

MINISTRY OF HEALTH OF UKRAINE
ODESA NATIONAL MEDICAL UNIVERSITY
Department of occupational pathology and
functional diagnostics and phthisiopulmonology

OCCUPATIONAL DISEASES

Methodical guide for independent work
for 6th year applicants of international faculty



Odesa
ONMedU
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UDC 616-057(076)

O-18

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*Recommended to print
by academic decision of the Odesa National
Medical University MH of Ukraine
(Protocol No. 6 dated 15.03.2024)*

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2025

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Topic 1. General Issues of Occupational Pathology. **Medical Examinations**

Goal: to broaden and specify knowledge about the main tasks of occupational pathology; stages of confirmation of the occupational nature of the disease and treatment of patients with occupational diseases; the algorithm for investigation of an accident at work; participation of doctors in medical examinations.

Basic concepts: occupational pathology; harmful factor; accident at work; preliminary, periodic and extraordinary medical examinations; invalid, disability.

Plan

1. Theoretical questions (main theses).
2. Practical works (tasks) to be performed.
3. Test tasks for self-control.
4. Individual tasks for applicants of higher education on the topic.
5. List of recommended literature (main, additional, electronic information resources).

1. Theoretical questions (main theses):

Occupational pathology is a clinical discipline that studies the development, clinical course of diseases provoked by acute or chronic effects of harmful factors on the body of workers under occupational conditions.

The subject studied by occupational pathology is the etiology, pathogenesis, clinic, diagnosis, treatment and prevention of occupational diseases in workers, their impact on professional suitability and general working capacity, labor and medical rehabilitation of patients with occupational diseases.

Occupational diseases have several specific characteristics:

- developing at the workplace;
- developing in working people;
- related to harmful occupational conditions;
- have a specific clinical picture that distinguishes them from the general clinical pathology;
- affect a person's professional suitability.

In order to classify the disease as occupational, it is necessary to prove its presence of all the indicated signs.

Currently, the legal document in force is the Cabinet resolution of Ministers of Ukraine No. 1662 “On approval of the List of occupational diseases”, which regulates what is at the legislative level occupational pathology.

The current legal document is Resolution of the Cabinet of Ministers No. 1662 “On approval of the list of occupational diseases” dated November 8, 2000.

According to this order, 7 groups of occupational pathology are distinguished in Ukraine:

- Occupational diseases caused by the action of chemical factors
- Occupational diseases are caused by the effect of industrial aerosols
- Occupational diseases caused by physical factors
- Occupational diseases caused by biological factors
- Occupational diseases caused by overstrain of organs and systems
- Occupational allergic diseases
- Professional neoplasms

Each of these groups is divided into separate nosoforms with indication of provoking factors and a list of works which could cause this pathology.

The procedure for establishing the occupational nature of the disease is determined by Resolution of the Cabinet of Ministers of Ukraine No. 1232, and goes through 3 stages:

1-st stage — a medical and preventive institution, make a diagnosis of the disease and, in case of suspicion of occupational origin of this disease, sends the patient with a package of necessary documents to the regional occupational pathologist;

2-nd stage — consultation of the regional occupational pathologist, who during the consultation reviews the presented documents, if they meet the requirements, adds his conclusion to them and refers the patient to a specialized treatment and prevention institution, to confirm a relevant connection;

3-rd stage — consideration of the case by the commission of the specialized hospital, with confirmation of the connection between the professional activity and the existing disease.

List of required documents:

- a copy of the workbook — to determine the length of service in the conditions of the effect of occupational factors;
- an extract from the outpatient card or from the medical history, which reflects the onset and dynamics of the development of the disease;
- sanitary-hygienic characteristics of working conditions, compiled by specialists of the state sanitary-epidemiological service that serves the enterprise.

The procedure for investigating and recording accidents, occupational diseases and accidents at work is determined by Resolution No. 337 of the Cabinet of Ministers of Ukraine of April 17, 2019

The list of groups of citizens subjected to mandatory medical examinations is established by Article 17 of the Law of Ukraine “On Labor Protection”, they include:

- workers engaged in heavy work;
- employees engaged in work related to difficult or harmful working conditions:
- employees employed in jobs where there is a need for professional selection;
- working persons under the age of 21.

Conducting medical examinations is regulated by the order of the Ministry of Health of Ukraine No. 246 “Procedure for conducting medical examinations of employees of certain categories” dated May 21, 2007.

The main tasks of medical and occupational examination of patients with occupational diseases are:

1. Restoring the health and working capacity of victims at work from accidents or occupational diseases;
2. Compensation for damage related to the loss of wages by insured persons or the corresponding part thereof during the performance of labor duties, providing them with social services in connection with health damage, as well as in the event of their death, making insurance payments to disabled persons to their family members.

