the laboratory work report.

Situational Tasks.

1. 60 patients with complaints on decrease in physical and mental capacity, frequent catarrhal diseases, pain in liver and heart, deterioration of accommodation and decrease of visual acuity have consulted to district physician. In potable water of the city the selenium content has made 0.00001 mg/dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

2. 70 patients with complaints on decrease in physical and mental capacity, frequent catarrhal diseases, pain in liver and heart, deterioration of accommodation and decrease of visual acuity have consulted to district physician. In potable water of the city the selenium content has made 0.0002 mg/dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

3. 40 patients with complaints on decrease in physical and mental capacity, frequent catarrhal diseases, pain in liver and heart, deterioration

of accommodation and decrease of visual acuity have consulted to district physician. In potable water of the city the selenium content has made 0.00001 mg/dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

4. 20 patients with complaints on decrease in physical and mental capacity, frequent catarrhal diseases, pain in liver and heart, deterioration of accommodation and decrease of visual acuity have consulted to district physician. In potable water of the city the selenium content has made 0.0004 mg/dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

5. 85 patients with complaints on decrease in physical and mental capacity, frequent catarrhal diseases, pain in liver and heart, deterioration of accommodation and decrease of visual acuity have consulted to district physician. In potable water of the city the selenium content has made 0.0006 mg/dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

6. 45 patients with complaints on decrease in physical and mental capacity, frequent catarrhal diseases, pain in liver and heart, deterioration of accommodation and decrease of visual acuity have consulted to district physician. In potable water of the city the selenium content has made 0.00002 mg/dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

7. 60 patients with complaints on decrease in physical and mental capacity, frequent catarrhal diseases, pain in liver and heart, deterioration of accommodation and decrease of visual acuity have consulted to district physician. In potable water of the city the selenium content has made 0.0007 mg/dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

8. 80 patients with complaints on decrease in physical and mental capacity, frequent catarrhal diseases, pain in liver and heart, deterioration of accommodation and decrease of visual acuity have consulted to district physician. In potable water of the city the selenium content has made 0.0003 mg/dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

9. 35 patients with complaints on decrease in physical and mental capacity, frequent catarrhal diseases, pain in liver and heart, deterioration of accommodation and decrease of visual acuity have consulted to district physician. In potable water of the city the selenium content has made

0.00009 mg/dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

10. 45 patients with complaints on decrease in physical and mental capacity, frequent catarrhal diseases, pain in liver and heart, deterioration of accommodation and decrease of visual acuity have consulted to district physician. In potable water of the city the selenium content has made 0.0008 mg/dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

11. 62 patients with complaints on decrease in physical and mental capacity, frequent catarrhal diseases, pain in liver and heart, deterioration of accommodation and decrease of visual acuity have consulted to district physician. In potable water of the city the selenium content has made 0.00002 mg/dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

12. 64 patients with complaints on decrease in physical and mental capacity, frequent catarrhal diseases, pain in liver and heart, deterioration of accommodation and decrease of visual acuity have consulted to district physician. In potable water of the city the selenium content has made 0.0003 mg/dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

13. 44 patients with complaints on decrease in physical and mental capacity, frequent catarrhal diseases, pain in liver and heart, deterioration of accommodation and decrease of visual acuity have consulted to district physician. In potable water of the city the selenium content has made 0.0009 mg/dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

14. 25 patients with complaints on decrease in physical and mental capacity, frequent catarrhal diseases, pain in liver and heart, deterioration of accommodation and decrease of visual acuity have consulted to district physician. In potable water of the city the selenium content has made 0.005 mg/dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

15. 75 patients with complaints on decrease in physical and mental capacity, frequent catarrhal diseases, pain in liver and heart, deterioration of accommodation and decrease of visual acuity have consulted to district physician. In potable water of the city the selenium content has made 0.0003 mg/dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

- Theme 2 -

For the lesson the student should know:
1. Methodical instructions on performance of laboratory work, characteristic of the environmental pathology**,** measures for prophylactic of the environmental pathology.
2. Algorithm of the situational task decision.
3. Explanation of Multiple choice questions.
4. Answers on the study questions:

Study Questions.

4.1. Characteristic and classification of reasons of environmental diseases.
4.2. Physical factors of air, water and soil, causing environmental diseases.
4.3. Chemical factors of air, water and soil, causing environmental diseases.
4.4. Biological factors of air, water and soil, causing environmental diseases.
4.5. Pollutants of physical and biological nature of air, water and soil, causing environmental diseases.
4.6. Pollutants of chemical nature of air, water and soil, causing environmental diseases.

For the lesson the student should be able to:
1. Work with the microcalculator.
2. Work with the photo and electro colorimeter.

Methodical Instructions on Performance of Laboratory Work.

Determination of the environmental pathology, related to iron content in potable water.

1. Determination of the environmental pathology at the patients

The patients with complaints on
- hemorrhagic rash,
- pigment spots of brick-red, brown or dark brown color,

are visually revealed on the skin of patients in the survey.

2. Determination of iron content in potable water, consumed by the patients

Equipment: calculator, photo and electro colorimeter (PhEC) (picture 2.1), conical flasks, measuring cylinders, tubes, mortar with pestle.

Picture 2.1. Photo and electro colorimeter.

Reagents: sulfosalicylic acid solution, gidroperit, ammonia, ammonium chloride solution.

Work performance:

a. 50 cm^3 of the investigated water is poured into the conical flask;

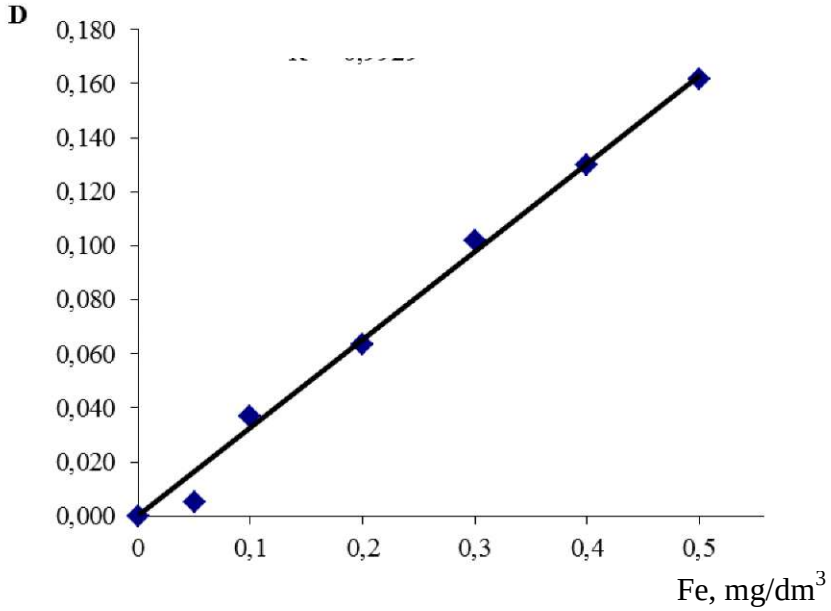
b. 1sm^3 of sulfosalicylic acid is added;

c. the pounded in a mortar the tablet of gidroperit is poured, mixed and waited for 5 min;

d. 1 cm^3 of ammonium chloride solution and 1 cm^3 of ammonia are added;

e. in 5 minutes the optical density of the sample relatively to the control sample at a wavelength of 400 nm (violet filter № 3) using the cuvette with the length of 50 mm is determined (the control sample is the distilled water).

The iron content is calculated on the calibration graph (picture 2.2):



Picture 2.2. The calibration graph for calculation of iron content on the optical density.

MPC of iron content in water is 0.3 mg/dm^3.

***Preliminary diagnosis*:** the skin pathology, related to the consumption of potable water with iron content in it.

Solve a problem, estimate the obtained data and request actions for their improvement

Situational Task.

50 patients with complaints on decrease in physical and mental capacity, frequent catarrhal diseases, pain in liver and heart, deterioration of accommodation and decrease of visual acuity have consulted to district physician. In potable water of the city the selenium content has made 0.0001 mg/dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

The algorithm of task's decision:

The potable water mismatches MPC on selenium which is equal 0.01 mg/dm^3. At the long-term use of the water containing selenium below the

physiological need of organism, decrease in physical and mental capacity, frequent catarrhal diseases, pain in liver and heart, deterioration of accommodation and decrease of visual acuity are possible. Taking into account the population complaints it is possible to assume the environmental pathology, caused by low selenium content in the water.

Preliminary diagnosis: endemic hyposelenosis.

Pathogenesis: selenium deficiency leads to disruption of the synthesis of coenzyme Q-10, which is required for the synthesis of ATP - ase that participates in the synthesis of ATP - the universal energy source.

Treatment should include detoxication, restoration of the nutritional status, immunocorrection, specific desensitization, antioxidant therapy.

Individual prevention includes formation of healthy lifestyle with a focus on rational and preventive nutrition, drinking mode, consumption less of the water with lack of selenium, usage of the bottled water, reception of phytopreparations, adaptogens.

Multiple Choice Questions.

Choose proper answers

1. Environmental or environmentally caused diseases are:
    1. diseases caused by abiotic chemical, physical and biotic environmental factors;
    2. diseases caused by etiological environmental factors;
    3. diseases caused by risk environmental factors;
    4. diseases caused by working conditions;
    5. diseases caused by excess of nitrates.
2. Risk factors for health are:
    1. lifestyle (49-53%);
    2. heredity (18-22%);
    3. environment (17-20%);
    4. biological (11%);
    5. industrial environment (18.5%).
3. There is an increase in the risk of environment-related diseases of the following systems:
    1. circulatory;
    2. nervous;
    3. endocrine;
    4. urogenital;
    5. digestive.

4. The environmentally induced pathology caused by iodine deficiency is:
    1. endemic goiter;
    2. dental caries;
    3. endemic molibdenosis;
    4. hyperselenosis;
    5. methemoglobinemia.
5. The basis for the suspicion of environmental etiology of the disease is:
    1. identification of the characteristic symptoms in clinical picture that are not found in other nosological forms and non-professional activity of the persons;
    2. the group nature of noninfectious diseases;
    3. the presence of harmful and dangerous environmental factors;
    4. the possibility of disease of the environmental etiology after cessation of exposure to harmful factors;
    5. the combined effect of two or more factors.
6. The environmentally induced diseases, the causes of which are finally not investigated are:
    1. multiple chemical sensitivity;
    2. chronic allergic diseases;
    3. autoimmune diseases;
    4. asthma;
    5. Alzheimer's disease.
7. Factors playing important role in development of ecological diseases are:
    1. heredity;
    2. food status;
    3. toxic effects;
    4. action of allergens;
    5. effect of physical and psychosocial factors.
8. The general laws in the formation of environmentally caused diseases are:
    1. man-made environment;
    2. a long impact of environmental pathogenic factors of low intensity;
    3. a long latency period;
    4. an increase in frequency of occurrence of non-specific diseases;
    5. acclimatization.
9. Mutation is:

1. a sudden change in hereditary, caused by sharp structural and functional changes in the genetic material;
2. a substance and impact, leading to mutations;
3. a process of occurrence of mutations, their accumulation, distribution and elimination;
4. a variability in the genome;
5. an appearance of mutations, which in turn cause the development of hereditary diseases.

10. Mutagen or mutagenic factor is:
    1. a variability in the genome;
    2. a substance and impact, leading to mutations;
    3. a process of occurrence of mutations, their accumulation, distribution and elimination;
    4. a sudden change in hereditary, caused by sharp structural and functional changes in the genetic material;
    5. an appearance of mutations, which in turn cause the development of hereditary diseases.
11. Mutagens are classified into:
    1. mutagenic;
    2. physical;
    3. chemical;
    4. biological;
    5. aromatic.
12. Physical mutagens are:
    1. extreme heat;
    2. ionizing radiations;
    3. ultraviolet radiations;
    4. microwave radiation;
    5. genotoxic substance.
13. Chemical mutagens are:
    1. melanin;
    2. alkaloid;
    3. bromine;
    4. microwave radiation;
    5. benzene.
14. Biological mutagens are:
    1. virus;
    2. bacteria;
    3. transposon;

4. helminths and the products of their metabolism;
5. microwave radiation.

15. The internal pollutants of dwelling are:
1. anthropotoxins;
2. substances released from household chemicals;
3. bioaerosols;
4. electrosmog;
5. oxides of sulfur.

Literature.

1. Lecture №1.
2. Alters, S. Biology. Understanding life / Sandra Alters. – USA: Mosby-Year Book, 1996. – 845 p.
3. Enger, E.D. Environmental science. A study of relationship: Fifth edition / Eldon D. Enger, Bradley F. Smith. – USA: The McGraw-Hill Companies, 1995. – 431 p.
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5. Rom, W.N. Environmental and occupational medicine: Fourth edition / William N. Rom. – Filadelphia: Lippincott Williams & Wilkins, 2007. – 1884 p.

Theme 3. THE FEATURES OF PATHOGENESIS, CLINICAL PICTURE, DIAGNOSTICS OF THE ENVIRONMENTAL DISEASES

The theme is necessary for the further training at general hygiene and ecology department, department of public health and public health services and also in practical work as a doctor for the treatment and prevention of environmental pathology, caused by mutagenic factors.

Purpose of the Lesson: to be able to diagnose the environmental pathology, caused by mutagenic factors, and to develop measures for its prophylactic.

Laboratory Work.

- 1. Reveal the patients with complaints on redness, itching and peeling of the skin after UVB action, determine the type of skin sensitivity to UVB action, intensity of UVB action.
- 2. Estimate the environmental pathology.
- 3. Offer optimization ways for prophylactic of photodermatitis, caused by the ultraviolet radiation in excess of the permissible dose.
- 4. Record the laboratory work report.

Situational Tasks.

1. 20 patients of the 1st type of skin with complaints on the appearance of small moles protruding above the surface of skin on the neck and underarm area have consulted to district physician. Patients were exposured to the sun for a long-term, UVB dose was 270 joule/m^2. Estimate the environmental pathology and suggest improvement actions for its prevention.

2. 30 patients of the 1st type of skin with complaints on the appearance of small moles protruding above the surface of skin on the neck and underarm area have consulted to district physician. Patients were exposured to the sun for a long-term, UVB dose was 280 joule/m^2. Estimate the environmental pathology and suggest improvement actions for its prevention.

3. 40 patients of the 1st type of skin with complaints on the appearance of small moles protruding above the surface of skin on the neck

and underarm area have consulted to district physician. Patients were exposured to the sun for a long-term, UVB dose was 290 joule/m^2. Estimate the environmental pathology and suggest improvement actions for its prevention.

4. 50 patients of the 1st type of skin with complaints on the appearance of small moles protruding above the surface of skin on the neck and underarm area have consulted to district physician. Patients were exposured to the sun for a long-term, UVB dose was 300 joule/m^2. Estimate the environmental pathology and suggest improvement actions for its prevention.

5. 60 patients of the 2nd type of skin with complaints on the appearance of small moles protruding above the surface of skin on the neck and underarm area have consulted to district physician. Patients were exposured to the sun for a long-term, UVB dose was 270 joule/m^2. Estimate the environmental pathology and suggest improvement actions for its prevention.

6. 45 patients of the 2nd type of skin with complaints on the appearance of small moles protruding above the surface of skin on the neck and underarm area have consulted to district physician. Patients were exposured to the sun for a long-term, UVB dose was 290 joule/m^2. Estimate the environmental pathology and suggest improvement actions for its prevention.

7. 25 patients of the 2nd type of skin with complaints on the appearance of small moles protruding above the surface of skin on the neck and underarm area have consulted to district physician. Patients were exposured to the sun for a long-term, UVB dose was 300 joule/m^2. Estimate the environmental pathology and suggest improvement actions for its prevention.

8. 35 patients of the 2nd type of skin with complaints on the appearance of small moles protruding above the surface of skin on the neck and underarm area have consulted to district physician. Patients were exposured to the sun for a long-term, UVB dose was 360 joule/m^2. Estimate the environmental pathology and suggest improvement actions for its prevention.

9. 55 patients of the 3rd type of skin with complaints on the appearance of small moles protruding above the surface of skin on the neck and underarm area have consulted to district physician. Patients were exposured to the sun for a long-term, UVB dose was 460 joule/m^2.

Estimate the environmental pathology and suggest improvement actions for its prevention.

10. 60 patients of the 3rd type of skin with complaints on the appearance of small moles protruding above the surface of skin on the neck and underarm area have consulted to district physician. Patients were exposured to the sun for a long-term, UVB dose was 500 joule/m^2. Estimate the environmental pathology and suggest improvement actions for its prevention.

11. 40 patients of the 1st type of skin with complaints on the appearance of small moles protruding above the surface of skin on the neck and underarm area have consulted to district physician. Patients were exposured to the sun for a long-term, UVB dose was 280 joule/m^2. Estimate the environmental pathology and suggest improvement actions for its prevention.

12. 45 patients of the 1st type of skin with complaints on the appearance of small moles protruding above the surface of skin on the neck and underarm area have consulted to district physician. Patients were exposured to the sun for a long-term, UVB dose was 290 joule/m^2. Estimate the environmental pathology and suggest improvement actions for its prevention.

13. 45 patients of the 1st type of skin with complaints on the appearance of small moles protruding above the surface of skin on the neck and underarm area have consulted to district physician. Patients were exposured to the sun for a long-term, UVB dose was 310 joule/m^2. Estimate the environmental pathology and suggest improvement actions for its prevention.

14. 55 patients of the 1st type of skin with complaints on the appearance of small moles protruding above the surface of skin on the neck and underarm area have consulted to district physician. Patients were exposured to the sun for a long-term, UVB dose was 320 joule/m^2. Estimate the environmental pathology and suggest improvement actions for its prevention.

15. 65 patients of the 2nd type of skin with complaints on the appearance of small moles protruding above the surface of skin on the neck and underarm area have consulted to district physician. Patients were exposured to the sun for a long-term, UVB dose was 370 joule/m^2. Estimate the environmental pathology and suggest improvement actions for its prevention.

- Theme 3 -

For the lesson the student should know:
1. Methodical instructions on performance of laboratory work, characteristic of the environmental pathology**,** measures for prophylactic of the environmental pathology.
2. Algorithm of the situational task decision.
3. Explanation of Multiple choice questions.
4. Answers on the study questions:

Study Questions.

4.1. Features of pathogenesis of environmental diseases.
4.2. The mechanism of human hereditary diseases.
4.3. Gene, chromosome, genome, cytoplasmic and somatic mutations, their value in occurrence of hereditary pathology of the person. DNA repair.
4.4. Features of clinical picture of environmental diseases.
4.5. Features of diagnostic of environmental diseases.
4.6. Features of treatment of environmental diseases.

For the lesson the student should be able to:
1. Work with the microcalculator.
2. Work with the photo and electro colorimeter.

Methodical Instructions on Performance of Laboratory Work.

Determination of the environmental pathology, related to the intensity of UVB action type according to the skin sensitivity type to UVB action.

1. Determination of the environmental pathology at the patients

The patients with complaints on
- redness,
- itching
- peeling of the skin after UVB action

are visually revealed on the skin of patients in the survey.

2. Determination of the intensity of UV radiation for the patients

Equipment: Device "TKA - PCM" (12) for measuring the intensity of UV radiation.

Work performance:

a. a photometric head is placed parallel to the plane of the object to be measured;

b. the switch is changed in the up position;

c. the desired limit of measurement is chosen (this unit is automatically turned on);

d. the value of a dose of UV radiation is read on the digital display.

3. Determination of the type of skin sensitivity to UVB action of the patients

Work performance:

a. to define the types of skin sensitivity to UVB colour of eyes, hair, skin, presence of freckles, predisposition to sunburning and tanning behavior are taken into account (table 3.1).

1st type is the especially sensitive skin. Individuals have blue or green eyes, freckles, red hair. Sunburning is often. Tanning behavior is occasionally.

2nd type is the sensitive skin. Individuals have blue, green or grey eyes, light-brown or chestnut hair. Sunburning is usually. Tanning behavior is sometimes.

3rd type is the normal skin. Individuals have grey or light- hazel eyes, chestnut hair. Sunburning is rarely. Tanning behavior is usually.

4th type is the tolerant skin. Individuals have swarthy skin, dark eyes and dark hairs. Sunburning is rarely. Tanning behavior is often.

5th type is the very tolerant skin. Individuals have brown, dark brown skin, black hair. Sunburning is very rarely. Tanning behavior is sometimes darkens.

6th type is the extremely tolerant skin. Individuals have very dark brown or black skin, black hair. Sunburning is extremely rarely. Tanning behavior is naturally black-brown skin.

b. to define the UVB dose and tolerance level according to type of skin sensitivity to UVB (table 3.1).

Table 3.1. Value of doses and tolerance levels of UVB for various types of skin.

Skin types	UVB dose, joule/m^2	Tolerance level, MED (minimum erythema dose)
I	200	0.8
II	250	1.0
III	350	1.4
IV	450	1.8
V	550	2.2
VI	600	2.4

***Preliminary diagnosis*:** photodermatitis, caused by the ultraviolet radiation in excess of the permissible dose.

Solve a problem, estimate the obtained data and request actions for their improvement

Situational Task.

20 patients of the 1st type of skin with complaints on the appearance of small moles protruding above the surface of skin on the neck and underarm area have consulted to district physician. Patients were exposured to the sun for a long-term, UVB dose was 260 joule/m^2. Estimate the environmental pathology and suggest improvement actions for its prevention.

The algorithm of task's decision:

When a long stay in the sun above mentioned complaints are possible.

Preliminary diagnosis: intradermal melanoform nevus.

Pathogenesis: UV light stimulates melanocyte work in the basal layer of the skin, produces a large amount of melanotropous hormone, increases the amount of melanocytes.

Treatment should include surgical correction, detoxication, immunocorrection, symptomatic treatment, antioxidant therapy, specific and nonspecific desensitization.

Individual prevention includes formation of healthy lifestyle with a focus on rational and preventive nutrition, control of the stay time in the sun, use the rational clothes, and apply the sun protection creams, sunscreen lotions, reception of phytopreparations, adaptogens.

Multiple Choice Questions.

Choose proper answers

1. The pathological process of environmentally caused diseases includes:
   1. damage of immune, nervous and endocrine mechanisms of regulation;
   2. violations of biochemical processes;
   3. violations of physiological functions;
   4. violations of morphological structures;
   5. the damage of certain organ and systems.
2. The clinical picture of environmental disease is:
   1. very diverse;
   2. usually has no specific symptoms;
   3. described by information complex index;
   4. described by biochemical, physiological, immunological and other studies;
   5. included into International Classification of Diseases.
3. The process of diagnostics of an environmental pathology includes:
   1. an anamnesis of the disease;
   2. establishment of prior factors (genetic, stress, infectious, toxic, physical);
   3. identification of the role of triggers (chemical, physical, biological and physiological factors, medications, physical activity, social interaction);
   4. revealing of mediators (hormones, lymphokines, cytokines, free radicals, neurotransmitters);
   5. definition of pathological process, deficiencies, excesses, intoxication and the reasons.
4. The diagnostic criteria of diseases of environmental etiology are:
   1. the sanitary and environmental characteristics of the residence area;
   2. duration of residence in the area;
   3. professional and general history;

4. account of non-specific clinical signs;
5. the study of dynamics of the pathological process.

5. Treatment of environmental diseases includes:
1. detoxication to remove heavy metals and toxic xenobiotics;
2. elimination of violations of nutritional status;
3. immunocorrection;
4. treatment of allergies;
5. antioxidant therapy.

6. The action of ionizing radiation results in the following types of DNA breaks:
1. single;
2. multiple;
3. erythema;
4. tanning;
5. immunosuppression.

7. Biological mutagens are:
1. virus;
2. bacteria;
3. transposon;
4. helminths and the products of their metabolism;
5. microwave radiation.

8. The major target of genotoxic lesions are:
1. somatic cells;
2. germinal cells;
3. embryonic cells;
4. mitochondrial cells;
5. nuclear cells.

9. Genotoxic effects on embryonic cells are the cause of:
1. inherited diseases;
2. carcinogenesis;
3. miscarriage;
4. teratogenesis;
5. infertility.

10. Mutations by the nature of changes in the genotype are classified into:
1. genetic;
2. chromosomal;
3. genomic;
4. cytoplasmic;

5. somatic.

11. Molecular mechanisms of gene (point) mutations are manifested in:
1. changing in the structure of chromosomes;
2. changing of the order of nucleotide pairs in the nucleic acid molecule;
3. losing of part of chromosome;
4. doubling or multiplication of certain chromosomal regions;
5. turning the individual sections of the chromosome by 180^0.

12. Intrachromosomal rearrangements result from:
1. changing in the structure of chromosomes;
2. changing in the structure of genes;
3. losing of part of chromosome;
4. doubling or multiplication of certain chromosomal regions;
5. turning the individual sections of the chromosome by 180^0.

13. Genomic mutations are:
1. aneuploidy;
2. geteroploidiey;
3. polyploidy;
4. photoreactivation;
5. inversion.

14. The ways of DNA reparation:
1. postreplicative reparation;
2. geteroploidiey;
3. excision repair;
4. photoreactivation;
5. inversion.

15. The types of skin sensitivity to UVB are determined on:
1. colour of eyes;
2. colour of hair, skin;
3. presence of freckles;
4. predisposition to sunburning;
5. tanning behavior.

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Theme 4. PREVENTION OF THE ENVIRONMENTAL DISEASES

*The theme is necessary for the further training at therapy departments, department of general hygiene and ecology and also in practical work as a doctor for the treatment and prevention of environmental pathology, caused by not rational diet in adverse ecological conditions***.**

Purpose of the Lesson: to be able to diagnose the environmental pathology, caused by not rational diet in adverse ecological conditions, and to develop measures for its prophylactic.

Laboratory Work.

- 1. Reveal the patients with complaints on headache, paleness, nausea, irritability, insomnia, blue skin, tingling in the extremities, which ate food from disposable utensils many times, determine the suitability of plastic utensils and containers for food purposes.
- 2. Estimate the environmental pathology.
- 3. Offer optimization ways for prophylactic of the vascular lesions, caused by polyethylene terephthalate in consumed food.
- 4. Record the laboratory work report.

Situational Tasks.

1. 25 women of 20-25 ages with complaints on dizziness, weakness, headache, memory loss, poor sleep, joint pain have consulted to district physician. Patients have lived with lead content in the soil of 11.0 mg / kg. Patients have consumed 35 g of proteins, 71 g of fats, 275 g of carbohydrates, and 400 mg of calcium per day. Estimate the environmental pathology and suggest improvement actions for its prevention.

2. 30 women of 20-25 ages with complaints on dizziness, weakness, headache, memory loss, poor sleep, joint pain have consulted to district physician. Patients have lived with lead content in the soil of 11.0 mg / kg. Patients have consumed 35 g of proteins, 71 g of fats, 275 g of carbohydrates, and 400 mg of calcium per day. Estimate the environmental pathology and suggest improvement actions for its prevention.

3. 27 women of 20-25 ages with complaints on dizziness, weakness, headache, memory loss, poor sleep, joint pain have consulted to district physician. Patients have lived with lead content in the soil of 11.0 mg / kg. Patients have consumed 35 g of proteins, 71 g of fats, 275 g of carbohydrates, and 400 mg of calcium per day. Estimate the environmental pathology and suggest improvement actions for its prevention.

4. 45 women of 20-25 ages with complaints on dizziness, weakness, headache, memory loss, poor sleep, joint pain have consulted to district physician. Patients have lived with lead content in the soil of 11.0 mg / kg. Patients have consumed 35 g of proteins, 71 g of fats, 275 g of carbohydrates, and 400 mg of calcium per day. Estimate the environmental pathology and suggest improvement actions for its prevention.

5. 50 women of 20-25 ages with complaints on dizziness, weakness, headache, memory loss, poor sleep, joint pain have consulted to district physician. Patients have lived with lead content in the soil of 11.0 mg / kg. Patients have consumed 35 g of proteins, 71 g of fats, 275 g of carbohydrates, and 400 mg of calcium per day. Estimate the environmental pathology and suggest improvement actions for its prevention.

6. 60 women of 20-25 ages with complaints on dizziness, weakness, headache, memory loss, poor sleep, joint pain have consulted to district physician. Patients have lived with lead content in the soil of 11.0 mg / kg. Patients have consumed 35 g of proteins, 71 g of fats, 275 g of carbohydrates, and 400 mg of calcium per day. Estimate the environmental pathology and suggest improvement actions for its prevention.

7. 70 women of 20-25 ages with complaints on dizziness, weakness, headache, memory loss, poor sleep, joint pain have consulted to district physician. Patients have lived with lead content in the soil of 11.0 mg / kg. Patients have consumed 35 g of proteins, 71 g of fats, 275 g of carbohydrates, and 400 mg of calcium per day. Estimate the environmental pathology and suggest improvement actions for its prevention.

8. 46 women of 20-25 ages with complaints on dizziness, weakness, headache, memory loss, poor sleep, joint pain have consulted to district physician. Patients have lived with lead content in the soil of 11.0 mg / kg. Patients have consumed 35 g of proteins, 71 g of fats, 275 g of carbohydrates, and 400 mg of calcium per day. Estimate the environmental pathology and suggest improvement actions for its prevention.

9. 55 women of 20-25 age with complaints on dizziness, weakness, headache, memory loss, poor sleep, joint pain have consulted to district

physician. Patients have lived with lead content in the soil of 11.0 mg / kg. Patients have consumed 35 g of proteins, 71 g of fats, 275 g of carbohydrates, and 400 mg of calcium per day. Estimate the environmental pathology and suggest improvement actions for its prevention.

10. 36 women of 20-25 age with complaints on dizziness, weakness, headache, memory loss, poor sleep, joint pain have consulted to district physician. Patients have lived with lead content in the soil of 11.0 mg / kg. Patients have consumed 35 g of proteins, 71 g of fats, 275 g of carbohydrates, and 400 mg of calcium per day. Estimate the environmental pathology and suggest improvement actions for its prevention.

11. 26 women of 20-25 ages with complaints on dizziness, weakness, headache, memory loss, poor sleep, joint pain have consulted to district physician. Patients have lived with lead content in the soil of 10.0 mg / kg. Patients have consumed 34 g of proteins, 72 g of fats, 270 g of carbohydrates, and 300 mg of calcium per day. Estimate the environmental pathology and suggest improvement actions for its prevention.

12. 35 women of 20-25 ages with complaints on dizziness, weakness, headache, memory loss, poor sleep, joint pain have consulted to district physician. Patients have lived with lead content in the soil of 9.0 mg / kg. Patients have consumed 25 g of proteins, 81 g of fats, 375 g of carbohydrates, and 400 mg of calcium per day. Estimate the environmental pathology and suggest improvement actions for its prevention.

13. 29 women of 20-25 ages with complaints on dizziness, weakness, headache, memory loss, poor sleep, joint pain have consulted to district physician. Patients have lived with lead content in the soil of 10.0 mg / kg. Patients have consumed 30 g of proteins, 74 g of fats, 285 g of carbohydrates, and 450 mg of calcium per day. Estimate the environmental pathology and suggest improvement actions for its prevention.

14. 42 women of 20-25 ages with complaints on dizziness, weakness, headache, memory loss, poor sleep, joint pain have consulted to district physician. Patients have lived with lead content in the soil of 10.0 mg / kg. Patients have consumed 25 g of proteins, 78 g of fats, 295 g of carbohydrates, and 250 mg of calcium per day. Estimate the environmental pathology and suggest improvement actions for its prevention.

15. 52 women of 20-25 ages with complaints on dizziness, weakness, headache, memory loss, poor sleep, joint pain have consulted to district physician. Patients have lived with lead content in the soil of 12.0 mg / kg. Patients have consumed 23 g of proteins, 81 g of fats, 295 g of carbohy-

drates, and 350 mg of calcium per day. Estimate the environmental pathology and suggest improvement actions for its prevention.

For the lesson the student should know:
1. Methodical instructions on performance of laboratory work, characteristic of the environmental pathology**,** measures for prophylactic of the environmental pathology.
2. Algorithm of the situational task decision.
3. Explanation of Multiple choice questions.
4. Answers on the study questions:

Study Questions.

4.1. Public prevention of environmental pathology.
4.2. The value of doctors for prevention of environmental pathology.
4.3. Environmental education and training.
4.4. Personal prevention of environmental pathology.
4.5. Formation of healthy life style.
4.6. Balanced and preventive nutrition in terms of environmental pathology prevention.

For the lesson the student should be able to:
1. Work with the magnifying glass.

Methodical Instructions on Performance of Laboratory Work.

Determination of the environmental pathology, caused by contamination of food products with polyethylene terephthalate contained in plastic utensils and containers.

1. Determination of the environmental pathology at the patients

The patients with complaints on
- headache,
- paleness,
- nausea,
- irritability,

- insomnia,
- blue skin,
- tingling in the extremities

are revealed in the survey and examination.

2. Determination of the suitability of plastic utensils and containers for food purposes of the patients

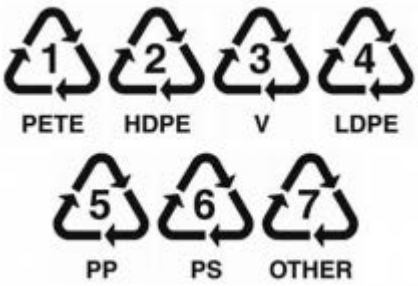
Equipment: magnifier.
Work performance: define labeling of utensils and containers, product production date, shelf life, storage conditions.

Every plastic container or bottle has a recycling symbol.

The symbol is a number, ranging from 1 to 7, within a triangle, which are of a great deal of information regarding the toxic chemicals used in the plastic, how likely the plastic is to leach, how bio-degradable the plastic is, and ultimately the safety of the plastic.

Triangle from three arrows – is a sign of recyclable raw materials, which symbolizes the closed cycle: creation → applications → disposal.

The recycling symbols and numbers:



1 – PETE or PET (Polyethylene Terephthalate)

Picked up by most curbside recycling programs, it is usually clear and used to make soda and water bottles. Some consider it safe, but this plastic is known to allow bacteria to accumulate.

It's found mostly in soda bottles, water bottles, beer bottles, salad dressing containers, mouthwash bottles, and peanut butter containers.

It is recycled into tote bags, furniture, carpet, paneling, fiber, and polar fleece.

2 – HDPE (High Density Polyethylene)

It is typically opaque and picked up by most curbside recycling programs. This plastic is one of the 3 plastics **considered to be safe**, and has a lower risk of leaching.

It's found mostly in milk jugs, household cleaner containers, juice bottles, shampoo bottles, cereal box liners, detergent bottles, motor oil bottles, yogurt tubs, and butter tubs.ilk jugs, detergent bottles, juice bottles, butter tubs, and toiletries bottles are made of this. It is usually opaque. This plastic is considered safe and has low risk of leaching.

It is recycled into pens, recycling containers, picnic tables, lumber, benches, fencing, and detergent bottles, to name a few.

3 – V or PVC (Vinyl)

It is used to make food wrap, plumbing pipes, and detergent bottles, and is seldom accepted by curbside recycling programs. These plastics used to, and still may, contain phthalates, which are linked to numerous health issues ranging from developmental problems to miscarriages. They also contain DEHA, which can be carcinogenic with long-term exposure. DEHA has also been linked to loss of bone mass and liver problems. Don't cook with or burn this plastic.

It's found in shampoo bottles, clear food packaging, cooking oil bottles, medical equipment, piping, and windows.

This plastic is recycled into paneling, flooring, speed bumps, decks, and roadway gutters.

4 – LDPE (Low Density Polyethylene)

Low density polyethylene is most found in squeezable bottles, shopping bags, clothing, carpet, frozen food, bread bags, and some food wraps. Curbside recycling programs haven't been known to pick up this plastic, but more are starting to accept it. It rests among the recycling symbols **considered to be safe**.

This plastic is recycled into compost bins, paneling, trash can liners and cans, floor tiles, and shipping envelopes.

5 – PP (Polypropylene)

Increasingly becoming accepted by curbside recycle programs, it is also **one of the safer plastics** to look for.

It is typically found in yogurt containers, ketchup bottles, syrup bottles, and medicine bottles.

Polypropylene is recycled into brooms, auto battery cases, bins, pallets, signal lights, ice scrapers, and bycycle racks.

6 – PS (Polystyrene)

Polystyrene is Styrofoam, which is notorious for being difficult to recycle, and thus, bad for the environment. This kind of plastic also poses a health risk, leaching potentially toxic chemicals, especially when heated. Most recycling programs won't accept it.

It is found in compact disc cases, egg cartons, meat trays, and disposable plates and cups.

It is recycled into egg cartons, vents, foam packing, and insulation.

7 – Other, Miscellaneous

All of the plastic resins that don't fit into the other categories are placed in the number 7 category. It's a mix bag of plastics that includes polycarbonate, which contains the toxic bisphenol-A (BPA). These plastics should be avoided due to possibly containing hormone disruptors like BPA, which has been linked to infertility, hyperactivity, reproductive problems, and other health issues.

It is found in sunglasses, iPod cases, computer cases, nylon, 3- and 5-gallon water bottles, and bullet-proof materials.

It is recycled into plastic lumber and other custom-made products.

The icon "glass-fork" – is the most important marker. It shows plastic utensils suitability for food contact.

If this icon is crossed or not present plastic such products are not suitable for foodstuffs.

The presence of a badge (PETE or PET) on the plastic container indicates the presence of polyethylene terephthalate in it.

***Preliminary diagnosis*:** the vascular lesions, caused by polyethylene terephthalate in consumed food.

3. Determination of nutrition according to menu
(content of proteins, fats, vitamins-antioxidants, mineral substances).

Equipment: calculator, tables «Chemical structure and nutritional value of foodstuffs».

Work performance:

a. on the basis of 7-day individual menu the content of proteins, fats, vitamins-antioxidants and mineral substances consumed during day and

week are calculated by means of tables;

b. develop the new diet in terms of environmental load following the main principles:

1. increase in proteins receipt till 15 % from the caloric content of a diet, basically at the expense of proteins of animal origin (60 % from the general receipt);

2. restriction in fats receipt till 30 % from the caloric content of a diet at relative reduction of receipt of vegetable oil and cod-liver oil (polyunsaturated fatty acids - 3 % from the general caloric content of a diet);

3. increase in vitamins-antioxidants (E, C, A, β-carotin) receipt on 20 - 50 % in comparison with the recommended age norms;

4. increase in dietary fibers receipt on 20-30 %;

5. increase in mineral substances and microelements (Ca, Fe, Mg, K, Zn, Se, I, Mn, Cu) receipt on 20 - 50 %.

Solve a problem, estimate the obtained data and request actions for their improvement

Situational Task.

20 women of 20-25 ages with complaints on dizziness, weakness, headache, memory loss, poor sleep, joint pain have consulted to district physician. Patients have lived with lead content in the soil of 11.0 mg / kg. Patients have consumed 35 g of proteins, 71 g of fats, 275 g of carbohydrates, and 400 mg of calcium per day**.** Estimate the environmental pathology and suggest improvement actions for its prevention.

The algorithm of task's decision:

The increased lead level is marked in the soil (the maximum permissible level is 0.05 mg / kg). The diet does not meet the nutrition in adverse environmental conditions.

Preliminary diagnosis: anemia**.**

Pathogenesis: Lead blocks the enzymes that are actively involved in the synthesis of heme. In connection with the violation of heme synthesis serum iron content increases, it is deposited in organs.

Treatment should include detoxication, primarily by means of food, restoration of the nutritional status**,** immunocorrection, symptomatic treat-

ment, antioxidant therapy, specific and nonspecific desensitization, introduction of predecessors of mediators, elimination of dysfunction of organs and systems.

The main principles of construction of a diet in terms of environmental load are:

1. increase in proteins receipt till 15 % from the caloric content of a diet, basically at the expense of proteins of animal origin (60 % from the general receipt);

2. restriction in fats receipt till 30 % from the caloric content of a diet at relative reduction of receipt of vegetable oil and cod-liver oil (polyunsaturated fatty acids - 3 % from the general caloric content of a diet);

3. increase in vitamins-antioxidants (E, C, A, β-carotin) receipt on 20 - 50 % in comparison with the recommended age norms;

4. increase in dietary fibers receipt on 20-30 %;

5. increase in mineral substances and microelements (Ca, Fe, Mg, K, Zn, Se, I, Mn, Cu) receipt on 20 - 50 %.

The normal values of daily dietary components (proteins - 61+15% = 70.15 g, fats - 67- 30% = 47 g, calcium - 800+50% = 1200 g, magnesium – 400 +50% = 600 mg, vitamin C - 70 +50% = 105 mg, vitamin A – 800 + 50% =1200 g).

Individual prevention includes formation of healthy lifestyle with a focus on rational and preventive nutrition, drinking mode, reception of phytopreparations, adaptogens, proper technological processing, and termination of use of products with a high lead content.

Multiple Choice Questions.

Choose proper answers

1. Prevention of environmental diseases is carried out by:
   1. individual and public health prevention;
   2. environmental monitoring;
   3. environmental education and training of the population;
   4. treatment by the precursors of synthesis of neurotransmitters at their deficit;
   5. elimination of dysfunctions in the organs and systems.
2. Individual prevention of environmental diseases includes:
   1. formation of healthy lifestyle with a focus on rational and preventive nutrition;

2. environmental monitoring;
3. environmental education and training of the population;
4. protection by time, distance, quantity, screen;
5. reception of phytopreparations, adaptogens.

3. Public prevention of environmental diseases includes:
1. formation of healthy lifestyle with a focus on rational and preventive nutrition;
2. medical measures for the population exposed to harmful environmental factors;
3. measures to protect the environment from pollution;
4. protection by time, distance, quantity, screen;
5. reception of phytopreparations, adaptogens.

4. In terms of environmental load diet in addition to traditional functions must ensure:
1. reduction of uptake of xenobiotics in the gastro-intestinal tract;
2. weakening of adverse influence of alien factors at cellular and organ levels;
3. reduction of the level of contaminants deposition in tissues with their accelerated removal from the body;
4. consumption of food substances blocking the absorption of xenobiotics;
5. consumption of food substances enhancing the intestinal motility.

5. The principles of non-specific nutritional support of the processes of xenobiotics biotransformation are:
1. ensuring adequate supply of nutrients, which are cofactors or substrates, as well as regulators of protective metabolic processes;
2. decrease to the minimum uptake of substrates of pathochemical reactions;
3. ensuring optimal balance of nutrients, given the availability of nutrients with unidirectional or inhibition properties;
4. the daily norm of each nutrient uptake should be determined taking into account the individual physiological needs and consumption of the nutrients in the adaptation mechanisms;
5. a number of nutrients can exacerbate the pathochemical processes induced by one or another kind of alien influence.

6. A diet in terms of environmental load in comparing to favorable ecological conditions must content:
1. more vitamins-antioxidants on 20 - 50 %;

2. more dietary fibers on 20 - 30 %;
3. more mineral substances and microelements on 20 - 50 %;
4. more proteins on 15 %;
5. more fats on 30 %.

7. The main principles of construction of a diet in terms of environmental load are:

1. increase in proteins receipt till 15 % from the caloric content of a diet, basically at the expense of proteins of animal origin (60 % from the general receipt);
2. restriction in fats receipt till 30 % from the caloric content of a diet at relative reduction of receipt of vegetable oil and cod-liver oil (polyunsaturated fatty acids - 3 % from the general caloric content of a diet);
3. increase in vitamins-antioxidants (E, C, A, β-carotin) receipt on 20 - 50 % in comparison with the recommended age norms;
4. increase in dietary fibers receipt on 20-30 %;
5. increase in mineral substances and microelements (Ca, Fe, Mg, K, Zn, Se, I, Mn, Cu) receipt on 20 - 50 %.

8. The recommended quantity of food intake in unfavorable ecological conditions is:

1. 4;
2. breakfast - 25%, lunch - 35 %, afternoon tea - 15%, dinner - 25%;
3. breakfast - 25%, lunch - 35 - 40%, afternoon tea - 10 - 15%, dinner - 25%;
4. 5-6;
5. 3.

9. The healthy lifestyle is:

1. the realized necessity of constant performance of rules and ways of health preservation and strengthening, combined with the reasonable relation to environment;
2. environmental monitoring;
3. propagation;
4. adaptive resistance to the stress factor;
5. reduction of alimentary alien load.

10. The leading components of healthy lifestyle are:

1. refusal of bad habits;
2. regular physical and impellent activity;
3. high-grade work, rational mode of work, productive leisure;

4. balanced diet;
5. personal hygiene.

11. Formation of healthy lifestyle – is:
    1. the realized necessity of constant performance of rules and ways of health preservation and strengthening, combined with the reasonable relation to environment;
    2. a prompting of the person to inclusion of rational forms of his or her behaviour during a daily life directed on preservation of health and preservation of the environment;
    3. propagation;
    4. adaptive resistance to the stress factor;
    5. provision of the necessary amount of nutrients.
12. The means of method of oral propagation are:
    1. planar;
    2. lectures;
    3. newspaper;
    4. volume;
    5. cartogram.
13. The types of illustrativity are:
    1. verbal;
    2. figurative;
    3. sign;
    4. action;
    5. natural and artificial objects, posters, diagrams, drawings, photographs.
14. The methods of propagation of knowledge on wildlife management are:
    1. oral;
    2. pictorial;
    3. printing;
    4. combined;
    5. illustrativity.
15. The means of method of pictorial propagation are:
    1. planar;
    2. lectures;
    3. newspaper;
    4. volume;
    5. natural.

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Theme 5. MEDICAL VALUE OF ATMOSPHERIC AIR

The theme is necessary for the further training at general hygiene and ecology department, department of public health and public health services and also in practical work as a doctor for the treatment and prevention of environmental pathology, caused by the physical, chemical and biological atmospheric air factors.

Purpose of the Lesson: to be able to diagnose the environmental pathology, caused by the atmospheric air factors, and to develop measures for its prophylactic.

Laboratory Work.

- 1. Reveal the patients with general weakness, dizziness, fever, tachycardia, hypotension, dyspnea, discoordination of movements, determine the temperature, relative humidity of atmospheric air, speed of air movement, atmospheric pressure.
- 2. Estimate the received results.
- 3. Offer optimization ways for prophylactic of hyperthermia and mountain, or altitude, disease, caused by the physical atmospheric air factors.
- 4. Record the laboratory work report.

Situational Tasks.

1. 60 women with complaints of depression, decreased working capacity, increase in body weight, insomnia at night and sleepiness in the morning, unwillingness to communicate with other people have consulted to district physician. The symptoms appeared at lower illumination by 20 % and reducing the duration of daylight for 1 hour. Estimate the environmental pathology and suggest improvement actions for prevention of seasonal affective disorder.

2. 70 women with complaints of depression, decreased working capacity, increase in body weight, insomnia at night and sleepiness in the morning, unwillingness to communicate with other people have consulted to district physician. The symptoms appeared at lower illumination by 25

% and reducing the duration of daylight for 2 hour. Estimate the environmental pathology and suggest improvement actions for prevention of seasonal affective disorder.

3. 30 women with complaints of depression, decreased working capacity, increase in body weight, insomnia at night and sleepiness in the morning, unwillingness to communicate with other people have consulted to district physician. The symptoms appeared at lower illumination by 40 % and reducing the duration of daylight for 2 hour. Estimate the environmental pathology and suggest improvement actions for prevention of seasonal affective disorder.

4. 75 women with complaints of depression, decreased working capacity, increase in body weight, insomnia at night and sleepiness in the morning, unwillingness to communicate with other people have consulted to district physician. The symptoms appeared at lower illumination by 40% and reducing the duration of daylight for 2.5 hour. Estimate the environmental pathology and suggest improvement actions for prevention of seasonal affective disorder.

5. 80 women with complaints of depression, decreased working capacity, increase in body weight, insomnia at night and sleepiness in the morning, unwillingness to communicate with other people have consulted to district physician. The symptoms appeared at lower illumination by 50 % and reducing the duration of daylight for 4 hour. Estimate the environmental pathology and suggest improvement actions for prevention of seasonal affective disorder.

6. 85 women with complaints of depression, decreased working capacity, increase in body weight, insomnia at night and sleepiness in the morning, unwillingness to communicate with other people have consulted to district physician. The symptoms appeared at lower illumination by 55 % and reducing the duration of daylight for 4 hour. Estimate the environmental pathology and suggest improvement actions for prevention of seasonal affective disorder.

7. 90 women with complaints of depression, decreased working capacity, increase in body weight, insomnia at night and sleepiness in the morning, unwillingness to communicate with other people have consulted to district physician. The symptoms appeared at lower illumination by 60 % and reducing the duration of daylight for 5 hour. Estimate the environmental pathology and suggest improvement actions for prevention of seasonal affective disorder.

8. 100 women with complaints of depression, decreased working capacity, increase in body weight, insomnia at night and sleepiness in the morning, unwillingness to communicate with other people have consulted to district physician. The symptoms appeared at lower illumination by 70 % and reducing the duration of daylight for 4 hour. Estimate the environmental pathology and suggest improvement actions for prevention of seasonal affective disorder.

9. 65 women with complaints of depression, decreased working capacity, increase in body weight, insomnia at night and sleepiness in the morning, unwillingness to communicate with other people have consulted to district physician. The symptoms appeared at lower illumination by 65 % and reducing the duration of daylight for 3 hour. Estimate the environmental pathology and suggest improvement actions for prevention of seasonal affective disorder.

10. 105 women with complaints of depression, decreased working capacity, increase in body weight, insomnia at night and sleepiness in the morning, unwillingness to communicate with other people have consulted to district physician. The symptoms appeared at lower illumination by 65 % and reducing the duration of daylight for 4.5 hour. Estimate the environmental pathology and suggest improvement actions for prevention of seasonal affective disorder.

11. 62 women with complaints of depression, decreased working capacity, increase in body weight, insomnia at night and sleepiness in the morning, unwillingness to communicate with other people have consulted to district physician. The symptoms appeared at lower illumination by 19 % and reducing the duration of daylight for 1 hour. Estimate the environmental pathology and suggest improvement actions for prevention of seasonal affective disorder.