Prevention of occupational diseases is carried out in the following areas:

1. Exclusion of a harmful factor from the occupational process, design and engineering solutions aimed at reducing the effect of the factor.
2. Mechanization and automation of work.
3. Centralization of management.

Note. Depending on the complexity and specificity of the educational topic, the availability of modern educational and scientific literature, this section can be presented with different levels of detail (the right to choose the form of displaying the content remains with the department):

Questions for self-control

1. Define occupational diseases
2. Specify the main differences of occupational diseases
3. Name the main documents regulating detection, accounting and prevention of occupational diseases
4. List the stages of development of the science of occupational diseases

Approximate tasks for theoretical material training

Main tasks	Instructions	Answers
1. List 5 signs of occupational diseases		
2. Outline the stages of development of occupational pathology as a science		
3. Identify 5 differences between occupational diseases and general clinical diseases		
4. Explain the reasons for the discrepancy in the levels of medical care in general practice and the clinic for occupational diseases		
5. List groups of occupational diseases in accordance with current legislation		
6. Determine the content of each sign of an occupational disease		

2. Practical works (tasks) to be performed

1. Build an accident investigation algorithm at work;
2. Build an algorithm for establishing the occupational nature of the disease.

3. Test tasks for self-control

1. The main method of detecting new occupational diseases is:

- a) Epidemiological study of the prevalence of pathological conditions among workers
- b) Experimental study of the influence of occupational factors on workers
- c) In-depth clinical examination of employees
- d) Laboratory-instrumental research of health indicators of workers

2. Financing of professional pathological assistance to the population is carried out:

- a) The state
- b) Local authorities
- c) Relevant ministries and departments
- d) Enterprises

3. The main purpose of the work of the professional pathology service is:

- a) Prevention of the development of occupational diseases
- b) Treatment of patients with occupational pathology
- c) Establishing a connection between the disease and occupational conditions
- d) Rehabilitation of disabled people due to occupational diseases

Note. It is suggested to use test tasks (for those seeking higher education who have to take part in the licensing test exams this year, it is more appropriate to use tests of the “KROK” type) and tests compiled by the departments for rector’s control.

4. Individual tasks for applicants of higher education on the topic:

1. According to the results of periodic medical examinations, it was found that among the employees of the enterprise for the manufacture of plastic products, located in Bukovyna, there is a significant prevalence of thyroid diseases. How should we prove or disprove the occupational nature of the disease?

2. The obstetrician-gynecologist of the women’s consultation turned to the dermatologist with complaints about a painless ulcer on the skin of the right hand, which is gradually progressing. It is known from the anamnesis that he takes part in medical examinations of women and has repeat-

edly identified sexually transmitted diseases. When the blood was tested RW +++.

Establish a diagnosis and indicate the possibility of an occupational nature of the disease.

5. List of recommended literature (main, additional, electronic information resources)

Main

1. Occupational diseases / V. A. Kapustnik, I. F. Kostyuk, H. O. Bondarenko et al. ; edited by V. A. Kapustnik, I. F. Kostyuk. Kyiv : AUS Medicine Publishing, 2018. 496 p.

2. Occupational pathology. Manual for independent work of students. Odesa, 2017. 98 p.

Electronic information resources

1. Chronic obstructive pulmonary disease (CORD). World Health Organization (WHO), 2024. URL: <http://www.who.int/detail>

2. Silica, Crystalline, Protecting Workers From Silica Hazards in the Workplace: Occupational Safety and Health administration us Department of labor. URL: <http://osha.gov/silica-crystalline/health-effects>

Topic 2. Pneumoconiosis, Chronic Bronchitis and Chronic Obstructive Lung Disease of Dust Etiology

Goal: to broaden and specify knowledge about pneumoconiosis, the course of these diseases, clinic and diagnosis, treatment and prevention, as well as carrying out an examination of work capacity for this pathology.

Basic concepts: pneumoconiosis; silicosis; silicates; asbestosis; talcose; anthracosis; metalloconiosis; carboconiosis; byssinosis; interstitial fibrosis; nodular and nodular pneumoconiosis; dust bronchitis; occupational bronchial asthma; chronic obstructive pulmonary disease (COPD).

Plan

1. Theoretical questions (main theses).
2. Practical works (tasks) to be performed.
3. Test tasks for self-control.
4. Individual tasks for applicants of higher education on the topic.
5. List of recommended literature (main, additional, electronic information resources).

1. Theoretical questions (main theses)

Pneumoconioses are occupational lung diseases caused by long-term inhalation of dust (industrial aerosol) and characterized by the development of diffuse interstitial fibrosis.

There are many characteristics of dust that determine the specific effects of industrial aerosol on the worker's body.