12. 68 women with complaints of depression, decreased working capacity, increase in body weight, insomnia at night and sleepiness in the morning, unwillingness to communicate with other people have consulted to district physician. The symptoms appeared at lower illumination by 21 % and reducing the duration of daylight for 2 hour. Estimate the environmental pathology and suggest improvement actions for prevention of seasonal affective disorder.

13. 44 women with complaints of depression, decreased working capacity, increase in body weight, insomnia at night and sleepiness in the morning, unwillingness to communicate with other people have consulted

to district physician. The symptoms appeared at lower illumination by 50 % and reducing the duration of daylight for 1.5 hour. Estimate the environmental pathology and suggest improvement actions for prevention of seasonal affective disorder.

14. 64 women with complaints of depression, decreased working capacity, increase in body weight, insomnia at night and sleepiness in the morning, unwillingness to communicate with other people have consulted to district physician. The symptoms appeared at lower illumination by 60% and reducing the duration of daylight for 2 hour. Estimate the environmental pathology and suggest improvement actions for prevention of seasonal affective disorder.

15. 72 women with complaints of depression, decreased working capacity, increase in body weight, insomnia at night and sleepiness in the morning, unwillingness to communicate with other people have consulted to district physician. The symptoms appeared at lower illumination by 45 % and reducing the duration of daylight for 4 hour. Estimate the environmental pathology and suggest improvement actions for prevention of seasonal affective disorder.

For the lesson the student should know:

1. Methodical instructions on performance of laboratory work, characteristic of the environmental pathology**,** measures for prophylactic of the environmental pathology.
2. Algorithm of the situational task decision.
3. Explanation of Multiple choice questions.
4. Answers on the study questions:

Study Questions.

4.1. Atmospheric air, its value. Abiotic and biotic factors of atmospheric air.

4.2. Medical value of ultraviolet and visible light of solar irradiance spectrum. Chronomedicine.

4.3. Medical value of geomagnetic factors of atmospheric air.

4.4. Medical value of climatic factors of atmospheric air.

4.5. Medical value of chemical factors of atmospheric air.

4.6. Medical value of biotic factors of atmospheric air.

- Theme 5 -

For the lesson the student should be able to:

1. Work with the devices:
- aspirated psychrometer;
- hygrometer ;
- anemometer ;
- barometer-aneroid .

Methodical Instructions on Performance of Laboratory Work.

Determination of the environmental pathologies, caused by the physical atmospheric air factors.

1. Determination of the environmental pathologies at the patients

The patients with complaints on
- general weakness,
- dizziness,
- fever,
- tachycardia,
- hypotension,
- dyspnea,
- discoordination of movements

are revealed in the survey and examination.

2. Determination of physical atmospheric air factors in the place of stay of the patients.

Determination of air temperature.

Equipment: aspirated psychrometer (picture 5.1).

Work performance:

a. the clockwork mechanism is started;
b. the device is hung on a stand in the investigated place;
c. the readings are taken from the dry thermometer in 3-5 minutes;

Picture 5.1. Aspirated psychrometer.

Ecological estimation.

The received parameters of atmospheric air temperature are compared with optimum ones 20^0C (15-25^0C).

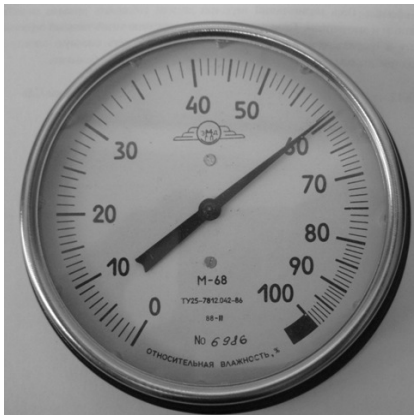
***Preliminary diagnosis*:** hyperthermia and heat stroke at the air temperature above 35^0C.

Determination of relative humidity.

Equipment: hygrometer (picture 5.2).

Work performance:

a. the hygrometer is established in the investigated place;
b. the investigator knock on its glass by finger;
c. the arrow indications are written down.



Picture 5.2. Hygrometer.

Ecological estimation.

The received parameters of relative humidity are compared with optimum ones 50 % (40-60 %).

***Preliminary diagnosis*:** hyperthermia at the relative humidity above 90 %.

Determination of speed of air movement.

Equipment*:* anemometer (picture 5.3).

Work performance:

a. the anemometer is established perpendicularly to air current direction in the investigated place;

b. the device is switched on;

c. the readings from the screen of measuring block are taken in 30 seconds.

Picture 5.3. Anemometer.

Ecological estimation.

The received parameters of speed of air movement are compared with optimum ones 2.5 m/s (1-4 m/s).

***Preliminary diagnosis*:** hyperthermia at the absence of speed of air movement.

Determination of atmospheric pressure.

Equipment**:** barometer-aneroid (picture 5.4).

Work performance:

a. barometer to establish in an investigated place;

b. knock by finger on its glass;

c. write down the device reading.

Picture 5.4. Barometer-Aneroid.

Ecological estimation.

The received parameters of atmospheric pressure are compared with optimum ones 760 mm hg (740-780 mm of hg).

***Preliminary diagnosis*:** mountain, or altitude, disease at the low atmospheric pressure.

Solve a problem, estimate the obtained data and request actions for their improvement

Situational Task.

50 women with complaints of depression, decreased working capacity, increase in body weight, insomnia at night and sleepiness in the morning, unwillingness to communicate with other people have consulted to district physician. The symptoms appeared at lower illumination by 20% and reducing the duration of daylight for 1 hour. Estimate the environmental pathology and suggest improvement actions for prevention of seasonal affective disorder.

The algorithm of task's decision:

The daylight illumination in summer time is 50.000 lux, the duration

of daylight hours - 15 hours. With a decrease in illumination and the duration of daylight hours, primarily in the female population, it is possible the appearance of depression, decreased working capacity, increase in body weight, insomnia, reduction of social contacts.

Preliminary diagnosis: seasonal affective disorder (SAD).

Pathogenesis: seasonal affective disorder is a type of depression that's related to changes in seasons and begins and ends at about the same times every year.

One possibility is that is related to a lack of serotonin.

Symptoms of the disease may consist of difficulty waking up in the morning, nausea, tendency to oversleep and over eat, especially a craving for carbohydrates, which leads to weight gain. Other symptoms include a lack of energy, difficulty concentrating on or completing tasks, withdrawal from friends, family, and social activities, and decreased sex drive. All of this leads to depression, pessimistic feelings of hopelessness, and lack of pleasure which characterize a person suffering from this disorder. People who experience spring and summer depression show symptoms of classic depression including insomnia, anxiety, irritability, decreased appetite, weight gain or loss, social withdrawal, and decreased sex drive.

Treatment should include light therapy (phototherapy) in the morning hours with the intensity of 10 000 lux with special light sources for 15 min; detoxication, restoration of the nutritional status, immunocorrection, symptomatic treatment, antioxidant therapy, psychotherapy and medications are additionally appointed.

Individual prevention includes formation of healthy lifestyle with a focus on rational and preventive nutrition, reception of phytopreparations, adaptogens.

Multiple Choice Questions.

Choose proper answers

1. Atmosphere structure is:
    1. troposphere;
    2. stratosphere;
    3. mesosphere;
    4. thermosphere;
    5. exosphere.
2. The conditional border of atmosphere, km, is:

1. 20;
2. 4000;
3. 2000;
4. 50000;
5. 10.

3. Air abiotic factors are:
   1. temperature;
   2. viruses;
   3. bacteria;
   4. humidity;
   5. geomagnetic field.
4. Solar radiation is:
   1. an integrated stream of electromagnetic fluctuations of various wave length;
   2. a stream of positively charged ions;
   3. the force per unit area exerted on a surface by the weight of air above that surface in the atmosphere of Earth;
   4. ionization, electrical and magnetic fields;
   5. corpuscular radiation.
5. Solar radiation spectrum is:
   1. ultraviolet C;
   2. ultraviolet B;
   3. ultraviolet A;
   4. visible light;
   5. infrared light.
6. Environmental diseases, caused by atmospheric temperature, are:
   1. sunstroke;
   2. syndrome of chronic exhaustion;
   3. hyperthermia;
   4. hypothermia;
   5. mountain [(high-)altitude] disease.
7. Symptoms of altitude sickness are:
   1. headaches;
   2. nausea or vomiting;
   3. fatigue or weakness;
   4. peripheral edema;
   5. pulmonary edema.
8. Symptoms of decompression sickness are:

1. convulsions;
2. loss of coordination;
3. arterial gas embolism;
4. bloody sputum;
5. cerebral edema.

9. Types of air chemical compound are:
   1. constants;
   2. variables;
   3. casual;
   4. inert gases;
   5. nitrogen.
10. Major air-born diseases are:
   1. tuberculosis;
   2. rheumatic fever;
   3. influenza;
   4. sunstroke;
   5. measles.
11. Optimum parameters of atmospheric air temperature are:
   1. 10^0C (5-15^{0}C);
   2. 20^0C (15-25^{0}C);
   3. 50 % (40-60 %);
   4. 2,5 m/s (1-4 m/s);
   5. 760 mm hg (740-780 mm hg).
12. Device for measurement of relative humidity:
   1. thermometer;
   2. hygrometer;
   3. anemometer;
   4. barometer-aneroid;
   5. spirometer.
13. Carbon dioxide functions are:
   1. dilator of smooth muscle;
   2. transport of oxygen to the tissues;
   3. regulator of pH levels of the blood;
   4. plays a vital role in the breathing processes of the living organisms;
   5. plays a vital role in the metabolism of the living organisms.
14. Health effects of nitrogen are:

1. reactions with haemoglobin in blood, causing the oxygen carrying capacity of the blood to decrease;
2. decreased functioning of the thyroid gland;
3. vitamin A shortages;
4. fashioning of nitro amines, which are known as one of the most common causes of cancer;
5. methemoglobinemia.

15. Atmospheric air composition is:
1. 78.1 % of nitrogen;
2. 20.9 % of oxygen;
3. 0.9 % of argon;
4. 0.03 % of carbon dioxide;
5. 15 % of argon.

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Theme 6. MEDICAL VALUE OF WATER

The theme is necessary for the further training at general hygiene and ecology department, department of public health and public health services and also in practical work as a doctor for the treatment and prevention of environmental pathology, caused by the physical, chemical and biological water factors.

Purpose of the Lesson: to be able to diagnose the environmental pathology, caused by the water factors, and to develop measures for its prophylactic.

Laboratory Work.

- 1. Reveal the patients with complaints on abdominal pain, constipation, diarrhea, flatulence, determine chromaticity and turbidity of water.
- 2. Estimate the environmental pathology.
- 3. Offer optimization ways for prophylactic of irritable bowel syndrome, caused by physical water factors.
- 4. Record the laboratory work report.

Situational Tasks.

1. 10 patients with complaints on dyspepsia, loss of appetite, weakness, disability, exacerbation of chronic diseases of the gastrointestinal tract, pain in the heart, high blood pressure have consulted to district physician. In drinking water the dry rest is 2 g / dm^3, chloride content is 500 mg / dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

2. 50 patients with complaints on dyspepsia, loss of appetite, weakness, disability, exacerbation of chronic diseases of the gastrointestinal tract, pain in the heart, high blood pressure have consulted to district physician. In drinking water the dry rest is 2.5 g / dm^3, chloride content is 450 mg / dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

3. 60 patients with complaints on dyspepsia, loss of appetite, weakness, disability, exacerbation of chronic diseases of the gastrointestinal

tract, pain in the heart, high blood pressure have consulted to district physician. In drinking water the dry rest is 3 g / dm^3, chloride content is 550 mg / dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

4. 40 patients with complaints on dyspepsia, loss of appetite, weakness, disability, exacerbation of chronic diseases of the gastrointestinal tract, pain in the heart, high blood pressure have consulted to district physician. In drinking water the dry rest is 2 g / dm^3, chloride content is 600 mg / dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

5. 30 patients with complaints on dyspepsia, loss of appetite, weakness, disability, exacerbation of chronic diseases of the gastrointestinal tract, pain in the heart, high blood pressure have consulted to district physician. In drinking water the dry rest is 3 g / dm^3, chloride content is 500 mg / dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

6. 70 patients with complaints on dyspepsia, loss of appetite, weakness, disability, exacerbation of chronic diseases of the gastrointestinal tract, pain in the heart, high blood pressure have consulted to district physician. In drinking water the dry rest is 4 g / dm^3, chloride content is 700 mg / dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

7. 80 patients with complaints on dyspepsia, loss of appetite, weakness, disability, exacerbation of chronic diseases of the gastrointestinal tract, pain in the heart, high blood pressure have consulted to district physician. In drinking water the dry rest is 3 g / dm^3, chloride content is 700 mg / dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

8. 900 patients with complaints on dyspepsia, loss of appetite, weakness, disability, exacerbation of chronic diseases of the gastrointestinal tract, pain in the heart, high blood pressure have consulted to district physician. In drinking water the dry rest is 3 g / dm^3, chloride content is 900 mg / dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

9. 100 patients with complaints on dyspepsia, loss of appetite, weakness, disability, exacerbation of chronic diseases of the gastrointestinal tract, pain in the heart, high blood pressure have consulted to district physician. In drinking water the dry rest is 4 g / dm^3, chloride content is 1500

mg / dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

10. 95 patients with complaints on dyspepsia, loss of appetite, weakness, disability, exacerbation of chronic diseases of the gastrointestinal tract, pain in the heart, high blood pressure have consulted to district physician. In drinking water the dry rest is 3 g / dm^3, chloride content is 800 mg / dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

11. 11 patients with complaints on dyspepsia, loss of appetite, weakness, disability, exacerbation of chronic diseases of the gastrointestinal tract, pain in the heart, high blood pressure have consulted to district physician. In drinking water the dry rest is 3 g / dm^3, chloride content is 520 mg / dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

12. 44 patients with complaints on dyspepsia, loss of appetite, weakness, disability, exacerbation of chronic diseases of the gastrointestinal tract, pain in the heart, high blood pressure have consulted to district physician. In drinking water the dry rest is 2.9 g / dm^3, chloride content is 480 mg / dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

13. 61 patients with complaints on dyspepsia, loss of appetite, weakness, disability, exacerbation of chronic diseases of the gastrointestinal tract, pain in the heart, high blood pressure have consulted to district physician. In drinking water the dry rest is 3.5 g / dm^3, chloride content is 570 mg / dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

14. 46 patients with complaints on dyspepsia, loss of appetite, weakness, disability, exacerbation of chronic diseases of the gastrointestinal tract, pain in the heart, high blood pressure have consulted to district physician. In drinking water the dry rest is 3 g / dm^3, chloride content is 660 mg / dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

15. 35 patients with complaints on dyspepsia, loss of appetite, weakness, disability, exacerbation of chronic diseases of the gastrointestinal tract, pain in the heart, high blood pressure have consulted to district physician. In drinking water the dry rest is 3.5 g / dm^3, chloride content is 580 mg / dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

- Theme 6 -

For the lesson the student should know:
1. Methodical instructions on performance of laboratory work, characteristic of the environmental pathology**,** measures for prophylactic of the environmental pathology.
2. Algorithm of the situational task decision.
3. Explanation of Multiple choice questions.
4. Answers on the study questions:

Study Questions.

4.1. Hydrosphere, its characteristic. Water, its meaning. Abiotic and biotic factors of water.
4.2. The water sources and systems of water supply.
4.3. Medical value of physical factors of water.
4.4. Medical value of insufficiency of chemical factors of water.
4.5. Medical value of excess of chemical factors of water.
4.6. Medical value of biological factors of water.

For the lesson the student should be able to:
1. Work with the microcalculator.
2. Work with the photo and electro colorimeter.

Methodical Instructions on Performance of Laboratory Work.

Determination of the environmental pathology, caused by the physical water factors.

1. Determination of the environmental pathology at the patients

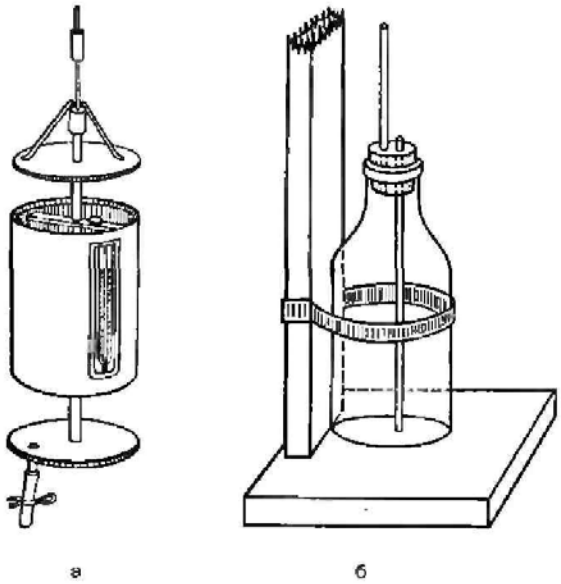
The patients with complaints on
- abdominal pain,
- constipation,
- diarrhea,
- flatulence

are revealed in the survey.

2. Determination of factors of water, consumed by the patients

Sampling of water.

Equipment: bathometer (picture 6.1).



Picture 6.1. Bathometers.

Work performance:

a. the water tests from open reservoirs and wells are taken in that place and on that depth where it is planned the gathering of water by the population;

a.a. for the *chemical analysis* water is taken in quantity 2-5 dm^3, in clean flagons, washed with distilled water and in addition by the water taken for the analysis; after sampling flagon is numbered and applied with the accompanying form about the name of water source where the test is taken, location, temperature of water and condition of weather at the moment of sampling;

a.b. for the *physical analysis* water is taken in the same way and definition of physical properties of water is desirable to perform right at water source;

a.c. for the *bacteriological analysis* sampling of water is carried out with bathometer into special sterile utensils in quantity 400-500 cm^3 on the depth of 15-20 cm from the surface of water; at sampling of water from water tap or well with pump it is necessary to burn the edges of the tap and to lower the stood too long water; the taken tests should be subjected to the analysis not later than in 2 hours;

a.d. for the *helminthological analysis* of water from open reservoirs sampling of water is taken not less than 3-5 tests in the morning, afternoon and evening so that the total volume of water would not less than 50 dm^3.

Determination of water chromaticity.

Equipment*:* photo and electro colorimeter (PhEC) (picture 6), membrane filter, conical flasks, distilled water.

Work performance:

a. the researched water is filtered through the membrane filter;

b. 5-10 ml is poured in the dish and seen with dark blue light filter;

c. chromaticity of test is estimated on the diagram.

The control is distilled water.

Picture 6. Photo and electro colorimeter.

Ecological estimation.

Chromaticity should not exceed 20^0 for the centralized sources and 30^0 - for decentralized ones.

***Preliminary diagnosis*:** irritable bowel syndrome, caused by physical water factors.

Determination of water turbidity.

Equipment: PhEC, chemical glasses, distilled water.

Work performance*:*

a. the researched water is well shook up;

b. 5-10 ml is poured in the dish and seen with green light filter.

The control is distilled water.

Ecological estimation.

Turbidity should not exceed 1.5 mg/dm^3 for the centralized sources and 2 mg/dm^3 - for decentralized ones.

***Preliminary diagnosis*:** irritable bowel syndrome, caused by physical water factors.

Solve a problem, estimate the obtained data and request actions for their improvement

Situational Task.

10 patients with complaints on a feeling of fullness in the stomach after eating, violation of appetite, feeling of bloating, nausea, belching, heartburn, pain in the heart, increased blood pressure have consulted to district physician. In drinking water the dry rest is 3 g / dm^3, chloride content is 500 mg / dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

The algorithm of task's decision:

There is the excess of dry rest (1 g / dm^3) and chloride (350 mg / dm^3) in the drinking tap. At long-term use of the water the above mentioned symptoms are possible.

Preliminary diagnosis: dyspepsia, hypertension.

Pathogenesis: the depletion of the reserve forces of the mucosa of the upper intestine and thus the secretion of gastric juice with less acidity and less enzyme force; the result is an incomplete splitting of food components, enhancing of fermentation processes, the accumulation in the upper sections of the intestine of products of incomplete decomposition of food and lower fatty acids, which are irritants and enhancers of peristalsis; increased chloride content inhibits gastric secretion, reduces diuresis.

Treatment should include detoxication, restoration of the nutritional status, immunocorrection, symptomatic treatment, antioxidant therapy.

Individual prevention includes formation of healthy lifestyle with a focus on rational and preventive nutrition, drinking mode, consumption

less water with excess of dry rest and chlorides, use of the bottled water, reception of phytopreparations, adaptogens.

Multiple Choice Questions.

Choose proper answers

1. Hydrosphere components are:
    1. world ocean;
    2. subsurface water;
    3. snow and ice storage;
    4. atmospheric moisture;
    5. rivers.
2. Land waters are:
    1. continental;
    2. underground;
    3. superficial;
    4. water-permeable;
    5. waterproof.
3. Types of underground waters on depth from a terrestrial surface are:
    1. soil waters;
    2. subsoil waters;
    3. middle water;
    4. aquiclude;
    5. aquitard.
4. Kinds of aquifers are:
    1. porous strata;
    2. unconfined;
    3. confined;
    4. water table;
    5. artesian.
5. The artesian aquifer is:
    1. confined aquifer;
    2. bounded on the top and bottom by confining layers;
    3. saturated with water under greater atmospheric pressure;
    4. replenished (recharged) primarily by rain that falls on the ground directly above the aquifer and percolates down to the water table;
    5. called a water-table aquifer.

6. A European system of classifying organisms according to their response to organic pollution in slow-moving streams is:
    1. alpha-mesaprobic zone;
    2. beta-mesaprobic zone;
    3. oligosaprobic zone;
    4. polysaprobic zone;
    5. self-cleaning zone.
7. Abiotic factors of water sphere are:
    1. high density and viscosity;
    2. horizontal and vertical mobility;
    3. stable temperature mode;
    4. transparency and light mode;
    5. salt mode.
8. Physical factors of water are:
    1. smell and taste;
    2. chromaticity and transparency;
    3. turbidity;
    4. atmospheric moisture;
    5. organoleptic properties.
9. The water with high rigidity can cause:
    1. methemoglobinemia;
    2. urolithiasis;
    3. schistosomiasis;
    4. poliomyelitis, hepatitis, meningitis and gastroenteritis;
    5. dysentery, hepatitis, salmonella infection.
10. Biogeochemical endemias or endemic diseases are:
    1. fluorosis and caries;
    2. hemochromatosis and molybdenosis;
    3. endemic goiter;
    4. B_{12} hypovitaminosis and anemia;
    5. iron-deficiency anemia.
11. Systems of water supply of the occupied places are:
    1. centralized (water pipe);
    2. decentralized;
    3 underground water sources;
    4. superficial water sources;
    5. local.
12. Controllable parameters of water of underground water source are:

1. organoleptic (smell, taste, turbidity, chromaticity, temperature);
2. chemical (pH, weighed substances, chlorides, sulphates, iron, fluorine, etc.);
3. biological (microbial count, coli-index);
4. sanitary (BCO, CCO, ammonia, nitrates, nitrites);
5. microbiological and parasitological indicators, content of harmful chemical substances, organoleptic properties and radio-activity.

13. Methods for improvement of water quality are:
1. general (clearing, disinfecting);
2. special;
3. mechanical (upholding), physical (filtering) and chemical (coagulation);
4. chemical (chlorination by means of gaseous chlorine, chlorine dioxide, ozone, iodine, silver) and physical (boiling, ultra-violet irradiation, electric pulse, ultrasound, ionizing radiation);
5. deodorization, decontamination, softening, desalination, deironing, defluorination, deactivation.

14. Parameters of water of the centralized systems of drinking water supply are:
1. dry rest – 1000 mg/dm^3;
2. chlorides – 350 mg/dm^3;
3. sulphates - 500 mg/dm^3;
4. pH - 6-9;
5. iron – 0,3 mg/dm^3.

15. The systems of water supply of the occupied places are:
1. centralized (water pipe);
2. decentralized, or local;
3. water table;
4. middle water;
5. superficial waters.

Literature.

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Theme 7. MEDICAL VALUE OF SOIL

The theme is necessary for the further training at general hygiene and ecology department, department of public health and public health services and also in practical work as a doctor for the treatment and prevention of environmental pathology, caused by the physical, chemical and biological soil factors.

Purpose of the Lesson: to be able to diagnose the environmental pathology, caused by the soil factors, and to develop measures for its prophylactic.

Laboratory Work.

- 1. Reveal the patients with complaints on headache, watery eyes, runny nose, cough, dizziness, nausea, fatigue, sensitivity to odors, frequent colds, which live on the ground floors of buildings built on clay soils, determine the soil porosity and permeability.
- 2. Estimate the environmental pathology.
- 3. Offer optimization ways for prophylactic of sick building syndrome, caused by physical soil factors.
- 4. Record the laboratory work report.

Situational Tasks.

1. 30 patients with complaints on peeling skin, brittle and hair loss, flaking and brittle nails, constant nausea, spontaneous diarrhea have consulted to district physician. They consumed food products grown on soil with selenium content of 20 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

2. 25 patients with complaints on peeling skin, brittle and hair loss, flaking and brittle nails, constant nausea, spontaneous diarrhea have consulted to district physician. They consumed food products grown on soil with selenium content of 36 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

3. 40 patients with complaints on peeling skin, brittle and hair loss, flaking and brittle nails, constant nausea, spontaneous diarrhea have consulted to district physician. They consumed food products grown on

soil with selenium content of 40 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

4. 40 patients with complaints on peeling skin, brittle and hair loss, flaking and brittle nails, constant nausea, spontaneous diarrhea have consulted to district physician. They consumed food products grown on soil with selenium content of 46 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

5. 15 patients with complaints on peeling skin, brittle and hair loss, flaking and brittle nails, constant nausea, spontaneous diarrhea have consulted to district physician. They consumed food products grown on soil with selenium content of 25 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

6. 23 patients with complaints on peeling skin, brittle and hair loss, flaking and brittle nails, constant nausea, spontaneous diarrhea have consulted to district physician. They consumed food products grown on soil with selenium content of 30 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

7. 45 patients with complaints on peeling skin, brittle and hair loss, flaking and brittle nails, constant nausea, spontaneous diarrhea have consulted to district physician. They consumed food products grown on soil with selenium content of 38 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

8. 34 patients with complaints on peeling skin, brittle and hair loss, flaking and brittle nails, constant nausea, spontaneous diarrhea have consulted to district physician. They consumed food products grown on soil with selenium content of 45 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

9. 56 patients with complaints on peeling skin, brittle and hair loss, flaking and brittle nails, constant nausea, spontaneous diarrhea have consulted to district physician. They consumed food products grown on soil with selenium content of 48 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

10. 44 patients with complaints on peeling skin, brittle and hair loss, flaking and brittle nails, constant nausea, spontaneous diarrhea have consulted to district physician. They consumed food products grown on soil with selenium content of 22 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

11. 32 patients with complaints on peeling skin, brittle and hair loss, flaking and brittle nails, constant nausea, spontaneous diarrhea have

consulted to district physician. They consumed food products grown on soil with selenium content of 22 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

12. 28 patients with complaints on peeling skin, brittle and hair loss, flaking and brittle nails, constant nausea, spontaneous diarrhea have consulted to district physician. They consumed food products grown on soil with selenium content of 38 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

13. 44 patients with complaints on peeling skin, brittle and hair loss, flaking and brittle nails, constant nausea, spontaneous diarrhea have consulted to district physician. They consumed food products grown on soil with selenium content of 44 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

14. 49 patients with complaints on peeling skin, brittle and hair loss, flaking and brittle nails, constant nausea, spontaneous diarrhea have consulted to district physician. They consumed food products grown on soil with selenium content of 49 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

15. 35 patients with complaints on peeling skin, brittle and hair loss, flaking and brittle nails, constant nausea, spontaneous diarrhea have consulted to district physician. They consumed food products grown on soil with selenium content of 28 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

For the lesson the student should know:

1. Methodical instructions on performance of laboratory work, characteristic of the environmental pathology**,** measures for prophylactic of the environmental pathology.
2. Algorithm of the situational task decision.
3. Explanation of Multiple choice questions.
4. Answers on the study questions:

Study Questions.

4.1. Lithosphere, its characteristic. Soil resources, formation and evolution. Soil resources.
4.2. Value of soil. Abiotic and biotic factors and.
4.3. Medical value of physical factors of soil.
4.4. Medical value of insufficiency of chemical factors of soil.

4.5. Medical value of excess of chemical factors of soil.
4.6. Medical value of biological factors of soil.

For the lesson the student should be able to:
1. Work with the stopwatch.

Methodical Instructions on Performance of Laboratory Work.

Determination of the environmental pathology, caused by the physical water factors.

1. Determination of the environmental pathology at the patients

The patients with complaints on
- headache,
- watery eyes,
- runny nose,
- cough,
- dizziness,
- nausea,
- fatigue,
- sensitivity to odors,
- frequent colds

are revealed in the survey and examination.

2. Determination of the soil factors, where the buildings of the patients are built on

Determination of soil porosity.

Equipment: measured cylinders, glass sticks, cups, spoons.
Work performance:

a. 40 cm^3 of dry-air soil is filled in the measured cylinder on 100 ml;
b. 60 cm^3 of water is poured and mixed;
c. volume of the liquid in the cylinder is measured;
d. volume of pores is calculated under the formula:

P = (100 - V) : 40 x 100,

where P – soil porosity, %,

V - volume of the liquid in the cylinder after mixing.

Ecological estimation.

Ecological estimation of soil porosity is made by comparing with optimum parameters - 60-65 %.

***Preliminary diagnosis*:** sick building syndrome, caused by poor soil porosity.

Determination of soil permeability.

Equipment: stop watch, measured test-tube on 15 cm (diameter 2 cm), bottom aperture of which is closed by filter paper and fabric, glasses, cups, stand, spoons.

Work performance:

a. the researched soil is filled in test-tube up to the level of 10 cm;
b. layer of water is poured up to the level of 12.5 cm from above;
c. the water distance is marked in 3 min.

Ecological estimation.

Ecological estimation of soil permeability is made by comparing with the following parameters:

- 1.5-3 mm is satisfactory;
- 3-5 mm is good;
- 5-25 mm is the best;
- 25-50 mm is bad;
- more than 50 mm is the worse.

***Preliminary diagnosis*:** sick building syndrome, caused by poor soil permeability.

Solve a problem, estimate the obtained data and request actions for their improvement

Situational Task.

20 patients with complaints on peeling skin, brittle and hair loss, flaking and brittle nails, constant nausea, spontaneous diarrhea have consulted to district physician. They consumed food products grown on the

soil with selenium content of 26 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

The algorithm of task's decision:

The soil mismatches sanitary-ecological requirements: selenium content is higher than MPC (MPC is 10 mg/kg). With prolonged use of high doses of selenium the above mentioned complaints can be revealed.

Preliminary diagnosis: hyperselenosis.

Pathogenesis: due to the ability of high doses of selenium to inhibit the activity of redox enzymes that disrupt the synthesis of methionine and have prooxidant action.

Treatment should include detoxication, restoration of the nutritional status, immunocorrection, symptomatic treatment, antioxidant therapy.

Individual prevention includes formation of healthy lifestyle with a focus on rational and preventive nutrition, drinking mode, consumption less foodstuffs with excess of selenium, use the bottled water, reception of phytopreparations, adaptogens.

Multiple Choice Questions.

Choose proper answers

1. Types of lithosphere are:
    1. oceanic lithosphere;
    2. continental lithosphere;
    3. core;
    4. the mantle;
    5. the crust.
2. Soil structure is:
    1. organic matter;
    2. surface soil;
    3. subsoil;
    4. parent rock;
    5. bedrock.
3. Physical properties of soils are:
    1. texture;
    2. porosity;
    3. air permeability;
    4. absorption capacity;

5. moisture content.

4. Chemical properties of soil are:
   1. chemical elements;
   2. organic and inorganic compounds;
   3. living organisms;
   4. porosity;
   5. infectivity.

5. Biological properties of soil are:
   1. chemical elements;
   2. organic and inorganic compounds;
   3. living organisms;
   4. porosity;
   5. permeability.

6. Soil formation factors are:
   1. parent material;
   2. climate;
   3. topography (relief);
   4. organisms;
   5. time.

7. Value of soil is:
   1. definition of a chemical compound of foodstuff;
   2. worsening of organoleptic properties of the foodstuff;
   3. influence thermal properties of ground layer of atmosphere;
   4. definition of depth of arrangement and structure of underground waters;
   5. the important factor in dysentery distribution, especially dangerous infections and helminthiases.

8. Urovskaya disease or Kashin-Beck disease symptoms are:
   1. joint pain;
   2. morning stiffness in the joints;
   3. disturbances of flexion and extension in the elbows;
   4. enlarged inter-phalangeal joints;
   5. limited motion in many joints.

9. Soil texture is:
   1. mineral components of soil;
   2. sand;
   3. silt;
   4. clay;
   5. loam.

10. The insufficient intake of iodine causes:
    1. endemic goiter;
    2. Keshan disease;
    3. renal stone disease;
    4. molybdenosis;
    5. endemic gout.
11. The excess of cobalt in soil causes:
    1. Urovskaya disease or Kashin-Beck disease;
    2. Keshan disease;
    3. endemic goiter;
    4. hyperselenosis;
    5. cardiomyopathy.
12. Keshan disease is manifested in:
    1. an increase of sizes of heart;
    2. an increase of sizes of thyroid gland;
    3. the development of focal myocardial necrosis;
    4. arrhythmia;
    5. cardiac insufficiency.
13. Urovskaya disease or Kashin-Beck disease (KBD) (endemic osteopathy) is caused by:
    1. excess of selenium;
    2. excess of cobalt;
    3. excess of molybdenum;
    4. excess of strontium or barium on the background of calcium deficiency;
    5. deficiency of molybdenum.
14. The medical significance of anaerobic bacteria is:
    1. clearing of the occupied places from garbage;
    2. decomposition of organic substances with the release of odorous and harmful substances;
    3. causing the "disease associated with the building," "sick building syndrome";
    4. converting of N_2 to nitrate by the way of nitrogen fixation;
    5. prevention.
15. Soil organisms (edafobionts) are divided into:
    1. constant (geobionts);
    2. temporary (geophiles);
    3 facultative (geoxens);
    4. nitrogen-fixing bacteria;

5. viruses.

Literature.

1. Lecture № 2.

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Theme 8. CONCLUDING SESSION

The theme has important meaning in prevention of environmental pathology, caused by the physical, chemical and biological factors and pollutants of atmospheric air, water and soil.

Purpose of the Lesson: to be able to diagnose the environmental pathology, caused by the factors and pollutants of atmospheric air, water and soil, and to develop measures for its prophylactic.

Laboratory Work.

- 1. Reveal the patients with the certain complaints**,** determine the following environmental factors and pollutants:
- the nitrates content in potable water of centralized and decentralized water sources, calculate the correlation factor;
- the iron content in potable water, consumed by the patients;
- the type of skin sensitivity to UVB action, intensity of UVB action;
- the suitability of plastic utensils and containers for food purposes;
- the temperature, relative humidity of atmospheric air, speed of air movement, atmospheric pressure;
- chromaticity and turbidity of water;
- soil porosity and permeability.

- 2. Estimate the received results.
- 3. Offer optimization ways for prophylactic of the environmental pathologies, related to the environmental factors and pollutants.
- 4. Record the laboratory work report.

Situational Tasks.

1. In the city with the population 300000 persons 20000 patients with arthritis were firstly registered. There are no enterprises of the chemical industry in the city. In potable water of the city the molybdenum maintenance has made 0.50 mg/dm^3. Estimate the morbidity of the environmental pathology and suggest improvement actions for its prevention.

2. 50 patients with complaints on decrease in physical and mental capacity, frequent catarrhal diseases, pain in liver and heart, deterioration

of accommodation and decrease of visual acuity have consulted to district physician. In potable water of the city the selenium content has made 0.0001 mg/dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

3. 20 patients of the 1st type of skin with complaints on the appearance of small moles protruding above the surface of skin on the neck and underarm area have consulted to district physician. Patients were exposured to the sun for a long-term, UVB dose was 260 joule/m^2. Estimate the environmental pathology and suggest improvement actions for its prevention.

4. 20 women of 20-25 ages with complaints on dizziness, weakness, headache, memory loss, poor sleep, joint pain have consulted to district physician. Patients have lived with lead content in the soil of 11.0 mg / kg. Patients have consumed 35 g of proteins, 71 g of fats, 275 g of carbohydrates, and 400 mg of calcium per day. Estimate the environmental pathology and suggest improvement actions for its prevention.

5. 50 women with complaints of depression, decreased working capacity, increase in body weight, insomnia at night and sleepiness in the morning, unwillingness to communicate with other people have consulted to district physician. The symptoms appeared at lower illumination by 20% and reducing the duration of daylight for 1 hour. Estimate the environmental pathology and suggest improvement actions for prevention of seasonal affective disorder.

6. 10 patients with complaints on a feeling of fullness in the stomach after eating, violation of appetite, feeling of bloating, nausea, belching, heartburn, pain in the heart, increased blood pressure have consulted to district physician. In drinking water the dry rest is 3 g / dm^3, chloride content is 500 mg / dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

7. 20 patients with complaints on peeling skin, brittle and hair loss, flaking and brittle nails, constant nausea, spontaneous diarrhea have consulted to district physician. They consumed food products grown on the soil with selenium content of 26 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

- Theme 8 -

For the lesson the student should know:

1. Methodical instructions on performance of laboratory work, characteristic of the environmental pathology, measures for prophylactic of the environmental pathology.
2. Algorithm of the situational task decision.
3. Explanation of Multiple choice questions.
4. Answers on the study questions:

Study Questions.

4.1. An organism and environment, their interrelation.
4.2. Ecosystem, biogeocenose, biosphere concept.
4.3. Environmental factors. The laws of their influence on an organism.
4.4. Environmental medicine as a science, its differentiation, purpose, tasks, methods, studying subject, connection with other sciences.
4.5. The brief outline of history of environmental medicine development.
4.6. The value of environmental medicine for a doctor.
4.7. Characteristic and classification of reasons of environmental diseases.
4.8. Physical factors of air, water and soil, causing environmental diseases.
4.9. Chemical factors of air, water and soil, causing environmental diseases.
4.10. Biological factors of air, water and soil, causing environmental diseases.
4.11. Pollutants of physical and biological nature of air, water and soil, causing environmental diseases.
4.12. Pollutants of chemical nature of air, water and soil, causing environmental diseases.
4.13. Features of pathogenesis of environmental diseases.
4.14. The mechanism of human hereditary diseases.
4.15. Gene, chromosome, genome, cytoplasmic and somatic mutations, their value in occurrence of hereditary pathology of the person. DNA repair.
4.16. Features of clinical picture of environmental diseases.
4.17. Features of diagnostic of environmental diseases.
4.18. Features of treatment of environmental diseases.
4.19. Public prevention of environmental pathology.
4.20. The value of doctors for prevention of environmental pathology.

4.21. Environmental education and training.
4.22. Personal prevention of environmental pathology.
4.23. Formation of healthy life style.
4.24. Balanced and preventive nutrition in terms of environmental pathology prevention.
4.25. Atmospheric air, its value. Abiotic and biotic factors of atmospheric air.
4.26. Medical value of ultraviolet and visible light of solar irradiance spectrum. Chronomedicine.
4.27. Medical value of geomagnetic factors of atmospheric air.
4.28. Medical value of climatic factors of atmospheric air.
4.29. Medical value of chemical factors of atmospheric air.
4.30. Medical value of biotic factors of atmospheric air.
4.31. Hydrosphere, its characteristic. Water, its meaning. Abiotic and biotic factors of water.
4.32. The water sources and systems of water supply.
4.33. Medical value of physical factors of water.
4.34. Medical value of insufficiency of chemical factors of water.
4.35. Medical value of excess of chemical factors of water.
4.36. Medical value of biological factors of water.
4.37. Lithosphere, its characteristic. Soil resources, formation and evolution. Soil resources.
4.38. Value of soil. Abiotic and biotic factors and.
4.39. Medical value of physical factors of soil.
4.40. Medical value of insufficiency of chemical factors of soil.
4.41. Medical value of excess of chemical factors of soil.
4.42. Medical value of biological factors of soil.

For the lesson the student should be able to:
1. Work with the microcalculator.
2. Work with the photo and electro colorimeter.
3. Work with the magnifying glass.
4. Work with the aspirated psychrometer.
5. Work with the hygrometer.
6. Work with the anemometer.
7. Work with the barometer-aneroid.
8. Work with the stopwatch.

- Theme 8 -

Multiple Choice Questions.

Choose proper answers

1. Environment is:
    1. is a combination of natural and changed by person's activity nature factors which show effect of influence on organism;
    2. all forces and phenomena of nature, the origin of which is not directly related to the activity of living organisms;
    3. the forces and phenomena of nature, the origin of which is directly related to the activity of living organisms;
    4. an environment of human caused by a set of objects, phenomena and factors that determine the conditions of his life;
    5. the results of development of any organism are determined by the ratio of its internal characteristics and characteristics of the environment in which it is located.
2. Environmental factor is:
    1. any factor, abiotic or biotic, that directly or indirectly influences living organisms;
    2. living (biotic) components of the planet;
    3. nonliving (abiotic) components of the planet;
    4. optimum factor;
    5. the combined effect of two or more factors when their joint biological activity is much higher than the effect of each component and their sum.
3. Environmental factors are classified:
    1. causal etiological and risk;
    2. primary and secondary periodic and nonperiodic;
    3. irritants, limiters, signals and modifiers;
    4. favorable, unfavorable, influencing of both kinds;
    5. abiotic, biotic, anthropogenic.
4. Environmental medicine is a science about:
    1. etiology, pathogenesis, clinical picture, diagnostics, treatment and prevention of environmental diseases in humans;
    2. prevention of environmental diseases and reduction of environmental morbidity;

3. identification of the nature of interaction between man and environment, the reasons and causal relationships between the quality of the environment and morbidity;
4. study of the mechanisms of development, clinical manifestations, diagnostic features;
5. development of diagnostics, treatment schemes and prophylactic actions on prevention of human diseases.

5. The etiological environmental factors are:
1. natural chemical factors of atmospheric air, water and soil of pessimal intensity;
2. natural physical factors of atmospheric air, water and soil of pessimal intensity;
3. natural biological factors of atmospheric air, water and soil of pessimal intensity;
4. natural chemical, physical, biological factors of atmospheric air, water and soil of optimal intensity;
5. artificial chemical, physical, biological factors of atmospheric air, water and soil of optimal intensity.

6. The basis for the suspicion of environmental etiology of the disease is:
1. identification of the characteristic symptoms in clinical picture that are not found in other nosological forms and non-professional activity of the persons;
2. the group nature of noninfectious diseases;
3. the presence of harmful and dangerous environmental factors;
4. the possibility of disease of the environmental etiology after cessation of exposure to harmful factors;
5. the combined effect of two or more factors.

7. The pathological process of environmentally caused diseases includes:
1. damage of immune, nervous and endocrine mechanisms of regulation;
2. violations of biochemical processes;
3. violations of physiological functions;
4. violations of morphological structures;
5. the damage of certain organ and systems.

8. The clinical picture of environmental disease is:
1. very diverse;
2. usually has no specific symptoms;

3. described by information complex index;
4. described by biochemical, physiological, immunological and other studies;
5. included into International Classification of Diseases.

9. The process of diagnostics of an environmental pathology includes:
1. an anamnesis of the disease;
2. establishment of prior factors (genetic, stress, infectious, toxic, physical);
3. identification of the role of triggers (chemical, physical, biological and physiological factors, medications, physical activity, social interaction);
4. revealing of mediators (hormones, lymphokines, cytokines, free radicals, neurotransmitters);
5. definition of pathological process, deficiencies, excesses, intoxication and the reasons.

10. Treatment of environmental diseases includes:
1. detoxication to remove heavy metals and toxic xenobiotics;
2. elimination of violations of nutritional status;
3. immunocorrection;
4. treatment of allergies;
5. antioxidant therapy.

11. Prevention of environmental diseases is carried out by:
1. individual and public health prevention;
2. environmental monitoring;
3. environmental education and training of the population;
4. treatment by the precursors of synthesis of neurotransmitters at their deficit;
5. elimination of dysfunctions in the organs and systems.

12. Individual prevention of environmental diseases includes:
1. formation of healthy lifestyle with a focus on rational and preventive nutrition;
2. environmental monitoring;
3. environmental education and training of the population;
4. protection by time, distance, quantity, screen;
5. reception of phytopreparations, adaptogens.

13. Public prevention of environmental diseases includes:

1. formation of healthy lifestyle with a focus on rational and preventive nutrition;
2. medical measures for the population exposed to harmful environmental factors;
3. measures to protect the environment from pollution;
4. protection by time, distance, quantity, screen;
5. reception of phytopreparations, adaptogens.

14. The main principles of construction of a diet in terms of environmental load are:

1. increase in proteins receipt till 15 % from the caloric content of a diet, basically at the expense of proteins of animal origin (60 % from the general receipt);
2. restriction in fats receipt till 30 % from the caloric content of a diet at relative reduction of receipt of vegetable oil and cod-liver oil (polyunsaturated fatty acids - 3 % from the general caloric content of a diet);
3. increase in vitamins-antioxidants (E, C, A, β-carotin) receipt on 20 - 50 % in comparison with the recommended age norms;
4. increase in dietary fibers receipt on 20-30 %;
5. increase in mineral substances and microelements (Ca, Fe, Mg, K, Zn, Se, I, Mn, Cu) receipt on 20 - 50 %.

15. The social and hygienic monitoring is:

1. a system of collecting, analyzing and evaluating information about the state of life and health of the population depending on the quality of the environment;
2. a comprehensive educational, training and upbringing activity aimed at formation of hygienic health of individuals, social groups and society as a whole;
3. the basic, proven by practices, provisions guiding the activity in the field of environmental education;
4. the provision of individuals, groups of individuals, social community by important and timely health information;
5. population structure.

16. Environmental diseases, caused by atmospheric temperature, are:

1. sunstroke;
2. syndrome of chronic exhaustion;
3. hyperthermia;

4. hypothermia;
5. mountain [(high-)altitude] disease.

17. Symptoms of altitude sickness are:
1. headaches;
2. nausea or vomiting;
3. fatigue or weakness;
4. peripheral edema;
5. pulmonary edema.

18. Symptoms of decompression sickness are:
1. convulsions;
2. loss of coordination;
3. arterial gas embolism;
4. bloody sputum;
5. cerebral edema.

19. Urovskaya disease or Kashin-Beck disease symptoms are:
1. joint pain;
2. morning stiffness in the joints;
3. disturbances of flexion and extension in the elbows;
4. enlarged inter-phalangeal joints;
5. limited motion in many joints.

20. The excess of cobalt in soil causes:
1. Urovskaya disease or Kashin-Beck disease;
2. Keshan disease;
3. endemic goiter;
4. hyperselenosis;
5. cardiomyopathy.

Literature.

1. Lectures №1-5.
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Theme 9. MEDICAL VALUE OF ATMOSPHERE POLLUTION

The theme is necessary for the further training at general hygiene and ecology department, department of public health and public health services and also in practical work as a doctor for the treatment and prevention of environmental pathology, caused by the physical, chemical and biological pollutants of atmospheric air.

Purpose of the Lesson: to be able to diagnose the environmental pathology, caused by the pollutants of atmospheric air, and to develop measures for its prophylactic.

Laboratory Work.

- 1. Reveal the patients with complaints on persistent cough with copious sputum, shortness of breath, determine the nitrogen oxides content in air.
- 2. Estimate the environmental pathology.
- 3. Offer optimization ways for prophylactic of lung pathology, caused by nitrogen oxides in the inhaled air.
- 4. Record the laboratory work report.

Situational Tasks.

1. 22 patients with complaints on troublesome cough, shortness of breath, general weakness have consulted to district physician. The content of sulfur dioxide in the air corresponds to a value of 1 mg / m^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

2. 19 patients with complaints on troublesome cough, shortness of breath, general weakness have consulted to district physician. The content of sulfur dioxide in the air corresponds to a value of 1.9 mg / m^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

3. 25 patients with complaints on troublesome cough, shortness of breath, general weakness have consulted to district physician. The content of sulfur dioxide in the air corresponds to a value of 1.5 mg / m^3. Estimate

the environmental pathology and suggest improvement actions for its prevention.

4. 35 patients with complaints on troublesome cough, shortness of breath, general weakness have consulted to district physician. The content of sulfur dioxide in the air corresponds to a value of 1.8 mg / m^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

5. 60 patients with complaints on troublesome cough, shortness of breath, general weakness have consulted to district physician. The content of sulfur dioxide in the air corresponds to a value of 1.1 mg / m^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

6. 50 patients with complaints on troublesome cough, shortness of breath, general weakness have consulted to district physician. The content of sulfur dioxide in the air corresponds to a value of 1.4 mg / m^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

7. 45 patients with complaints on troublesome cough, shortness of breath, general weakness have consulted to district physician. The content of sulfur dioxide in the air corresponds to a value of 1.2 mg / m^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

8. 20 patients with complaints on troublesome cough, shortness of breath, general weakness have consulted to district physician. The content of sulfur dioxide in the air corresponds to a value of 1.3 mg / m^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

9. 40 patients with complaints on troublesome cough, shortness of breath, general weakness have consulted to district physician. The content of sulfur dioxide in the air corresponds to a value of 0.8 mg / m^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

10. 30 patients with complaints on troublesome cough, shortness of breath, general weakness have consulted to district physician. The content of sulfur dioxide in the air corresponds to a value of 2.1 mg / m^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

11. 24 patients with complaints on troublesome cough, shortness of breath, general weakness have consulted to district physician. The content of sulfur dioxide in the air corresponds to a value of 1.1 mg / m^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

12. 22 patients with complaints on troublesome cough, shortness of breath, general weakness have consulted to district physician. The content of sulfur dioxide in the air corresponds to a value of 1.2 mg / m^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

13. 35 patients with complaints on troublesome cough, shortness of breath, general weakness have consulted to district physician. The content of sulfur dioxide in the air corresponds to a value of 1.3 mg / m^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

14. 55 patients with complaints on troublesome cough, shortness of breath, general weakness have consulted to district physician. The content of sulfur dioxide in the air corresponds to a value of 1.4 mg / m^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

15. 65 patients with complaints on troublesome cough, shortness of breath, general weakness have consulted to district physician. The content of sulfur dioxide in the air corresponds to a value of 1.5 mg / m^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

For the lesson the student should know:

1. Methodical instructions on performance of laboratory work, characteristic of the environmental pathology**,** measures for prophylactic of the environmental pathology.
2. Algorithm of the situational task decision.
3. Explanation of Multiple choice questions.
4. Answers on the study questions:

Study Questions.

4.1. Pollution of environment. The basic sources of pollution and pollutants of environment. Self-cleaning.

4.2. Medical consequences of environmental pollution.
4.3. The basic sources of pollution and pollutants of atmospheric air.
4.4. Medical value of chemical pollutants of atmospheric air.
4.5. Medical value of physical pollutants of atmospheric air.
4.6. Medical value of biological pollutants of atmospheric air.

For the lesson the student should be able to:
1. Work with the photo and electro colorimeter.

Methodical Instructions on Performance of Laboratory Work.

Determination of the environmental pathology, caused by contamination of tropospheric air with the nitrogen oxides.

1. Determination of the environmental pathology at the patients

The patients with complaints on
- persistent cough with copious sputum,
- shortness of breath,

are revealed in the survey.

2. Determination of nitrogen oxides content in air, which is inhaled by the patients

Determination of nitrogen oxides in air.

The determination is based on formation of the painted connection at interaction in acid medium of nitrogen oxides with Greese reactive.
Equipment: electroaspirator, absorbed devices, gas pipettes, conical flask, photo and electro colorimeter (PhEC) (picture 9.1).

Picture 9.1. Photo and electro colorimeter.

Reactives: absorbed solution (0,1N NaOH), Greese reactive in acetic acid.
Selection of air tests:

a. the researched air is selected by the vacuum method in gas pipettes in capacity 250-500 ml, containing 4 ml of 0.1N NaOH (the residual pressure makes 27-67 hPa);

b. the clip is opened for 1 minute and closed again in the place of air test selection;

c. it is kept for 8 hours with shaking periodically.

Work performance:

a. the test in quantity 3 ml is transferred from the gas pipettes to the colorimetric test tube;

b. 0.5 ml of Greese reactive is added;

c. it is shaken up and measurement on FEC with green light filter №6 is made in 30 minutes.

d. the control is distilled water;

e. the contents of nitrogen oxides in air is calculated under the formula:

$$\mathbf{X = (A \times C \times 1.17 \times 1000) : (B \times V_o),}$$

where A – quantity of NO_2, found out in the analyzed volume, mg,
B - volume of absorbed solution taken for the analysis, cm^3,
C - volume of absorbed solution in all test, cm^3,
1.17 - factor of recalculation NO_2 to N_2O_5,
V_o - volume of researched air given in normal conditions, dm^3.

Ecological estimation.

The received value of nitrogen oxides concentration is compared with maximum single 0.4 mg/m^3 maximum permissible concentrations.

***Preliminary diagnosis*:** the lung pathology, caused by nitrogen oxides in the inhaled air.

Solve a problem, estimate the obtained data and request actions for their improvement

Situational Task.

20 patients with complaints on troublesome cough, shortness of breath, general weakness have consulted to district physician. The content of sulfur dioxide in the air corresponds to a value of 0.9 mg / m^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

The algorithm of task's decision:

There is high content of sulfur dioxide (MPC - 0.5 mg / m^3) in the air. When a long stay outdoors above mentioned complaints are possible.

Preliminary diagnosis: acute tracheobronchitis.

Pathogenesis: sulfur dioxide, resorbing in the upper respiratory tract, irritates the nerve endings of the olfactory, trigeminal, glossopharyngeal, vagus nerve to release tachykinins, causing stimulation of axonal reflex, vasodilation and increased vascular permeability.

Treatment should include detoxication, immunocorrection, symptomatic treatment, antioxidant therapy.

Individual prevention includes formation of healthy lifestyle with a focus on rational nutrition, reception of phytopreparations, adaptogens.

Multiple Choice Questions.

Choose proper answers

1. Pollution of human environment is:

1. the introduction of new, non characteristic components (physical, biological, chemical agents or energy kinds) into the environment or

excess of their natural level in the quantities having a negative influence on human, animals or plants as direct and indirect ways;

2. introduction of new, non characteristic components for environment;

3. excess of natural level of new for environment components in the quantities having a negative influence on humans, animals or plants as direct and indirect ways;

4. entering of chemical materials which are quantitatively or qualitatively alien to natural biogeocenoses;

5. the most typical manifestation of long influence of factors of small intensity on the population of cities and is characterized by a wide spectrum of biological answers.

2. Types of pollution on spatial location are:
   1. parametrical;
   2. local;
   3. global;
   4. ingredient;
   5. regional.
3. Types of atmosphere pollution influence on human health are:
   1. sharp action;
   2. chronic action;
   3. remote effects;
   4. chronic specific action;
   5. chronic nonspecific action.
4. Kinds of pollutants on nature are:
   1. chemical;
   2. physical;
   3. biological;
   4. primary;
   5. secondary.
5. Major primary pollutants produced by human activity are:
   1. sulfur oxides;
   2. nitrogen oxides;
   3. carbon monoxide;
   4. ammonia;
   5. photochemical smog.
6. Major secondary pollutants are:
   1. photochemical smog;

2. ozone;
3. peroxyacetylnitrates;
4. peroxyacetyl nitrate;
5. ammonia.

7. Minor air pollutants are:
1. sulfur oxides;
2. nitrogen oxides;
3. capable of long-range transport, bioaccumulate in human and animal tissue, biomagnify in food chains;
4. persistent organic pollutants;
5. organic compounds that are resistant to environmental degradation through chemical, biological, and photolytic processes.

8. Types of sources of air pollution are:
1. anthropogenic;
2. natural;
3. stationary sources;
4. regional;
5. primary.

9. Hematotoxicity manifests itself in the form of:
1. methemoglobinemia;
2. carboxyhemoglobinemia;
3. carbhemoglobinemia;
4. anemia;
5. syndrome of reactive dysfunction of respiratory tract.

10. Chronic exposure to chemical pollutants leads to:
1. long-term current rhinitis;
2. sinusitis;
3. bronchiectasis;
4. asthma;
5. methemoglobinemia.

11. Increased content of carbon oxide (IV) in the inhaled air to 3% leads to:
1. headache;
2. pulmonary edema;
3. shortness of breath;
4. a rapid loss of consciousness;
5. allergic diseases.

12. Pollutants of physical nature are:

1. electromagnetic radiation;
2. infrasound;
3. viruses;
4. noise;
5. ammonia.

13. Health effects of noise influence are:
    1. reduced hearing sensitivity;
    2. cardiovascular effects;
    3. increased blood pressure;
    4. vegetative asthenic syndrome;
    5. noise-induced hearing loss.
14. Pollutants of biological nature are:
    1. hydrogen sulfide;
    2. microbes;
    3. viruses;
    4. fungi;
    5. noise.
15. Consequences of atmosphere pollution are:
    1. respiratory infections, heart disease, lung cancer;
    2. acid deposition;
    3. global warming;
    4. ozone depletion;
    5. change of climate.

Literature.

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Theme 10. MEDICAL VALUE OF HYDROSPHERE POLLUTION

The theme is necessary for the further training at general hygiene and ecology department, department of public health and public health services and also in practical work as a doctor for the treatment and prevention of environmental pathology, caused by the physical, chemical and biological pollutants of water.

Purpose of the Lesson: to be able to diagnose the environmental pathology, caused by the pollutants of water, and to develop measures for its prophylactic.

Laboratory Work.

- 1. Reveal the patients with complaints on dizziness, weakness, fatigue, working capacity decrease, determine the lead content in water, consumed by the patients.
- 2. Estimate the environmental pathology.
- 3. Offer optimization ways for prophylactic of blood pathology, caused by lead in consumed water.
- 4. Record the laboratory work report.

Situational Tasks.

1. 22 patients with complaints on muscle weakness, severe pain in the lumbosacral area, thighs, legs, ribs, amplifying at physical exertion, changes in gait have consulted to district physician. The content of cadmium in the water corresponds to a value of 0.02 mg / dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

2. 24 patients with complaints on muscle weakness, severe pain in the lumbosacral area, thighs, legs, ribs, amplifying at physical exertion, changes in gait have consulted to district physician. The content of cadmium in the water corresponds to a value of 0.03 mg / dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

3. 26 patients with complaints on muscle weakness, severe pain in the lumbosacral area, thighs, legs, ribs, amplifying at physical exertion,

changes in gait have consulted to district physician. The content of cadmium in the water corresponds to a value of 0.04 mg / dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

4. 28 patients with complaints on muscle weakness, severe pain in the lumbosacral area, thighs, legs, ribs, amplifying at physical exertion, changes in gait have consulted to district physician. The content of cadmium in the water corresponds to a value of 0.05 mg / dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

5. 30 patients with complaints on muscle weakness, severe pain in the lumbosacral area, thighs, legs, ribs, amplifying at physical exertion, changes in gait have consulted to district physician. The content of cadmium in the water corresponds to a value of 0.07 mg / dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

6. 35 patients with complaints on muscle weakness, severe pain in the lumbosacral area, thighs, legs, ribs, amplifying at physical exertion, changes in gait have consulted to district physician. The content of cadmium in the water corresponds to a value of 0.04 mg / dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

7. 32 patients with complaints on muscle weakness, severe pain in the lumbosacral area, thighs, legs, ribs, amplifying at physical exertion, changes in gait have consulted to district physician. The content of cadmium in the water corresponds to a value of 0.08 mg / dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

8. 40 patients with complaints on muscle weakness, severe pain in the lumbosacral area, thighs, legs, ribs, amplifying at physical exertion, changes in gait have consulted to district physician. The content of cadmium in the water corresponds to a value of 0.09 mg / dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

9. 45 patients with complaints on muscle weakness, severe pain in the lumbosacral area, thighs, legs, ribs, amplifying at physical exertion, changes in gait have consulted to district physician. The content of cadmium in the water corresponds to a value of 0.1 mg / dm^3. Estimate the

environmental pathology and suggest improvement actions for its prevention.

10. 50 patients with complaints on muscle weakness, severe pain in the lumbosacral area, thighs, legs, ribs, amplifying at physical exertion, changes in gait have consulted to district physician. The content of cadmium in the water corresponds to a value of 0.09 mg / dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

11. 25 patients with complaints on muscle weakness, severe pain in the lumbosacral area, thighs, legs, ribs, amplifying at physical exertion, changes in gait have consulted to district physician. The content of cadmium in the water corresponds to a value of 0.03 mg / dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

12. 50 patients with complaints on muscle weakness, severe pain in the lumbosacral area, thighs, legs, ribs, amplifying at physical exertion, changes in gait have consulted to district physician. The content of cadmium in the water corresponds to a value of 0.04 mg / dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

13. 33 patients with complaints on muscle weakness, severe pain in the lumbosacral area, thighs, legs, ribs, amplifying at physical exertion, changes in gait have consulted to district physician. The content of cadmium in the water corresponds to a value of 0.05 mg / dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

14. 32 patients with complaints on muscle weakness, severe pain in the lumbosacral area, thighs, legs, ribs, amplifying at physical exertion, changes in gait have consulted to district physician. The content of cadmium in the water corresponds to a value of 0.06 mg / dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

15. 35 patients with complaints on muscle weakness, severe pain in the lumbosacral area, thighs, legs, ribs, amplifying at physical exertion, changes in gait have consulted to district physician. The content of cadmium in the water corresponds to a value of 0.07 mg / dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

- Theme 10 -

For the lesson the student should know:

1. Methodical instructions on performance of laboratory work, characteristic of the environmental pathology**,** measures for prophylactic of the environmental pathology.
2. Algorithm of the situational task decision.
3. Explanation of Multiple choice questions.
4. Answers on the study questions:

Study Questions.

4.1. Pollution of water and its medical value.
4.2. The basic sources of pollution and pollutants of water.
4.3. Medical value of chemical pollutants of atmospheric air.
4.4. Medical value of physical pollutants of atmospheric air.
4.5. Medical value of biological pollutants of atmospheric air.
4.6. Methods of studying and estimation of hydrosphere pollutants.

For the lesson the student should be able to:

1. Work with the photo and electro colorimeter.

Methodical Instructions on Performance of Laboratory Work.

Determination of the environmental pathology, caused by lead water pollution.

1. Determination of the environmental pathology at the patients

The patients with complaints on
- dizziness,
- weakness,
- fatigue,
- working capacity decrease

are revealed in the survey.

2. Determination of the pollutant of water, consumed by the patients

Determination of lead content in water.

The determination is based on formation of a precipitate of sulfuric acid lead at reaction with sulfuric acid.

Equipment: pipettes, conical flask, flasks.

Reactives: 10 % sulfuric acid.

Work performance:

a. 3-4 drops of 10 % sulfuric acid is added to 3 cm^3 of the investigated water;

b. the solution is mixed;

c. the appearance of white colour residue is marked in 3-5 minutes.

Ecological estimation.

The appearance of white colour residue testifies about lead content in water.

***Preliminary diagnosis*:** blood pathology, caused by lead in consumed water.

Solve a problem, estimate the obtained data and request actions for their improvement

Situational Task.

20 patients with complaints on muscle weakness, severe pain in the lumbosacral area, thighs, legs, ribs, amplifying at physical exertion, changes in gait have consulted to district physician. The content of cadmium in the water corresponds to a value of 0.01 mg / dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

The algorithm of task's decision:

There is high content of cadmium (MPC - 0.001 mg / dm^3) in the water. When a long consumption of the water above mentioned complaints are possible.

Preliminary diagnosis: cadmium osteomalacia.

Pathogenesis: cadmium inhibits the formation of active metabolites from vitamin D_3, calcium release from the bone and the resorption of calcium from the small intestine into the plasma.

Treatment should include detoxication, immunocorrection, symptomatic treatment, antioxidant therapy, specific desensitization.

Individual prevention includes formation of healthy lifestyle with a focus on rational and preventive nutrition, drinking mode, do not consume the water with excess of cadmium, use of the bottled water, treat the water by means of filters, reception of phytopreparations, adaptogens.

Multiple Choice Questions.

Choose proper answers

1. Water pollution is:
    1. introduction of new, non characteristic components (physical, biological, chemical agents or energy kinds) into the water or excess of their natural level in the quantities having a negative influence on human, animals or plants as direct and indirect ways;
    2. pollution which disappears within about ten years after the cause of the pollution has been eliminated;
    3. pollution which is caused, in the main, by non-biodegradable chemicals that are active on fauna and flora;
    4. pollution which causes ecosystem destruction and usually requires reconstruction that takes at least one hundred years;
    5. irreversible and results in the definitive destruction of a species or ecosystem.
2. Self-cleaning is:
    1. the natural process that allows cleaning surface stream water;
    2. surface self-cleaning;
    3. percolating water self-cleaning;
    4. performance of dumps into water at various time of day;
    5. a source, bringing in surface or ground water pollutants.
3. The water pollution sources are:
    1. industrial waste water;
    2. urban waste water;
    3. agriculture waste water;
    4. chemical;
    5. eutrophication.
4. Water pollutant is:
    1. a substance that causes a nonobservance of water quality standards;

2. organic substance;
3. inorganic substance;
4. biochemical oxygen demand;
5. limiting factor.

5. Pollutants of chemical nature are:
1. pesticides;
2. disinfection by-products;
3. volatile organic compounds;
4. viruses;
5. heavy metals.

6. Pollutants of physical nature are:
1. Escherichia coli;
2. streptococcus faecalis;
3. pesticides;
4. heat;
5. helminthes.

7. Pollutants of biological nature can cause the following infection diseases:
1. bacteria illnesses;
2. virus illnesses;
3. zoonoses;
4. protozoonoses;
5. helminthiasises.

8. The entering routes of chemical water pollutants into human body are:
1. inhalation;
2. peroral;
3. percutaneous;
4. biological;
5. direct.

9. Neurotoxicity – is a:
1. water pollution with fresh physiological excrements of humans and animals and possible infection of water with microbes;
2. property of chemical pollutants cause distortion of the structure and function of the nervous system;
3. property of chemical substances to cause changes in the structure and functions of the kidneys;
4. accumulation of xenobiotic passing through the glomerular filtration barrier in tubular epithelial cells;

5. syndrome of acute renal failure.

10. Consumption of water with high concentration of mercury can cause:
    1. methemoglobinemia;
    2. Minamata disease;
    3. itai-itai disease;
    4. aplastic anemia;
    5. risk of low IQ in the child.

11. The syndromes of kidneys damages are:
    1. syndrome of acute renal failure;
    2. nephrotic syndrome;
    3. rapidly progressive glomerulonephritis syndrome;
    4. tubulointerstitial nephritis syndrome;
    5. syndrome of reactive dysfunction of respiratory tract.

12. Consumption of water with high concentration of lead can cause:
    1. hypochromic anemia;
    2. biochemical oxygen demand;
    3. tubulointerstitial nephritis syndrome;
    4. itai-itai disease;
    5. diarrhea and shock.

13. Consumption of water with high concentration of cadmium for a long time can cause:
    1. cadmium nephropathy;
    2. renal hypertension;
    3. cadmium osteomalacias;
    4. iron deficiency;
    5. neurotoxic syndrome.

14. Physical pollutants can cause:
    1. carcinogenic effect;
    2. dyspepsia;
    3. hypochromic anemia;
    4. irritable bowel syndrome;
    5. aplastic anemia.

15. The symptoms of hypoxia at 20 - 50% of methemoglobin in the blood are:
    1. expressed cyanosis;
    2. asymptomatic cyanosis;
    3. headache;
    4. weakness;

5. shortness of breath.

Literature.

1. Lecture №3.

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Theme 11. MEDICAL VALUE OF SOIL POLLUTION

The theme is necessary for the further training at general hygiene and ecology department, department of public health and public health services and also in practical work as a doctor for the treatment and prevention of environmental pathology, caused by the physical, chemical and biological pollutants of soil.

Purpose of the Lesson: to be able to diagnose the environmental pathology, caused by the pollutants of soil, and to develop measures for its prophylactic.

Laboratory Work.

- 1. Reveal the patients with complaints on weakness, abdominal pain, nausea, headache, dry cough, skin rash, hives, weight loss, determine the content of helminthes eggs in soil.
- 2. Estimate the environmental pathology.
- 3. Offer optimization ways for prophylactic of ascaridosis, caused by helminthes eggs in soil.
- 4. Record the laboratory work report.

Situational Tasks.

1. 22 patients with complaints on general muscle weakness, itching, tingling, burning, sensitivity reduction have consulted to district physician. Patients have used food grown on the soil containing chlorpyrifos in amount of 1.8 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

2. 24 patients with complaints on general muscle weakness, itching, tingling, burning, sensitivity reduction have consulted to district physician. Patients have used food grown on the soil containing chlorpyrifos in amount of 2.6 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

3. 25 patients with complaints on general muscle weakness, itching, tingling, burning, sensitivity reduction have consulted to district physician. Patients have used food grown on the soil containing chlorpyrifos in

amount of 3.3 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

4. 28 patients with complaints on general muscle weakness, itching, tingling, burning, sensitivity reduction have consulted to district physician. Patients have used food grown on the soil containing chlorpyrifos in amount of 1.9 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

5. 30 patients with complaints on general muscle weakness, itching, tingling, burning, sensitivity reduction have consulted to district physician. Patients have used food grown on the soil containing chlorpyrifos in amount of 4.5 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

6. 35 patients with complaints on general muscle weakness, itching, tingling, burning, sensitivity reduction have consulted to district physician. Patients have used food grown on the soil containing chlorpyrifos in amount of 5.6 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

7. 32 patients with complaints on general muscle weakness, itching, tingling, burning, sensitivity reduction have consulted to district physician. Patients have used food grown on the soil containing chlorpyrifos in amount of 4.7 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

8. 40 patients with complaints on general muscle weakness, itching, tingling, burning, sensitivity reduction have consulted to district physician. Patients have used food grown on the soil containing chlorpyrifos in amount of 6.6 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

9. 45 patients with complaints on general muscle weakness, itching, tingling, burning, sensitivity reduction have consulted to district physician. Patients have used food grown on the soil containing chlorpyrifos in amount of 7.6 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

10. 50 patients with complaints on general muscle weakness, itching, tingling, burning, sensitivity reduction have consulted to district physician. Patients have used food grown on the soil containing chlorpyrifos in amount of 6.1 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

11. 25 patients with complaints on general muscle weakness, itching, tingling, burning, sensitivity reduction have consulted to district physician. Patients have used food grown on the soil containing chlorpyrifos in amount of 3.8 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

12. 26 patients with complaints on general muscle weakness, itching, tingling, burning, sensitivity reduction have consulted to district physician. Patients have used food grown on the soil containing chlorpyrifos in amount of 2.8 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

13. 28 patients with complaints on general muscle weakness, itching, tingling, burning, sensitivity reduction have consulted to district physician. Patients have used food grown on the soil containing chlorpyrifos in amount of 3.7 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

14. 29 patients with complaints on general muscle weakness, itching, tingling, burning, sensitivity reduction have consulted to district physician. Patients have used food grown on the soil containing chlorpyrifos in amount of 1.9 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

15. 32 patients with complaints on general muscle weakness, itching, tingling, burning, sensitivity reduction have consulted to district physician. Patients have used food grown on the soil containing chlorpyrifos in amount of 4.7 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

For the lesson the student should know:

1. Methodical instructions on performance of laboratory work, characteristic of the environmental pathology**,** measures for prophylactic of the environmental pathology.
2. Algorithm of the situational task decision.
3. Explanation of Multiple choice questions.
4. Answers on the study questions:

Study Questions.

4.1. Pollution of soil and its medical value.

4.2. The basic sources of soil pollution.
4.3. The basic pollutants of soil.
4.4. Medical value of chemical pollutants of soil.
4.5. Medical value of physical pollutants of soil.
4.6. Medical value of biological pollutants of soil.

For the lesson the student should be able to:
1. Work with the microscope.

Methodical Instructions on Performance of Laboratory Work.

Determination of the environmental pathology, caused by pollution of soil with helminthes eggs.

1. Determination of the environmental pathology at the patients

The patients with complaints on
- weakness,
- abdominal pain,
- nausea,
- headache,
- dry cough,
- skin rash,
- hives,
- weight loss

are revealed in the survey and examination.

2. Determination of the pollutant of soil, where the patients grown up the fodstuffs

Determination of helminthes eggs in soil.

Equipment: microscope, subject and integument glasses, test centrifuge tubes, balance, measured cylinders, loops, filter papers and membrane, glass sticks, centrifuge, cone of Goldman, glasses, cup with ground, the spoon for pouring, glass beads.
Reagents: 5 % solution of KOH, sated solution of $NaNO_3$, distilled water, glycerin, spirit, cotton wool.

Work performance:

a. 10 g of the investigated ground is filled in test centrifuge tubes;

b. 20 ml of 5 % solution of KOH is added, carefully mixed by means of glass beads for 5 minutes and centrifuged at 1500 rev/min;

c. surplus of 5 % solution of KOH is poured off;

d. 20 ml of sated solution of $NaNO_3$ is added in test tubes, mixed, centrifuged for 2 minutes;

e. superficial film with helminthes eggs is transferred by the loop to the glass with 5 ml of water;

f. hashing, centrifuge and removal of film are repeated 5 times;

g. water with superficial slick is filtered through filters in cone of Goldman;

h. filters are clarified with glycerin and investigated under the microscope on the subject glass at small increase.

Ecological estimation.

Ecological estimation of helminthes eggs content in soil is made by comparing with the following parameters:

- 0 is safe pure;
- 1-10 is poorly polluted;
- 10-100 is moderately polluted;
- more than 100 is strongly polluted soil.

***Preliminary diagnosis*:** ascaridosis, caused by the polluted with helminthes eggs soil.

Solve a problem, estimate the obtained data and request actions for their improvement

Situational Task.

20 patients with complaints on general muscle weakness, itching, tingling, burning, sensitivity reduction have consulted to district physician. Patients have used food grown on the soil containing chlorpyrifos in amount of 1.6 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

The algorithm of task's decision:

There is high content of chlorpyrifos (MPC - 0.2 mg / kg) in the soil. When a long consumption of the food stuffs grown on the soil above mentioned complaints are possible.

Preliminary diagnosis: neuropathy.

Pathogenesis: phosphorusorganic pesticides inhibit acetylcholinesterase, resulting in an accumulation of acetylcholine, which leads to disruption of nerve excitation transfer through nerve cells and ganglionic synapses.

Treatment should include detoxication, immunocorrection, symptomatic treatment, antioxidant therapy, specific and nospecific desensitization.

Individual prevention includes formation of healthy lifestyle with a focus on rational and preventive nutrition, do not consumpt food stuffs grown on the soil with excess of chlorpyrifos, reception of phytopreparations, adaptogens.

Multiple Choice Questions.

Choose proper answers

1. Differences of lithosphere pollution from mechanisms of atmosphere and hydrosphere pollution are:
   1. ground – is an inactive environment;
   2. processes of pollutants migration are slow;
   3. ground collects xenobiotics (human-made) chemicals well;
   4. introduction of new, non characteristic components (physical, biological, chemical agents or energy kinds) into the environment;
   5. excess of natural level of soil components in the quantities having a negative influence on humans, animals or plants as direct and indirect ways.
2. On danger ground is divided into:
   1. safe, dangerous, extremely dangerous;
   2. pure, poorly polluted, polluted and strongly polluted;
   3. safe pure, poorly polluted, moderately polluted, strongly polluted;
   4. safe, non safe;
   5. pure, dirty.

3. The most common anthropogenous sources of lithosphere pollution are:
    1. agriculture;
    2. industrial enterprises;
    3. transport;
    4. household objects;
    5. chemical, physical, biological pollutants.

4. Fetid gases which appear at a rotting and fermentation of organic substances with in anaerobic conditions are:
    1. ammonia;
    2. hydrogen sulphide;
    3. methane;
    4. biological decomposition gasses;
    5. humification gasses.

5. The basic chemical pollutants of soil are:
    1. petroleum hydrocarbons;
    2. polynuclear aromatic hydrocarbons (such as naphthalene and benzo(a)pyrene);
    3. solvents;
    4. pesticides;
    5. fertilizers.

6. Harmful effects of solvents are:
    1. carcinogenic;
    2. neuropsychiatric;
    3. permanent blindness and death;
    4. nausea/vomiting;
    5. damage internal organs like the liver, the kidneys, or the brain.

7. Harmful effects of pesticides are:
    1. irritation of the skin and eyes;
    2. affecting the nervous system;
    3. causing reproductive problems;
    4. lymphoma and leukemia;
    5. neurodevelopmental disorder.

8. The following disorders are marked in artificial geochemical provinces:
    1. congenital malformations;
    2. developmental abnormalities;
    3. impaired physical and mental development of children;
    4. acute and chronic poisonings, allergic diseases;

5.endemic diseases.

9. Coal dust is responsible for:

1. the lung disease known as pneumoconiosis, including black lung disease;
2. the risk of coronary heart disease;
3. the risk of coronary heart disease, acute vascular dysfunction and thrombus formation, cardiovascular morbidity and mortality;
4. the risk of acute vascular dysfunction and thrombus formation;
5. the risk of cardiovascular morbidity and mortality.

10. Diseases due to ground pollution are:

1. bacterial (a belly typhus, a dysentery, legionellosis);
2. virus (poliomyelitis, infectious hepatitis);
3. parasitological (ascariasis, dochmiasis);
4. fungal (dermatophytes, coccidioidomycosis, blastomycosis, sporotrichosis, aspergillosis);
5. protozoa (teniasis, amoebiasis, balantidifsis).

11. The main symptoms of poisoning by phosphorus organic pesticides are:

1. bradycardia;
2. contraction of the pupil;
3. increase in fertility (owing to usage of pesticides);
4. muscle twitching of the face, neck;
5. hypertension.

12. The consequences of the impact of effectors of the endocrine system are:

1. violation of the reproductive function;
2. testicular cancer;
3. prostate cancer;
4. fluorosis;
5. breast cancer.

13. The consequences of the impact of dihlordife-niltrihloretan (DDT) are:

1. kidney, central and peripheral nervous system damage;
2. cirrhosis of the liver;
3. long-term consequences;
4. contraction of the pupil;
5. biogeochemical regions formation.

14. Safe pure soil contains:

1. 0 of helminthes eggs;
2. 1-10 of helminthes eggs;
3. 10-100 of helminthes eggs;
4. more than 100 of helminthes eggs;
5. 0 of larvae of flies, eggs of helminthes.

15. Gas gangrene is caused by:
1. Clostridium botulinum;
2. Legionella;
3. Clostridium perfringens;
4. Clostridium tetani;
5. Aspergillus.

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Theme 12. MEDICAL VALUE OF FOODSTUFF POLLUTION

The theme is necessary for the further training at therapy departments, department of general hygiene and ecology and also in practical work as a doctor for the treatment and prevention of environmental pathology, caused by polluted foodstuffs.

Purpose of the Lesson: to be able to diagnose the environmental pathology, caused by polluted foodstuffs, and to develop measures for its prophylactic.

Laboratory Work.

- 1. Reveal the patients with complaints on the feeling of heaviness in the stomach, nausea in the morning and after eating, vomiting, belching, epigastric pain, detect the soda content in milk.
- 2. Estimate the environmental pathology.
- 3. Offer optimization ways for prophylactic of anotside gastritis, caused by soda in the consumed milk.
- 4. Record the laboratory work report.

Situational Tasks.

1. 20 patients with complaints on weakness, fatigue, dizziness, intense headache, irritability have consulted to district physician. Patients have consumed the meat with lead content of 10.0 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

2. 21 patients with complaints on weakness, fatigue, dizziness, intense headache, irritability have consulted to district physician. Patients have consumed the meat with lead content of 10.0 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

3. 22 patients with complaints on weakness, fatigue, dizziness, intense headache, irritability have consulted to district physician. Patients have consumed the meat with lead content of 11.0 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

4. 25 patients with complaints on weakness, fatigue, dizziness, intense headache, irritability have consulted to district physician. Patients have consumed the meat with lead content of 12.0 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

5. 27 patients with complaints on weakness, fatigue, dizziness, intense headache, irritability have consulted to district physician. Patients have consumed the meat with lead content of 13.0 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

6. 29 patients with complaints on weakness, fatigue, dizziness, intense headache, irritability have consulted to district physician. Patients have consumed the meat with lead content of 14.0 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

7. 30 patients with complaints on weakness, fatigue, dizziness, intense headache, irritability have consulted to district physician. Patients have consumed the meat with lead content of 15.0 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

8. 22 patients with complaints on weakness, fatigue, dizziness, intense headache, irritability have consulted to district physician. Patients have consumed the meat with lead content of 12.0 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

9. 40 patients with complaints on weakness, fatigue, dizziness, intense headache, irritability have consulted to district physician. Patients have consumed the meat with lead content of 30.0 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

10. 45 patients with complaints on weakness, fatigue, dizziness, intense headache, irritability have consulted to district physician. Patients have consumed the meat with lead content of 35.0 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

11. 30 patients with complaints on weakness, fatigue, dizziness, intense headache, irritability have consulted to district physician. Patients have consumed the meat with lead content of 11.0 mg / kg. Estimate the

environmental pathology and suggest improvement actions for its prevention.

12. 31 patients with complaints on weakness, fatigue, dizziness, intense headache, irritability have consulted to district physician. Patients have consumed the meat with lead content of 12.0 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

13. 32 patients with complaints on weakness, fatigue, dizziness, intense headache, irritability have consulted to district physician. Patients have consumed the meat with lead content of 14.0 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

14. 35 patients with complaints on weakness, fatigue, dizziness, intense headache, irritability have consulted to district physician. Patients have consumed the meat with lead content of 13.0 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

15. 37 patients with complaints on weakness, fatigue, dizziness, intense headache, irritability have consulted to district physician. Patients have consumed the meat with lead content of 15.0 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

For the lesson the student should know:

1. Methodical instructions on performance of laboratory work, characteristic of the environmental pathology**,** measures for prophylactic of the environmental pathology.
2. Algorithm of the situational task decision.
3. Explanation of Multiple choice questions.
4. Answers on the study questions:

Study Questions.

4.1. Food stuffs, their composition and value.
4.2. Sources and pollutants of food stuffs. Detoxification of xenobiotics
4.3. Medical value of xenobiotics of natural origin, which enter in foodstuffs from initial raw food material, which enter in foodstuffs from raw materials and products of chemical and microbiological synthesis.

4.4. Medical value of xenobiotics which enter in foodstuffs as a result of processing and cooking of food.
4.5. Medical value of xenobiotics which enter in foodstuffs from utensils, inventories, containers, packaging materials.
4.6. Diagnostic, treatment and prevention of environmental pathology, caused by pollutants of food stuffs.

For the lesson the student should be able to:
1. Work with the reagents.

Methodical Instructions on Performance of Laboratory Work.

Determination the environmental pathology, related to the milk falsified by soda.

1. Determination of the environmental pathology at the patients

The patients with complaints on
- feeling of heaviness in the stomach,
- nausea in the morning and after eating,
- vomiting,
- belching,
- epigastric pain

are revealed in the survey.

2. Detection of soda content in milk, consumed by the patients

Detection of soda content in milk.

Equipment: test tubes, conical flasks, measured cylinders.
Reagents: rosolic acid (R).
Work performance:

a. 2 ml of the investigated milk are poured in the test tube;
d. 2-3 drops of 0.2 % rosolic acid solution are added into the test tube.

Ecological estimation.

Ecological estimation of soda content in milk is made by changing of colour: milk with soda has pink colour, free from soda milk has yellow colour.

***Preliminary diagnosis*:** anotside gastritis, caused by soda in the consumed milk.

Solve a problem, estimate the obtained data and request actions for their improvement

Situational Task.

20 patients with complaints on weakness, fatigue, dizziness, intense headache, irritability have consulted to district physician. Patients have consumed the meat with lead content of 10.0 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

The algorithm of task's decision:

The increased lead level is marked in the meat products (the maximum permissible level is 0.5 mg / kg). When a long use of meat products with a high lead content above mentioned complaints are possible.

Preliminary diagnosis: neurasthenia**.**

Pathogenesis: lead entering the body is distributed with the current blood, nutrition and intracellular metabolism in the cerebral cortex are broken, causing the weakening of internal inhibition processes that disrupt the balance of the nervous processes up to the painful pathological predominance of the excitatory process.

Treatment should include detoxication, immunocorrection, symptomatic treatment, antioxidant therapy, specific and nonspecific desensitization, restoration of the nutritional status.

Individual prevention includes formation of healthy lifestyle with a focus on rational and preventive nutrition, performance of proper technological processing, don not consume the products with a high lead content, reception of phytopreparations, adaptogens.

Multiple Choice Questions.

Choose proper answers

1. Classification of xenobiotics is:
    1. xenobiotics of natural origin;
    2. xenobiotics which enter in foodstuffs as a result of reception of initial raw food material;
    3. xenobiotics which enter in foodstuffs from raw materials and food products, received by chemical and microbiological synthesis;
    4. xenobiotics which enter in foodstuffs as a result of processing and cooking of food;
    5. xenobiotics which enter in foodstuffs at contact to polymeric and other materials.
2. Xenobiotics which enter in foodstuffs as a result of processing and cooking of food are:
    1. food additives (dyes, preservatives, antioxidants);
    2. the compounds which are formed at influence of culinary processing and chemical interaction (at cooking of meat in alkaline water - lizilalanin, at smoking - benzo (a) pyrene and nitrosamines);
    3. metals, pesticides, nitrates;
    4. medical preparations such as biostimulators, antibiotics, sexual hormones, tireostatics, sedatives, glucocorticoids, vitamins;
    5. toxic substances.
3. Xenobiotics of natural origin are:
    1. caffeine;
    2. metals;
    3. pesticides;
    4. anthraquinones;
    5. essential oils.
4. Food additives are:
    1. dyes;
    2. preservatives;
    3. somatotropin;
    4. histamine;
    5. antioxidants.
5. Xenobiotics entering the body from foods possess:
    1. multicomponential effect;
    2. neurotoxicity;

3. hepatotoxicity;
4. remote effect;
5. carcinogenic effect.

6. Consumption of food and foodstuffs rich in oxalic acid leads to:
1. disruption of oxalates metabolism;
2. oxaluria;
3. carcinogenic effect;
4. diarrhea;
5. tachycardia.

7. Serotonin causes:
1. hypertension;
2. oxaluria;
3. arrhythmia;
4. diarrhea;
5. tachycardia.

8. Common symptoms of mercury poisoning include:
1. peripheral neuropathy;
2. skin discoloration;
3. swelling;
4. desquamation;
5. diarrhea.

9. Copper causes:
1. Minamata disease;
2. Wilson's disease;
3. a syndrome of portal hypertension;
4. siderosis;
5. haemochromatosis.

10. Tyramine leads to:
1. hypertension;
2. allergic reactions;
3. dyspepsia;
4. diarrhea;
5. tachycardia.

11. Recombinant growth hormone leads to:
1. increase in the level of insulin-like factor;
2. acromegaly;
3. increase in the risk of malignant tumors of breast and colon;
4. disruption of metabolism;

5. dyspepsia.

12. At cooking of meat in alkaline water the following xenobiotic is released:

1. lizilalanin;
2. benzo (a) pyrene;
3. nitrosamines;
4. colours;
5. dyes.

13. Benzo(a)pyrene possess:

1. carcinogenic action;
2. mutagenic action;
3. allergic action;
4. remote effect;
5. toxic effect.

14. Xenobiotics which enter in foodstuffs at contact to polymeric and other packaging materials:

1. salts of copper, zinc, lead;
2. heavy metals;
3. plasticizers;
4. polyvinyl chloride;
5. lizilalanin.

15. Polyvinyl chloride causes:

1. fast-growing malignant tumor of blood vessel walls;
2. malignant tumor of the breast and bowel;
3. gemangiosarkoma;
4. allergic reactions;
5. dyspepsia.

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Theme 13. MEDICAL VALUE OF INDOOR HABITAT

The theme is necessary for the further training at general hygiene and ecology department, department of public health and public health services and also in practical work as a doctor for the treatment and prevention of environmental pathology, caused by indoor habitat.

Purpose of the Lesson: to be able to diagnose the environmental pathology, caused by indoor habitat, and to develop measures for its prophylactic.

Laboratory Work.

- 1. Reveal the patients with complaints on headache, dyspnea, working capacity decrease, determine the carbon dioxide content in air.
- 2. Estimate the environmental pathology.
- 3. Offer optimization ways for prophylactic of blood pathology, caused by carbon dioxide in the inhaled air.
- 4. Record the laboratory work report.

Situational Tasks.

1. 20 patients with complaints on cough with difficultly separated sputum, dyspnea at the physical activity, accruing weariness have consulted to district physician. Patients were staying for a long time in premises with the high content of a tobacco smoke. Estimate the environmental pathology and suggest improvement actions for its prevention.

2. 25 patients with complaints on cough with difficultly separated sputum, dyspnea at the physical activity, accruing weariness have consulted to district physician. Patients were staying for a long time in premises with the high content of a tobacco smoke. Estimate the environmental pathology and suggest improvement actions for its prevention.

3. 30 patients with complaints on cough with difficultly separated sputum, dyspnea at the physical activity, accruing weariness have consulted to district physician. Patients were staying for a long time in premises with the high content of a tobacco smoke. Estimate the environmental pathology and suggest improvement actions for its prevention.

4. 40 patients with complaints on cough with difficultly separated sputum, dyspnea at the physical activity, accruing weariness have consulted to district physician. Patients were staying for a long time in premises with the high content of a tobacco smoke. Estimate the environmental pathology and suggest improvement actions for its prevention.

5. 45 patients with complaints on cough with difficultly separated sputum, dyspnea at the physical activity, accruing weariness have consulted to district physician. Patients were staying for a long time in premises with the high content of a tobacco smoke. Estimate the environmental pathology and suggest improvement actions for its prevention.

6. 48 patients with complaints on cough with difficultly separated sputum, dyspnea at the physical activity, accruing weariness have consulted to district physician. Patients were staying for a long time in premises with the high content of a tobacco smoke. Estimate the environmental pathology and suggest improvement actions for its prevention.

7. 35 patients with complaints on cough with difficultly separated sputum, dyspnea at the physical activity, accruing weariness have consulted to district physician. Patients were staying for a long time in premises with the high content of a tobacco smoke. Estimate the environmental pathology and suggest improvement actions for its prevention.

850 patients with complaints on cough with difficultly separated sputum, dyspnea at the physical activity, accruing weariness have consulted to district physician. Patients were staying for a long time in premises with the high content of a tobacco smoke. Estimate the environmental pathology and suggest improvement actions for its prevention.

9. 55 patients with complaints on cough with difficultly separated sputum, dyspnea at the physical activity, accruing weariness have consulted to district physician. Patients were staying for a long time in premises with the high content of a tobacco smoke. Estimate the environmental pathology and suggest improvement actions for its prevention.

10. 60 patients with complaints on cough with difficultly separated sputum, dyspnea at the physical activity, accruing weariness have consulted to district physician. Patients were staying for a long time in premises with the high content of a tobacco smoke. Estimate the environmental pathology and suggest improvement actions for its prevention.

11. 30 patients with complaints on cough with difficultly separated sputum, dyspnea at the physical activity, accruing weariness have consulted to district physician. Patients were staying for a long time in premises

with the high content of a tobacco smoke. Estimate the environmental pathology and suggest improvement actions for its prevention.

12. 34 patients with complaints on cough with difficultly separated sputum, dyspnea at the physical activity, accruing weariness have consulted to district physician. Patients were staying for a long time in premises with the high content of a tobacco smoke. Estimate the environmental pathology and suggest improvement actions for its prevention.

13. 36 patients with complaints on cough with difficultly separated sputum, dyspnea at the physical activity, accruing weariness have consulted to district physician. Patients were staying for a long time in premises with the high content of a tobacco smoke. Estimate the environmental pathology and suggest improvement actions for its prevention.

14. 42 patients with complaints on cough with difficultly separated sputum, dyspnea at the physical activity, accruing weariness have consulted to district physician. Patients were staying for a long time in premises with the high content of a tobacco smoke. Estimate the environmental pathology and suggest improvement actions for its prevention.

15. 44 patients with complaints on cough with difficultly separated sputum, dyspnea at the physical activity, accruing weariness have consulted to district physician. Patients were staying for a long time in premises with the high content of a tobacco smoke. Estimate the environmental pathology and suggest improvement actions for its prevention.

For the lesson the student should know:

1. Methodical instructions on performance of laboratory work, characteristic of the environmental pathology**,** measures for prophylactic of the environmental pathology.
2. Algorithm of the situational task decision.
3. Explanation of Multiple choice questions.
4. Answers on the study questions:

Study Questions.

4.1. Characteristic of indoor habitat. Indoor and outdoor habitat pollution.
4.2. Medical value of chemical pollutants of indoor habitat.
4.3. Medical value of physical pollutants of indoor habitat.
4.4. Medical value of biological pollutants of indoor habitat.

4.5. Sick building syndrome.
4.6. Diagnostic, treatment and prevention of environmental pathology, caused by pollutants of indoor habitat.

For the lesson the student should be able to:
1. Work with the table.

Methodical Instructions on Performance of Laboratory Work.

Determination the environmental pathology, related to the carbon dioxide content in indoor air.

1. Determination of the environmental pathology at the patients

The patients with complaints on
- headache,
- dyspnea,
- working capacity decrease

are revealed in the survey.

2. Determination of carbon dioxide content in indoor air, where the patients stay

Determination of the of carbon dioxide content in air

The method is based on blowing the investigated air through the sodium carbonate (or ammonia) volumetric solution in presence of the phenol-phthalein. The $Na_2CO_3+H_2O+CO_2=2NaHCO_3$ reaction takes place in this case. Pink in the alkaline medium, the phenol-phthalein is discoloured after the contact with CO_2 (acid medium).
Equipment: syringe with capacity of 100 dm^3 (picture 13.1).

Picture 13.1. The syringe for determination of CO_2 concentration.

Reagents: 0.005 % sodium hydrocarbonate solution, 1 % phenolphtalein solution.

Work performance:

a. 20 cm^3 of 0.005 % sodium hydrocarbonate solution with 2 drops of 1 % phenolphtalein solution are taken in the syringe;

b. a portion of air in quantity 80 cm^3 is sucked and shaked within 1 minute;

c. if there was no solution decolouration the first portion of air is squeezed out cautiously from the syringe, having left the solution inside the syringe;

d. a new portion of air is taken in the syringe and shaked within 1 minute;

e. this operation is repeated before full decolouration of the solution;

f. the total amount of air which has passed through the syringe is counted up and defined the concentration of carbon dioxide under the table 13.1.

Table 13.1. The concentration of carbon dioxide in dependence of the sucked air volume.

Air volume, cm^3	Concentration of carbon dioxide, %

80	3.2
160	2.08
240	1.56
320	1.2
400	0.88
480	0.52

Ecological estimation.

Ecological estimation of air purity of the premises is made by comparing with the recommended indicators of concentration of carbon dioxide (0.05 %).

***Preliminary diagnosis*:** blood pathology, caused by carbon dioxide in the inhaled air.

Solve a problem, estimate the obtained data and request actions for their improvement

Situational Task.

20 patients with complaints on cough with difficultly separated sputum, dyspnea at the physical activity, accruing weariness have consulted to district physician. Patients were staying for a long time in premises with the high content of a tobacco smoke. Estimate the environmental pathology and suggest improvement actions for its prevention.

The algorithm of task's decision:

When a long inhalation of a tobacco smoke above mentioned complaints are possible.

Preliminary diagnosis: chronic obstructive illness of lungs.

Pathogenesis: tobacco smoke irritates receptors of a wandering nerve that leads to activation of cholinergic mechanisms of vegetative nervous system; movement of cilia of ciliary epithelium of bronchial tubes is broken, epithelium metaplasia develops; viscosity of a bronchial secret increases; the inflammation mediators are allocated.

Treatment should include detoxication, immunocorrection, symptomatic treatment, antioxidant therapy, specific and nonspecific desensitization.

Individual prevention includes formation of healthy lifestyle with a focus on rational and preventive nutrition, aeration of premises, reception of phytopreparations, adaptogens.

Multiple Choice Questions.

Choose proper answers

1. The characteristic feature of indoor habitat pollution is:
    1. multicomponential effect;
    2. multifactorial effect;
    3. single effect;
    4. remote effect;
    5. toxic effect.
2. Indoor habitat is characterized by:
    1. living area;
    2. ceiling height;
    3. air cube;
    4. microclimate;
    5. insolation.
3. The specific reactions of «sick buildings syndrome»:
    1. cold, lacrimation, the asthmatic phenomena at not asthmatics, rattles in lungs;
    2. undue fatigability, memory impairment, impossibility to concentrate, block, drowsiness, headache, dizziness, nausea;
    3. reddening of integuments, dryness of skin, itch, feeling of burning, pain;
    4. reddening and irritation of eyes, dryness in nose or throat, pain in throat, hoarseness of voice and change of its timbre;
    5. asthenic reactions.
4. Poor indoor air quality can cause:
    1. infections;
    2. lung cancer;
    3. chronic lung diseases;
    4. asthma;
    5. coughing.

5. Indoor habitat influence on humans is characterized by:
    1. chronic influence;
    2. low-intensity;
    3. high degree of exposure;
    4. occurence of the nonspecific prepathological states;
    5. acute influence.
6. The parameters of pure air of premises are:
    1. carbon dioxide - 0,05 $\%_0$;
    2. oxidability - 4 mg/m^3;
    3. microbic number - 2000 cell/m^3;
    4. hemolytic streptococcus - 10 cell/m^3;
    5. oxidability - 6 mg/m^3.
7. The symptoms connected to «sick buildings syndrome» are:
    1. sensory irritation of the eyes, nose, throat;
    2. skin irritation;
    3. asthenic reactions;
    4. specific reactions;
    5. nonspecific hypersensitivity reactions.
8. The main indoor pollutants are:
    1. anthropotoxins;
    2. ammonia;
    3. asbestos;
    4. household dust;
    5. nicotine.
9. The main outdoor pollutants are:
    1. sulfur oxides;
    2. products of photochemical reactions (photo-oxidants);
    3. pollen;
    4. formaldehyde;
    5. lead.
10. The groups of chemical compounds on hazards of anthropotoxins are:
    1. class 2 - highly dangerous substances;
    2. class 3 - moderately dangerous substances;
    3. class 4 - low dangerous substances;
    4. phenol, ammonia, organic acids, methanol and other alcohols homologous series, methyl styrene, vinyl acetate;
    5. acetone, methyl ethyl ketone, butane, methyl and butyl.
11. The impacts of electromagnetic radiation on humans are:

1. functional disorders of nervous system;
2. neurasthenic and asthenic syndrome;
3. weakness, irritability, fatigue, memory loss, sleep disturbances;
4. neurocirculatory dystonia;
5. violation of immunogenesis processes, often in the side of the oppressed, autoimmunity, immunodeficiency.

12. The main biological pollutants are:
    1. bacteria;
    2. molds;
    3. pollen;
    4. viruses;
    5. animal dander.
13. The most important bacteria in indoor air are:
    1. Mycobacterium tuberculosis;
    2. Staphylococcus aureus;
    3. Streptococcus pneumoniae;
    4. Legionella;
    5. mycotoxins.
14. The main chemical pollutants are:
    1. anthropotoxins;
    2. asbestos;
    3. formaldehyde;
    4. chloroform;
    5. volatile organic compounds.
15. Health effects of formaldehyde are:
    1. eye, nose, and throat irritation;
    2. wheezing and coughing;
    3. fatigue;
    4. skin rash;
    5. severe allergic reactions.

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Theme 14. MEDICAL CHARACTERISTIC OF RESIDENCE CONDITIONS (practical work)

The theme is necessary for the further training at general hygiene and ecology department, department of public health and public health services and also in practical work as a doctor for the treatment and prevention of environmental pathology, caused by indoor habitat.

Purpose of the Lesson: to be able to make estimation of residence conditions and to develop actions on its improvement.

Practical Work.

- 1. Study the residence conditions of students.
- 2. Estimate the received results.
- 3. Offer measures on improvement of outdoor and indoor habitat.
- 4. Issue the act of residence conditions inspection.

For the lesson the student should know:

1. Methodical instructions on performance of laboratory work, characteristic of the environmental pathology, measures for prophylactic of the environmental pathology.
2. Algorithm of the situational task decision.
3. Explanation of Multiple choice questions.
4. Answers on the study questions:

Study Questions.

4.1. Characteristic of placement of dwelling.
4.2. Characteristic of atmospheric air, water and soil of residence.
4.3. Characteristic of pollution sources and pollutants of outdoor environment of dwelling.
4.4. Characteristic of dwelling and its indoor environment.
4.5. Characteristic of pollution sources and pollutants of indoor environment of dwelling.
4.6. Medical value of residence conditions.

For the lesson the student should be able to:
1. Inspect the residence conditions.

Scheme of residence conditions inspection.

I am, the student of the 2nd year of medical faculty of Vitebsk State Medical University, */Full name/*, group №__, have made the inspection of residence conditions.

It is established:

1. The address.
2. Who does it belong to (living and exploitation establishment, association of proprietors, private ownership)?
3. Who lives: general number, including adults and children.
4. Building location. Surrounding: inhabited quarter, a green file, the industrial enterprises, streets, a wind rose.
5. The ground area: area of building, area of gardening, accomplishment, keeping.
6. The characteristic of atmospheric air of the residence territory (physical, chemical, biological factors, their levels and the concentrations).
7. Sources and pollutants of atmospheric air on the residence territory.
8. The characteristic of surface water on the residence territory (physical, chemical, biological factors, their levels and the concentrations).
9. Sources and pollutants of surface water on the residence territory.
10. The characteristic of soil on the residence territory (physical, chemical, biological factors, their levels and the concentrations).
11. Sources and pollutants of soil on the residence territory.
12. Characteristic of sources and water for drinking water supply of dwelling.
13. The type of inhabited building *(*one-room one-storey, one-room two-storey (cottages), multiroom low-rise, multiroom many-storey and high-rise buildings*)* and its characteristic.
14. The dwelling lay-out (set of rooms, area of rooms, its interrelation, windows orientation on world parts, corridor lay-out).
15. The characteristic of indoor habitat (living area per 1 student; ceiling height; air cube per 1 student; microclimate; insolation; ventilation, heating, illumination, water supply, solid and liquid waste clearing;

chemical, physical and biological factors of air; equipment; decorating materials).

16. Sources of physical pollution and physical pollutants of indoor and outdoor habitat.

17. Sources of chemical pollution and chemical pollutants of indoor and outdoor habitat.

18. Sources of biological pollution and biological pollutants of indoor and outdoor habitat.

19. Presence of insects, rodents and household animals in dwelling.

20. The conclusion on the residence conditions.

21. The improvement offers on the residence conditions.

22. Inspection date, name of the surveyor.

The note: the conclusion and the improvement offers on the residence conditions are represented in details from 4 to 19 points.

Multiple Choice Questions.

Choose proper answers

1. The level of standing of subsoil water on the settlement ground is:
   1. 1.5-2 m from surfaces;
   2. not less than 0.3-0.5 m from a sole of the base;
   3. not less than 0.1 m from a sole of the base;
   4. 0.5-1 m from surfaces;
   5. 3 m from surfaces.
2. Planning of residential zone should provide:
   1. rational residential construction;
   2. optimum placing of establishments and enterprises of service, public centers, street network and green plantings;
   3. protection from cold and hot dry winds;
   4. presence of artesian pools;
   5. improvement of sanitary well-being and populations' life conditions.
3. A microdistrict includes:
   1. residential buildings;
   2. preschool centers, schools;
   3. drugstores;
   4. food shops;

5. green area with platforms for populations' rest, employment by physical culture and sports.

4. Residential area establishments are:
   1. polyclinics;
   2. sports halls and pools;
   3. cinemas;
   4. libraries;
   5. supermarkets, shops.

5. Systems of build-up of residential area are:
   1. continuous;
   2. closed;
   3. ordinary;
   4. group;
   5. line.

6. The parameters of residential area are:
   1. green planting area should not be less than 40 % of the area of all territory;
   2. area of building should not be more than 25 %;
   3. area 40-50 m^2 on 1 person;
   4. discontinuities between facades of buildings should not be less than 2-2.5 heights of the highest building and between ends of buildings should not be less than 1 height;
   5. area for gymnastics, volleyball, tennis, basketball sport playgrounds and platforms should make not less than 1 m^2 per 1 inhabitant.

7. Features of planning of rural populated areas are:
   1. area of building should not exceed 5-6 %;
   2. 20-25 inhabitants on 1 hectare (400-500 m^2 on 1 person);
   3. two zones;
   4. low-rise buildings, presence of private plots and premises for cattle and bird;
   5. sanitary-protective zone (100-300 m) between inhabited and industrial zones.

8. Apartment structure is:
   1. inhabited rooms (bedroom, children's room, office and hall);
   2. auxiliary rooms (lobby-hall, dining room, kitchen, bathing, toilet and pantries);
   3. open rooms (loggias, balconies, verandahs);

4. bilateral planning with premises on two sides of house;
5. one- and bilateral planning of apartment.

9. The types of roofs are:
1. combined with ceiling;
2. not combined with ceiling;
3. warm, smooth, not slippery, suppose easy clearing;
4. easy concrete, brick, plaster-concrete;
5. local, general.

10. The components of sanitary-technical accomplishment are:
1. ventilation;
2. heating;
3. illumination;
4. water supply;
5. solid and liquid waste clearing.

11. Living rooms of hostels are built on the following principles:
1. living room per 2-3 persons;
2. 6 m^2 per 1 resident;
3. 9-13 m^2 per 1 person;
4. area of kitchen with a gas stove is 7, lobby - 6, toilet – 1,5, bathroom – 2.5 m^2;
5. bedrooms, children's rooms are oriented on southern, kitchen - on northern directions.

12. The system of clearing of occupied places from solid waste is:
1. plan-household, or container;
2. export;
3. floatable;
4. plan-room;
5. canalization.

13. Microclimate is:
1. a climate of the limited area;
2. comfortable;
3. discomfortable;
4. cooling;
5. heating.

14. Dampness results in:
1. decrease of organism resistance;
2. increase of sick rate level of respiratory ways;

3. aggravation of a tuberculosis, rheumatism and other chronic diseases;
4. disturbance of heat exchange processes of organism;
5. blinding action.

15. Features of hostel's planning are:
1. big quantity of beds;
2. area per 1 person is underestimated;
3. presence of reading rooms, rooms of day stay and other premises of the general using;
4. wardrobe, kitchens, still-rooms, pantries for storage of personal things, lavatories, washing room;
5. presence of isolator (1 cot on 40 residents).

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Theme 15. ENVIRONMENTAL MONITORING

The theme is necessary for the further training at general hygiene and ecology department, department of public health and public health services and also in practical work as a doctor for the substantiation, organization and carrying out of actions for environment protection and strengthening of population health taking into account influence of ecological factors, prevention of environmental pathology, caused by changes in environment under the influence of natural and technogenic factors.

Purpose of the Lesson: to be able to diagnose the environmental pathology, caused by changes in environment under the influence of natural and technogenic factors, and to develop measures for its prophylactic.

Laboratory Work.

- 1. Reveal the patients with complaints on nausea, eructation, bitterness in a mouth, stupid pains in right hypochondrium, weakness, fast fatigue, headaches, determine the degree of air cleanliness of the city on phenolic compounds in oak leaves.
- 2. Estimate the environmental pathology.
- 3. Offer optimization ways for prophylactic of liver pathology, caused by the polluted inhaled air.
- 4. Record the laboratory work report.

Situational Tasks.

1. 13 patients with complaints on weakness, fatigue, appetite loss, cough, dyspnea, pains in the field of a thorax have consulted to district physician. Patients have being lived in the center of the city with intensive vehicle movement and benzo (a) pyrene content of 19.0 mcg / m^3 for a long time. Estimate the environmental pathology and suggest improvement actions for its prevention.

2. 33 patients with complaints on weakness, fatigue, appetite loss, cough, dyspnea, pains in the field of a thorax have consulted to district physician. Patients have being lived in the center of the city with intensive

vehicle movement and benzo (a) pyrene content of 38.0 mcg / m^3 for a long time. Estimate the environmental pathology and suggest improvement actions for its prevention.

3. 41 patients with complaints on weakness, fatigue, appetite loss, cough, dyspnea, pains in the field of a thorax have consulted to district physician. Patients have being lived in the center of the city with intensive vehicle movement and benzo (a) pyrene content of 28.0 mcg / m^3 for a long time. Estimate the environmental pathology and suggest improvement actions for its prevention.

4. 28 patients with complaints on weakness, fatigue, appetite loss, cough, dyspnea, pains in the field of a thorax have consulted to district physician. Patients have being lived in the center of the city with intensive vehicle movement and benzo (a) pyrene content of 38.0 mcg / m^3 for a long time. Estimate the environmental pathology and suggest improvement actions for its prevention.

5. 16 patients with complaints on weakness, fatigue, appetite loss, cough, dyspnea, pains in the field of a thorax have consulted to district physician. Patients have being lived in the center of the city with intensive vehicle movement and benzo (a) pyrene content of 16.0 mcg / m^3 for a long time. Estimate the environmental pathology and suggest improvement actions for its prevention.

6. 19 patients with complaints on weakness, fatigue, appetite loss, cough, dyspnea, pains in the field of a thorax have consulted to district physician. Patients have being lived in the center of the city with intensive vehicle movement and benzo (a) pyrene content of 48.0 mcg / m^3 for a long time. Estimate the environmental pathology and suggest improvement actions for its prevention.

7. 20 patients with complaints on weakness, fatigue, appetite loss, cough, dyspnea, pains in the field of a thorax have consulted to district physician. Patients have being lived in the center of the city with intensive vehicle movement and benzo (a) pyrene content of 40.0 mcg / m^3 for a long time. Estimate the environmental pathology and suggest improvement actions for its prevention.

8. 40 patients with complaints on weakness, fatigue, appetite loss, cough, dyspnea, pains in the field of a thorax have consulted to district physician. Patients have being lived in the center of the city with intensive vehicle movement and benzo (a) pyrene content of 35.0 mcg / m^3 for a

long time. Estimate the environmental pathology and suggest improvement actions for its prevention.

9. 20 patients with complaints on weakness, fatigue, appetite loss, cough, dyspnea, pains in the field of a thorax have consulted to district physician. Patients have being lived in the center of the city with intensive vehicle movement and benzo (a) pyrene content of 20.0 mcg / m^3 for a long time. Estimate the environmental pathology and suggest improvement actions for its prevention.

10. 30 patients with complaints on weakness, fatigue, appetite loss, cough, dyspnea, pains in the field of a thorax have consulted to district physician. Patients have being lived in the center of the city with intensive vehicle movement and benzo (a) pyrene content of 31.0 mcg / m^3 for a long time. Estimate the environmental pathology and suggest improvement actions for its prevention.

11. 23 patients with complaints on weakness, fatigue, appetite loss, cough, dyspnea, pains in the field of a thorax have consulted to district physician. Patients have being lived in the center of the city with intensive vehicle movement and benzo (a) pyrene content of 25.0 mcg / m^3 for a long time. Estimate the environmental pathology and suggest improvement actions for its prevention.

12. 24 patients with complaints on weakness, fatigue, appetite loss, cough, dyspnea, pains in the field of a thorax have consulted to district physician. Patients have being lived in the center of the city with intensive vehicle movement and benzo (a) pyrene content of 38.0 mcg / m^3 for a long time. Estimate the environmental pathology and suggest improvement actions for its prevention.

13. 42 patients with complaints on weakness, fatigue, appetite loss, cough, dyspnea, pains in the field of a thorax have consulted to district physician. Patients have being lived in the center of the city with intensive vehicle movement and benzo (a) pyrene content of 29.0 mcg / m^3 for a long time. Estimate the environmental pathology and suggest improvement actions for its prevention.

14. 29 patients with complaints on weakness, fatigue, appetite loss, cough, dyspnea, pains in the field of a thorax have consulted to district physician. Patients have being lived in the center of the city with intensive vehicle movement and benzo (a) pyrene content of 28.0 mcg / m^3 for a long time. Estimate the environmental pathology and suggest improvement actions for its prevention.

15. 19 patients with complaints on weakness, fatigue, appetite loss, cough, dyspnea, pains in the field of a thorax have consulted to district physician. Patients have being lived in the center of the city with intensive vehicle movement and benzo (a) pyrene content of 17.0 mcg / m^3 for a long time. Estimate the environmental pathology and suggest improvement actions for its prevention.

For the lesson the student should know:

1. Methodical instructions on performance of laboratory work, characteristic of the environmental pathology**,** measures for prophylactic of the environmental pathology.
2. Algorithm of the situational task decision.
3. Explanation of Multiple choice questions.
4. Answers on the study questions:

Study Questions.

4.1. National system of environmental monitoring.
4.2. Kinds of monitoring.
4.3. Biological monitoring. Indication method.
4.4. Ecological monitoring.
4.5. Social and hygienic monitoring.
4.6. Environmental protection from pollution.

For the lesson the student should be able to:

1. Work with the reagents.

Methodical Instructions on Performance of Laboratory Work.

Determination of the environmental pathology, caused by the polluted inhaled air.

1. Determination of the environmental pathologies at the patients

The patients with complaints on

- nausea,
- eructation,

- bitterness in a mouth,
- stupid pains in right hypochondrium,
- weakness,
- fast fatigue,
- headaches

are revealed in the survey and examination.

2. Determination of phenolic compounds in oak leaves in the place of residence of the patients.

Determination of phenolic compounds in oak leaves.

Equipment: mortars with pestles, scales, glasses on 100 cm^3; water bath, evaporation cups on 800-1000 cm^3 or glasses of the same volume, burets, flasks on 50 cm^3, the cleared water, crushed vegetative material (leaves of an oak, a maple) collected in different ecological conditions.

Reagents: indicarmine solution (1 g of indicarmine dissolved in 50 cm^3 of the concentrated sulfuric acid and lead up by water to 1 dm^3), 0.1 N $KMnO_4$ solution (R).

Work performance:

a. 1-3 g of dry crushed or 4-10 g of fresh pounded in a mortar with beaten glass the vegetative material tests are heated up in glass on 100 cm^3 with 40 cm^3 of cleared water during 15 mines on boiling water bath at intensive shaking;

b. the extract is cooled, filtered and lead up to the label of 50 cm^3 in flask;

c. the part of the received extract (7.5 cm^3) is transferred to porcelain cup or glass of 250 cm^3 volume;

d. 1 cm^3 of indicarmine solution is added;

e. the mixer is titrated with 0,1 N $KMnO_4$ solution (3.16 g of $KMnO_4$ per 1 dm^3 of water) at vigorous shaking till the appearance of golden-yellow shade;

f. the result of titration is multiplied by a factor of 4.16 for transfer of milliliters of 0.1 N $KMnO_4$ in milligrammes of the phenolic compounds contained in 10 cm^3 of the extract taken for titration.

Ecological estimation.

The estimation of degree of air cleanliness of the city is made by comparing with the control (*the sum of phenolic compounds is equal 9.4 mg/g in the leaves of an oak collected from the Berezinsky biospheric reserve*).

Accumulation of phenolic compounds in oak leaves in the city depends on the concentration of pollutants such as ammonia, formaldehyde and nitrogen dioxide in atmosphere.

***Preliminary diagnosis*:** liver pathology, caused by the polluted inhaled air.

Solve a problem, estimate the obtained data and request actions for their improvement

Situational Task.

10 patients with complaints on weakness, fatigue, appetite loss, cough, dyspnea, pains in the field of a thorax have consulted to district physician. Patients have being lived in the center of the city with intensive vehicle movement and benzo (a) pyrene content of 18.0 mcg / m^3 for a long time. Estimate the environmental pathology and suggest improvement actions for its prevention.

The algorithm of task's decision:

The increased benzo (a) pyrene content is marked in the atmospheric air (the maximum permissible concentration is 10 mcg / m^3). When a long stay in the opened air above mentioned complaints are possible.

***Preliminary diagnosis**:* lungs sarcaidoses.

Pathogenesis: in the liver cells benzo (a) pyrene will be transformed in dihydroxiepoxide which activates protooncogenes, transforming them in oncogenes; the activated oncogenes produce oncoproteins, blocking regulating factors of proliferative activity.

Treatment should include detoxication, immunocorrection, symptomatic treatment, antioxidant therapy, specific and nonspecific desensitization.

Individual prevention includes formation of healthy lifestyle with a focus on rational and preventive nutrition, control of stay time in the opened air, reception of phytopreparations, adaptogens.

Multiple Choice Questions.

Choose proper answers

1. Environmental monitoring is:
    1. a system of planned long-term systematic observations over the environment, evaluation of its state, analysis and forecast of its changes due to the impact of natural and man-caused factors, and also biological responses to environment changes under the influence of natural and technogenic factors;
    2. a national state administration body in charge of exploitation of natural resources and environmental protection, pursuing the state ecology policy;
    3. expressed in deterioration of useful properties, loss of stocks of natural resources or objects and negatively reflected in economic interests of proprietors, owners and users of natural resources or objects;
    4. deterioration of natural resources and objects or environment;
    5. any direct or indirect environmental impact of the economic and other activities, which consequence lead to negative changes of environment.
2. National Environmental Monitoring System includes:
    1. land monitoring;
    2. surface water monitoring;
    3. air monitoring;
    4. ozone layer monitoring;
    5. radiation monitoring.
3. The organization of work of NEMS is carried out in accordance with the following governmental provisions:
    1. "On the establishment of the National Environmental Monitoring System in the Republic of Belarus (NEMS)";
    2. "On the program of the National Environmental Monitoring System in the Republic of Belarus";

3. "On the implementation of the National Environmental Monitoring System in the Republic of Belarus";
4. "On the local environmental monitoring in the Republic of Belarus";
5. "On the National Environmental Monitoring System in the Republic of Belarus".

4. The types of monitoring are:
1. chemical, biological, physical;
2. monitoring of atmosphere, hydrosphere, lithosphere;
3. ingredient monitoring;
4. dot stationary;
5. dot mobile.

5. The monitoring purpose – is:
1. a system of continuous supervision, assessment and forecast of environment conditions;
2. a constant supervision of sources and factors of anthropogenous influences and arising effects in environment;
3. a revealing of anthropogenous pollution and its ecological estimation;
4. a control of large ecosystems - reserves, anthropocenoses;
5. a control of health of the person.

6. The groups of actions for environmental protection are:
1. legislative;
2. technological;
3. planning;
4. organizational;
5. sanitary-engineering.

7. Bioindication methods are:
1. passive monitoring;
2. active monitoring;
3. sanitary-and-hygienic monitoring;
4. genetic monitoring;
5. biological monitor.

8. The kinds of bioindicators are:
1. plant biomonitors;
2. animal biomonitors;
3. microbial biomonitors;
4. local;

5. global.

9. The information can be deduced through the study of bioindicators signs such as:

1. their content of certain elements or compounds;
2. their morphological or cellular structure;
3. metabolic-biochemical processes;
4. behaviour;
5. population structure.

10. Ecological monitoring is:

1. the use of the properties of an organism to obtain information on certain aspects of the biosphere;
2. a definition of condition of abiotic part of biosphere and anthropogenous changes in ecosystems due to the effect of pollution, agricultural land use, urbanization, etc;
3. generated the information required to assess and respond to ecosystem changes;
4. an organism or biological response that reveals the presence of the pollutants by the occurrence of typical symptoms or measurable responses, and is therefore more qualitative;
5. the visible or physiological and biochemical damages or abnormalities are signs of stress and are studied in free-living organisms.

11. The social and hygienic monitoring is:

1. a system of collecting, analyzing and evaluating information about the state of life and health of the population depending on the quality of the environment;
2. a comprehensive educational, training and upbringing activity aimed at formation of hygienic health of individuals, social groups and society as a whole;
3. the basic, proven by practices, provisions guiding the activity in the field of environmental education;
4. the provision of individuals, groups of individuals, social community by important and timely health information;
5. population structure.

12. Environmental protection from pollution is:

1. a system of the actions directed toward the elimination of negative influence on humans in the form of emissions in air, dumps in water

and garbage in soil containing new agents or exceeding their natural level;

2. a system of collecting, analyzing and evaluating information about the state of life and health;

3. the use of the properties of an organism to obtain information on certain aspects of the biosphere;

4. a system of continuous supervision, assessment and forecast of environment conditions;

5. a control of health of the person.

13. The legislative group of actions for environmental protection includes:

1. working out of hygienic standards;

2. zoning of territory of a city;

3. clearing of atmospheric emission, hydrospheric dumping, litospheric garbage;

4. dumps at various time of day;

5. monitoring.

14. The planning group of actions for environmental protection includes:

1. working out of hygienic standards;

2. zoning of territory of a city;

3. clearing of atmospheric emission, hydrospheric dumping, litospheric garbage;

4. dumps at various time of day;

5. monitoring.

15. The organizational group of actions for environmental protection includes:

1. working out of hygienic standards;

2. zoning of territory of a city;

3. clearing of atmospheric emission, hydrospheric dumping, litospheric garbage;

4. dumps at various time of day;

5. monitoring.

Literature.

1. Lecture №1.

2. Grabarkiewicz, Jeffrey D. An Introduction to Freshwater Fishes As Biological Indicators (Report) / Jeffrey D. Grabarkiewicz, Wayne S. Davis // Environmental Protection Agency: Washington. - 2008. - P.15.

Theme 16. THE ESTIMATION OF RISK OF THE ENVIRONMENTAL FACTORS INFLUENCE ON HEALTH OF THE PERSON

The theme is necessary for the further training at general hygiene and ecology department, department of public health and public health services and also in practical work as a doctor for the substantiation, organization and carrying out of actions for environment protection and strengthening of population health taking into account influence of ecological factors, prevention of environmental pathology, caused by risk environmental factors and pollutants.

Purpose of the Lesson: to be able to diagnose the environmental pathology, caused by risk environmental factors and pollutants, and to develop measures for its prophylactic.

Laboratory Work.

- 1. Reveal the patients with complaints on the raised body temperature, short wind, slackness, fatigue, pale skin, sweating, frequent infectious diseases, a long bleeding from a nose, determine the risk of influence of the air polluted by benzol on health, calculate the cancerogenic risk.
- 2. Estimate the environmental pathology.
- 3. Offer optimization ways for prophylactic of blood oncological pathology, caused by benzol in the inhaled air with the cancerogenic risk of more than 0.00001.
- 4. Record the laboratory work report.

Situational Tasks.

1. 25 patients with complaints on a pain of aching character in the field of the right kidney, blood in urine, increase of arterial pressure, edemas of feet have consulted to district physician. Patients have being drunk the water with arsenic content of 0.5 mg / dm^3 for a long time. Estimate the environmental pathology and suggest improvement actions for its prevention.

2. 28 patients with complaints on a pain of aching character in the field of the right kidney, blood in urine, increase of arterial pressure, ede-

mas of feet have consulted to district physician. Patients have being drunk the water with arsenic content of 0.4 mg / dm^3 for a long time. Estimate the environmental pathology and suggest improvement actions for its prevention.

3. 24 patients with complaints on a pain of aching character in the field of the right kidney, blood in urine, increase of arterial pressure, edemas of feet have consulted to district physician. Patients have being drunk the water with arsenic content of 0.6 mg / dm^3 for a long time. Estimate the environmental pathology and suggest improvement actions for its prevention.

4. 30 patients with complaints on a pain of aching character in the field of the right kidney, blood in urine, increase of arterial pressure, edemas of feet have consulted to district physician. Patients have being drunk the water with arsenic content of 0.7 mg / dm^3 for a long time. Estimate the environmental pathology and suggest improvement actions for its prevention.

5. 40 patients with complaints on a pain of aching character in the field of the right kidney, blood in urine, increase of arterial pressure, edemas of feet have consulted to district physician. Patients have being drunk the water with arsenic content of 0.8 mg / dm^3 for a long time. Estimate the environmental pathology and suggest improvement actions for its prevention.

6. 33 patients with complaints on a pain of aching character in the field of the right kidney, blood in urine, increase of arterial pressure, edemas of feet have consulted to district physician. Patients have being drunk the water with arsenic content of 0.7 mg / dm^3 for a long time. Estimate the environmental pathology and suggest improvement actions for its prevention.

7. 35 patients with complaints on a pain of aching character in the field of the right kidney, blood in urine, increase of arterial pressure, edemas of feet have consulted to district physician. Patients have being drunk the water with arsenic content of 0.5 mg / dm^3 for a long time. Estimate the environmental pathology and suggest improvement actions for its prevention.

8. 36 patients with complaints on a pain of aching character in the field of the right kidney, blood in urine, increase of arterial pressure, edemas of feet have consulted to district physician. Patients have being drunk the water with arsenic content of 0.6 mg / dm^3 for a long time. Estimate the

environmental pathology and suggest improvement actions for its prevention.

9. 37 patients with complaints on a pain of aching character in the field of the right kidney, blood in urine, increase of arterial pressure, edemas of feet have consulted to district physician. Patients have being drunk the water with arsenic content of 0.9 mg / dm^3 for a long time. Estimate the environmental pathology and suggest improvement actions for its prevention.

10. 42 patients with complaints on a pain of aching character in the field of the right kidney, blood in urine, increase of arterial pressure, edemas of feet have consulted to district physician. Patients have being drunk the water with arsenic content of 0.9 mg / dm^3 for a long time. Estimate the environmental pathology and suggest improvement actions for its prevention.

11. 26 patients with complaints on a pain of aching character in the field of the right kidney, blood in urine, increase of arterial pressure, edemas of feet have consulted to district physician. Patients have being drunk the water with arsenic content of 0.6 mg / dm^3 for a long time. Estimate the environmental pathology and suggest improvement actions for its prevention.

12. 27 patients with complaints on a pain of aching character in the field of the right kidney, blood in urine, increase of arterial pressure, edemas of feet have consulted to district physician. Patients have being drunk the water with arsenic content of 0.5 mg / dm^3 for a long time. Estimate the environmental pathology and suggest improvement actions for its prevention.

13. 29 patients with complaints on a pain of aching character in the field of the right kidney, blood in urine, increase of arterial pressure, edemas of feet have consulted to district physician. Patients have being drunk the water with arsenic content of 0.7 mg / dm^3 for a long time. Estimate the environmental pathology and suggest improvement actions for its prevention.

14. 31 patients with complaints on a pain of aching character in the field of the right kidney, blood in urine, increase of arterial pressure, edemas of feet have consulted to district physician. Patients have being drunk the water with arsenic content of 0.8 mg / dm^3 for a long time. Estimate the environmental pathology and suggest improvement actions for its prevention.

15. 32 patients with complaints on a pain of aching character in the field of the right kidney, blood in urine, increase of arterial pressure, edemas of feet have consulted to district physician. Patients have being drunk the water with arsenic content of 0.9 mg / dm^3 for a long time. Estimate the environmental pathology and suggest improvement actions for its prevention.

For the lesson the student should know:
1. Methodical instructions on performance of laboratory work, characteristic of the environmental pathology**,** measures for prophylactic of the environmental pathology.
2. Algorithm of the situational task decision.
3. Explanation of Multiple choice questions.
4. Answers on the study questions:

Study Questions.

4.1. Risk for health of the environment factors and pollutants. The kinds of risk.
4.2. Methodology of estimation of risk of influence of harmful factors and pollutants for health.
4.3. Risk of acute influence of the substances of general toxic (noncancerogenic) action for health.
4.4. Risk of chronic influence of the substances of general toxic (noncancerogenic) action for health.
4.5. Risk of influence of the cancerogenic substances for health.
4.6. Individual risk.

For the lesson the student should be able to:
1. Work with the microcalculator.
2. Make the calculations under the formulas.

Methodical Instructions on Performance of Laboratory Work.

Determination of the environmental pathology, caused by the polluted inhaled air.

1. Determination of the environmental pathologies at the patients

The patients with complaints on

- the raised body temperature,
- short wind,
- slackness,
- fatigue,
- pale skin,
- sweating,
- frequent infectious diseases,
- a long bleeding from a nose

are revealed in the survey and examination.

2. Determination of benzol content in air, which the patients inhale.

Determination of benzol content in air by the express method

Equipment: gas analyzer UG-1 (picture 16.1), indicator tubes, standard scales.

Picture 16.1. Gas analyzer UG-1.

Work performance:

a. the bellow is compressed by the rod with the note of necessary substance and its volumes;

b. the indicator tube is connected to the rubber tube (the sealed ends are preliminary broken off);

c. the stopper is removed from the safety catch and the air is passed through the indicator tube;

d. the indicator tube is taken out and put to the scale, the top limit of color column shows the concentration of the investigated substance on the scale in mg/dm^3.

The MPC of benzol in air is 40 mg/dm^3.

3. Determination of risk for the substances with cancerogenic action

Calculation of risk for the substances with cancerogenic action.

For calculation of risk for the substances with cancerogenic action **Average Adsorbed Daily Dose (AADD)** or **Lifetime Average Daily Dose (LADD)** is multiplied by value of potential peroral cancerogenic risk (PPCR) or potential inhalation cancerogenic risk (PICR) and duration of exposure (in case of constant residing this size is equal to 1).

The result of such calculation – is a number of cases of oncological diseases (expressed by the nearest integer) per the specific population of people.

The risk is calculated on the basis of the conditions of daily consumption of this water throughout a person's life. For the same period the standard for the calculation of risk is defined.

Data for estimation of potential inhalation and peroral cancerogenic risks are taken from the table 16.1.

Table 16.1. Data for risk estimation (standards).

Substance	**Classification number CAS**	**Value of potential inhalation cancerogenic risk (PICR), (mkg/m^3)$^{-1}$**	**Value of potential peroral cancerogenic risk (PPCR), (mg/kg)$^{-1}$**	**Referent dose (RfD) of non-cancerogenic peroral risk, mg/kg**	**Value of potential cancerogenic risk at external irradiation, (risk/year) / (pCu/g)**
Arsenic	7440382	0.0033	1.5	0.0003	
Benzol	71432	0.000029	0.1		

The risk is calculated under the formulas:

AADD = C × V / m,

where AADD - Average Adsorbed Daily Dose;
C - concentration of the cancerogenic substance in potable water;
V - the average daily volume of inhaled air (V) - 22 m^3;
m - the average weight of the person (70 kg).

$$\mathbf{CR = AADD \times PICR \times \alpha,}$$

where CR - cancerogenic risk (number of the additional cases of cancer disease per million of the population, constantly consuming such water),
AADD - Average Adsorbed Daily Dose;
PPCR – the value of potential peroral cancerogenic risk (table 4);
α - duration of exposure (in case of the constant residing it is equal to 1).

Ecological estimation.

The risk assessment is made by comparing with comprehensible value of occurrence of the additional cases of cancer disease (it's acceptable value is usually within 0.000001 – 0.00001 or from 1 to 10 additional cases per 1 million of the population).

***Preliminary diagnosis*:** blood oncological pathology, caused by benzol in the inhaled air with the cancerogenic risk of more than 0.00001.

Solve a problem, estimate the obtained data and request actions for their improvement

Situational Task.

20 patients with complaints on a pain of aching character in the field of the right kidney, blood in urine, increase of arterial pressure, edemas of feet have consulted to district physician. Patients have being drunk the water with arsenic content of 0.3 mg / dm^3 for a long time. Estimate the environmental pathology and suggest improvement actions for its prevention.

The algorithm of task's decision:

The increased arsenic content is marked in the water (the maximum permissible concentration is 0.05 mg / dm^3). When a long drink of the water above mentioned complaints are possible.

The dose of arsenic which is absorbed with drinking water (AADD) is calculated under the formula, taking into account that the average weight of a person (m) - 70 kg, the average daily water consumption (V) - 3 dm^3, the concentration of arsenic in water (C) – 0.3 mg / dm^3:

$$\mathbf{AADD = C \times V / m = 0.3 \times 3 / 70 = 0.0129\ mg / kg}$$

Taking into account the data for risk estimation (standarts) (table 16.1) the total amount of carcinogenic risk (CR) in case of peroral way is calculated under the formula:

$$\mathbf{CR = 0.0129 \times 1.5 \times 1 = 0.0193}$$

This is equivalent to 19285 additional cancer cases per million of the population, constantly consuming such water, or the appearance of a single case of cancer from 52 of the observed individuals (1 / risk).

The residences of the city have the extremely high carcinogenic risk in comparing with comprehensible value of occurrence of the additional cases of cancer disease (from 1 to 10 additional cases per 1 million of the population).

Preliminary diagnosis*:* kidney carcinoma.

Pathogenesis: changes in DNA methylation, loss of a part of genes, occurrence of new cells inducing cancerogenic regeneration.

Treatment should include detoxication, immunocorrection, symptomatic treatment, antioxidant therapy, specific and nonspecific desensitization.

Individual prevention includes formation of healthy lifestyle with a focus on rational and preventive nutrition, stop the consumption of water with arsenic, reception of phytopreparations, adaptogens.

Multiple Choice Questions.

Choose proper answers

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- Theme 16 -

1. The types of risk factors are:
    1. absolute;
    2. relative;
    3. etiologic;
    4. attributable;
    5. ecological.
2. The stages of the methodology of risk estimation are:
    1. hazard identification;
    2. exposure assessment;
    3. determination of dose dependence of the effect;
    4. calculation of specific risk;
    5. the expected frequency of undesirable effects resulting from exposure to the pollutant.
3. The types of xenobiotics action are:
    1. system;
    2. contact;
    3. hepatotoxic, neurotoxic, fetotoxic effects, kidney damage, reproductive disorders, cancer;
    4. action through the skin;
    5. acute, sub-chronic, chronic.
4. At assessment of the exposure it is necessary to determine:
    1. the concentration of the contaminants;
    2. time, frequency, duration and route of exposure;
    3. identification of the environment that carries pollutants and others;
    4. a contact of organism with a chemical, physical or biological agent;
    5. the mass of the substance, related to the unit of time (mg / day), or the absorbed dose as a number of xenobiotic per unit of body weight (mg / kg).
5. The parameters for risk estimation are:
    1. AADD - Average Adsorbed Daily Dose;
    2. LADD - Lifetime Average Daily Dose;
    3. NOEL - No Observed Effects Level;
    4. LOEL - Lowest Observed Effects Level;
    5. RfD - reference dose.
6. The types of system xenobiotics action are:
    1. hepatotoxic;
    2. neurotoxic;
    3. fetotoxic;

4. kidney damage;
5. action through the skin.

7. The amount of exposure is:
1. the absorbed dose as a number of xenobiotic per unit of body weight (mg / kg);
2. way of exposure (inhalation, peroral, percutaneous);
3. a way of chemical substance from the source to exposure organism;
4. the assessment of exposure concentrations;
5. the mass of the substance, related to the unit of time (mg / day).

8. The models of dose - effect dependence are:
1. the threshold model for non-carcinogenic substances;
2. the no-threshold model for carcinogenic substances;
3. the average adsorbed daily dose, calculated from the concentration of xenobiotic in air, drinking water, foodstuffs;
4. the probability that the certain chemical compound provokes the cancerous growth;
5. duration of exposure.

9. Life expectancy is divided into the following periods:
1. infancy (1 year);
2. children (1-6 years);
3. children (7-12 years);
4. adolescence (13-18 years);
5. adults (19-70 years).

10. The absolute risk is:
1. the probability of occurrence of disease in humans for a predetermined period of time;
2. the percentage of all cases of the disease caused by this factor of risk;
3. the value of the absolute increase of prevalence of the disease under the influence of risk factors;
4. the indicator that assesses the proportion of morbidity associated with this risk factor;
5. the ratio of the values of absolute risk in the presence and absence of exposure to environmental factors.

11. The carcinogenic risk throughout life – is a function of three main factors:
1. body weight;
2. the average adsorbed daily dose;

3. the probability that the certain chemical compound provokes the cancerous growth;
4. duration of exposure;
5. reference dose.

12. The stages of calculation of individual risk are:
1. determination of the internal dose;
2. assessment of adverse effects (diagnosis);
3. bioindication;
4. calculation;
5. aerogenic load.

13. The parameters for calculation of risk for substances with cancerogenic action are:
1. Average Adsorbed Daily Dose (AADD);
2. Lifetime Average Daily Dose (LADD);
3. potential peroral cancerogenic risk (PPCR);
4. potential inhalation cancerogenic risk (PICR);
5. duration of exposure.

14. The etiological risk is:
1. the probability of occurrence of disease in humans for a predetermined period of time;
2. the percentage of all cases of the disease caused by this factor of risk;
3. the value of the absolute increase of prevalence of the disease under the influence of risk factors;
4. the indicator that assesses the proportion of morbidity associated with this risk factor;
5. the ratio of the values of absolute risk in the presence and absence of exposure to environmental factors.

15. The aerogenic load is calculated under the following factors:
1. the concentration of the substances;
2. the volume of inhaled air;
3. the spent time in different zones;
4. the resulting internal dose for the year;
5. the total individual airborne load.

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Theme 17. CONCLUDING SESSION

The theme is necessary for the further training at general hygiene and ecology department, department of public health and public health services and also in practical work as a doctor for the treatment and prevention of environmental pathology, caused by the physical, chemical and biological pollutants of atmospheric air, water and soil, polluted foodstuffs and indoor habitat.

Purpose of the Lesson: to be able to diagnose the environmental pathology, caused by the physical, chemical and biological pollutants of atmospheric air, water and soil, polluted foodstuffs and indoor habitat.

Laboratory Work.

- 1. Reveal the patients with the certain complaints, determine the following environmental, foodstuffs and indoor habitat pollutants:
- the nitrogen oxides content in air;
- the lead content in water, consumed by the patients;
- the content of helminthes eggs in soil;
- the soda content in milk;
- the carbon dioxide content in air;
- the residence conditions of students;
- the degree of air cleanliness of the city on phenolic compounds in oak leaves;
- the risk of influence of the air polluted by benzol on health, calculate the cancerogenic risk.

- 2. Estimate the received results.
- 3. Offer optimization ways for prophylactic of the environmental pathologies, related to the environmental, foodstuffs and indoor habitat pollutants.
- 4. Record the laboratory work report.

Situational Tasks.

1. 20 patients with complaints on troublesome cough, shortness of breath, general weakness have consulted to district physician. The content of sulfur dioxide in the air corresponds to a value of 0.9 mg / m^3. Estimate

the environmental pathology and suggest improvement actions for its prevention.

2. 20 patients with complaints on muscle weakness, severe pain in the lumbosacral area, thighs, legs, ribs, amplifying at physical exertion, changes in gait have consulted to district physician. The content of cadmium in the water corresponds to a value of 0.01 mg / dm^3. Estimate the environmental pathology and suggest improvement actions for its prevention.

3. 20 patients with complaints on general muscle weakness, itching, tingling, burning, sensitivity reduction have consulted to district physician. Patients have used food grown on the soil containing chlorpyrifos in amount of 1.6 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

4. 20 patients with complaints on weakness, fatigue, dizziness, intense headache, irritability have consulted to district physician. Patients have consumed the meat with lead content of 10.0 mg / kg. Estimate the environmental pathology and suggest improvement actions for its prevention.

5. 20 patients with complaints on cough with difficultly separated sputum, dyspnea at the physical activity, accruing weariness have consulted to district physician. Patients were staying for a long time in premises with the high content of a tobacco smoke. Estimate the environmental pathology and suggest improvement actions for its prevention.

6. 10 patients with complaints on weakness, fatigue, appetite loss, cough, dyspnea, pains in the field of a thorax have consulted to district physician. Patients have being lived in the center of the city with intensive vehicle movement and benzo (a) pyrene content of 18.0 mcg / m^3 for a long time. Estimate the environmental pathology and suggest improvement actions for its prevention.

7. 20 patients with complaints on a pain of aching character in the field of the right kidney, blood in urine, increase of arterial pressure, edemas of feet have consulted to district physician. Patients have being drunk the water with arsenic content of 0.3 mg / dm^3 for a long time. Estimate the environmental pathology and suggest improvement actions for its prevention.

- Theme 17 -

For the lesson the student should know:

1. Methodical instructions on performance of laboratory work, characteristic of the environmental pathology, measures for prophylactic of the environmental pathology.
2. Algorithm of the situational task decision.
3. Explanation of Multiple choice questions.
4. Answers on the study questions:

Study Questions.

4.1. Pollution of environment. The basic sources of pollution and pollutants of environment. Self-cleaning.
4.2. Medical consequences of environmental pollution.
4.3. The basic sources of pollution and pollutants of atmospheric air.
4.4. Medical value of chemical pollutants of atmospheric air.
4.5. Medical value of physical pollutants of atmospheric air.
4.6. Medical value of biological pollutants of atmospheric air.
4.7. Pollution of water and its medical value.
4.8. The basic sources of pollution and pollutants of water.
4.9. Medical value of chemical pollutants of atmospheric air.
4.10. Medical value of physical pollutants of atmospheric air.
4.11. Medical value of biological pollutants of atmospheric air.
4.12. Methods of studying and estimation of hydrosphere pollutants.
4.13. Pollution of soil and its medical value.
4.14. The basic sources of soil pollution.
4.15. The basic pollutants of soil.
4.16. Medical value of chemical pollutants of soil.
4.17. Medical value of physical pollutants of soil.
4.18. Medical value of biological pollutants of soil.
4.19. Food stuffs, their composition and value.
4.20. Sources and pollutants of food stuffs. Detoxification of xenobiotics
4.21. Medical value of xenobiotics of natural origin, which enter in foodstuffs from initial raw food material, which enter in foodstuffs from raw materials and products of chemical and microbiological synthesis.
4.22. Medical value of xenobiotics which enter in foodstuffs as a result of processing and cooking of food.
4.23. Medical value of xenobiotics which enter in foodstuffs from utensils, inventories, containers, packaging materials.

4.24. Diagnostic, treatment and prevention of environmental pathology, caused by pollutants of food stuffs.
4.25. Characteristic of indoor habitat. Indoor and outdoor habitat pollution.
4.26. Medical value of chemical pollutants of indoor habitat.
4.27. Medical value of physical pollutants of indoor habitat.
4.28. Medical value of biological pollutants of indoor habitat.
4.29. Sick building syndrome.
4.30. Diagnostic, treatment and prevention of environmental pathology, caused by pollutants of indoor habitat.
4.31. Characteristic of placement of dwelling.
4.32. Characteristic of atmospheric air, water and soil of residence.
4.33. Characteristic of pollution sources and pollutants of outdoor environment of dwelling.
4.34. Characteristic of dwelling and its indoor environment.
4.35. Characteristic of pollution sources and pollutants of indoor environment of dwelling.
4.36. Medical value of residence conditions.
4.37. National system of environmental monitoring.
4.38. Kinds of monitoring.
4.39. Biological monitoring. Indication method.
4.40. Ecological monitoring.
4.45. Social and hygienic monitoring.
4.46. Environmental protection from pollution.
4.47. Risk for health of the environment factors and pollutants. The kinds of risk.
4.48. Methodology of estimation of risk of influence of harmful factors and pollutants for health.
4.49. Risk of acute influence of the substances of general toxic (noncancerogenic) action for health.
4.50. Risk of chronic influence of the substances of general toxic (noncancerogenic) action for health.
4.51. Risk of influence of the cancerogenic substances for health.
4.52. Individual risk.

For the lesson the student should be able to:
1. Work with the microscope.
2. Work with the photo and electro colorimeter.
3. Work with the reagents.

4. Work with the table.
5. Inspect the residence conditions.
6. Work with the microcalculator.
7. Make the calculations under the formulas.

Multiple Choice Questions.

Choose proper answers

1. Pollution of human environment is:
    1. the introduction of new, non characteristic components (physical, biological, chemical agents or energy kinds) into the environment or excess of their natural level in the quantities having a negative influence on human, animals or plants as direct and indirect ways;
    2. introduction of new, non characteristic components for environment;
    3. excess of natural level of new for environment components in the quantities having a negative influence on humans, animals or plants as direct and indirect ways;
    4. entering of chemical materials which are quantitatively or qualitatively alien to natural biogeocenoses;
    5. the most typical manifestation of long influence of factors of small intensity on the population of cities and is characterized by a wide spectrum of biological answers.
2. Types of atmosphere pollution influence on human health are:
    1. sharp action;
    2. chronic action;
    3. remote effects;
    4. chronic specific action;
    5. chronic nonspecific action.
3. Kinds of pollutants on nature are:
    1. chemical;
    2. physical;
    3. biological;
    4. primary;
    5. secondary.
4. Hematotoxicity manifests itself in the form of:
    1. methemoglobinemia;
    2. carboxyhemoglobinemia;

3. carbhemoglobinemia;
4. anemia;
5. syndrome of reactive dysfunction of respiratory tract.

5. Neurotoxicity – is a:
1. water pollution with fresh physiological excrements of humans and animals and possible infection of water with microbes;
2. property of chemical pollutants cause distortion of the structure and function of the nervous system;
3. property of chemical substances to cause changes in the structure and functions of the kidneys;
4. accumulation of xenobiotic passing through the glomerular filtration barrier in tubular epithelial cells;
5. syndrome of acute renal failure.

6. Consumption of water with high concentration of mercury can cause:
1. methemoglobinemia;
2. Minamata disease;
3. itai-itai disease;
4. aplastic anemia;
5. risk of low IQ in the child.

7. Consumption of water with high concentration of lead can cause:
1. hypochromic anemia;
2. biochemical oxygen demand;
3. tubulointerstitial nephritis syndrome;
4. itai-itai disease;
5. diarrhea and shock.

8. Consumption of water with high concentration of cadmium for a long time can cause:
1. cadmium nephropathy;
2. renal hypertension;
3. cadmium osteomalacias;
4. iron deficiency;
5. neurotoxic syndrome.

9. Diseases due to ground pollution are:
1. bacterial (a belly typhus, a dysentery, legionellosis);
2. virus (poliomyelitis, infectious hepatitis);
3. parasitological (ascariasis, dochmiasis);
4. fungal (dermatophytes, coccidioidomycosis, blastomycosis, sporotrichosis, aspergillosis);

5. protozoa (teniasis, amoebiasis, balantidifsis).

10. The following disorders are marked in artificial geochemical provinces:
    1. congenital malformations;
    2. developmental abnormalities;
    3. impaired physical and mental development of children;
    4. acute and chronic poisonings, allergic diseases;
    5.endemic diseases.
11. Classification of xenobiotics is:
    1. xenobiotics of natural origin;
    2. xenobiotics which enter in foodstuffs as a result of reception of initial raw food material;
    3. xenobiotics which enter in foodstuffs from raw materials and food products, received by chemical and microbiological synthesis;
    4. xenobiotics which enter in foodstuffs as a result of processing and cooking of food;
    5. xenobiotics which enter in foodstuffs at contact to polymeric and other materials.
12. Indoor habitat is characterized by:
    1. living area;
    2. ceiling height;
    3. air cube;
    4. microclimate;
    5. insolation.
13. The specific reactions of «sick buildings syndrome»:
    1. cold, lacrimation, the asthmatic phenomena at not asthmatics, rattles in lungs;
    2. undue fatigability, memory impairment, impossibility to concentrate, block, drowsiness, headache, dizziness, nausea;
    3. reddening of integuments, dryness of skin, itch, feeling of burning, pain;
    4. reddening and irritation of eyes, dryness in nose or throat, pain in throat, hoarseness of voice and change of its timbre;
    5. asthenic reactions.
14. The types of monitoring are:
    1. chemical, biological, physical;
    2. monitoring of atmosphere, hydrosphere, lithosphere;
    3. ingredient monitoring;
    4. dot stationary;

5. dot mobile.

15. The groups of actions for environmental protection are:
    1. legislative;
    2. technological;
    3. planning;
    4. organizational;
    5. sanitary-engineering.

16. The social and hygienic monitoring is:
    1. a system of collecting, analyzing and evaluating information about the state of life and health of the population depending on the quality of the environment;
    2. a comprehensive educational, training and upbringing activity aimed at formation of hygienic health of individuals, social groups and society as a whole;
    3. the basic, proven by practices, provisions guiding the activity in the field of environmental education;
    4. the provision of individuals, groups of individuals, social community by important and timely health information;
    5. population structure.

17. The types of risk factors are:
    1. absolute;
    2. relative;
    3. etiologic;
    4. attributable;
    5. ecological.

18. The stages of the methodology of risk estimation are:
    1. hazard identification;
    2. exposure assessment;
    3. determination of dose dependence of the effect;
    4. calculation of specific risk;
    5. the expected frequency of undesirable effects resulting from exposure to the pollutant.

19. The types of xenobiotics action are:
    1. system;
    2. contact;
    3. hepatotoxic, neurotoxic, fetotoxic effects, kidney damage, reproductive disorders, cancer;
    4. action through the skin;

5. acute, sub-chronic, chronic.

20. The absolute risk is:

1. the probability of occurrence of disease in humans for a predetermined period of time;
2. the percentage of all cases of the disease caused by this factor of risk;
3. the value of the absolute increase of prevalence of the disease under the influence of risk factors;
4. the indicator that assesses the proportion of morbidity associated with this risk factor;
5. the ratio of the values of absolute risk in the presence and absence of exposure to environmental factors.

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