1. Chemical composition of dust.
2. Dust dispersion.
3. Fibrosing action.

In professional pathology, the maximum permissible concentration (MPC) is the concentration of a substance that, when in contact with it for 8 hours a day, or 40 hours a week, or 5 days a week, does not lead to known immediate or distant pathological changes in the organism.

Silicosis is a pneumoconiosis caused by exposure to dust containing free silicon dioxide.

Silicatoses — pneumoconiosis (kaolinosis, asbestosis, talcosis, olivinoses, cement, mica pneumoconiosis, etc.), which arise as a result of the action of mineral dust that keeps silicon dioxide in a bound state with various elements: aluminum, magnesium, iron, calcium and others

Asbestosis — silicosis that occurs as a result of inhalation of asbestos dust.

Talcosis is silicosis resulting from the action of talc dust.

Anthracosis — occurs and develops during a long period of work in mines (15–20 years or more) and inhalation of air with a high concentration of coal dust.

Metalloconiosis — pneumoconiosis caused by the action of metal dust: iron, aluminum, tin, manganese, etc. (siderosis, aluminosis, stannosis, manganosis, etc.).

Carboconiosis — pneumoconiosis that arise as a result of hydrocarbon dust: coal, coke, graphite, soot (anthracosis, graphitosis, soot pneumoconiosis, etc.).

Pneumoconiosis from the effect of organic dust: bisinosis (from cotton dust and flax), bagasosis (from sugarcane dust), etc.

Interstitial fibrosis on an X-ray is characterized by a change in the pulmonary pattern in the form of its strengthening and deformation due to the development of perivascular and peribronchial fibrosis, as well as fibrosis of the interalveolar and interlobular septa.

Nodular fibrosis on an X-ray is revealed by shallow rounded darkening, which are caused by coniotic nodules. According to the size, nodules are divided into three groups: up to 1.5 mm (p), from 1.5 to 3 mm (q), from 3 to 10 mm (g).

Nodular eclipses are rounded, with clear contours, their intensity depends on the dust that caused pneumoconiosis. The nodular process is usually bilateral. Three categories are distinguished by the number of nodules: small (1), moderate (2), multiple (3).

Nodular pneumoconiosis is characterized on radiographs by the presence of large rounded or irregularly shaped darkening with clear or indistinct contours against the background of nodular or interstitial darkening.

Main X-ray signs of pneumoconiosis

Types of fibrosis	Code of type	Character of shadows, size, contours	Degree of expression and area of distribution
Primary pneumofibrosis	0	Some strengthening of pulmonary picture	Not sharply expressed
Interstitial	s t u	Little shadows wrong form: — liner till 1.5 mm — reticular shadows, 1.5–3.0 mm — liner and macular shadows, 3.0–10.0 mm	1. Not sharply expressed 2. Moderately expressed 3. Sharply expressed numerous shadows
Nodular	p q r	Small spheroid darkening (nodulars) on the background of interstitial fibrosis — size until 1.5 mm — size from 1.5 till 3.0mm — size from 3 till 10 mm	1. Small amount 2. Moderate amount 3. Numerous
Nodar	A B C	Big spheroid shadows (nodes) on the background of interstitial and nodular fibrosis: — size from 10 mm to 50 mm — size from 50 mm to 100 mm — size over 100 mm	1. Distribution area < 50 mm 2. Distribution of the area less than 1/3 of the lung field 3. Distribution of the area of more than 1/3 of the lung field

Dust bronchitis is one of the occupational diseases caused by long-term exposure to industrial dust. It is characterized by diffuse inflammation of the bronchi and is primarily chronic diffuse endobronchitis.

Occupational bronchial asthma is a disease the main manifestation of which is a wheezing attack caused by bronchospasm, hypersecretion of the bronchial glands, swelling of the mucous membrane of the bronchi, and which is etiologically associated with the effect on the bronchial apparatus of substances at the patient's workplace.

Chronic obstructive pulmonary disease (COPD) is a group of diseases characterized by persistent respiratory symptoms and restriction of airway patency due to pathological changes in them and damage to alveoli.

Note. Depending on the complexity and specificity of the educational topic, the availability of modern educational and scientific literature, this section can be presented with different levels of detail (the right to choose the form of displaying the content remains with the department):

Questions for self-control

1. Epidemiology of silicosis.
2. Basic theories of the development of silicosis.
3. List the main complications of silicosis.

Approximate tasks for theoretical material training

Main tasks	Instructions	Answers
1. To determine the MPC of dust containing free silicon oxide and the works at which this MPC may be exceeded		
2. To determine the morphological changes in pneumoconiosis and to specify the pathogenetic mechanisms of their development		
3. To characterize the clinical manifestations of pneumofibrosis in patients with silicosis		
4. Divide the development of silicosis into stages depending on the clinical picture and the data of radiological and functional studies		
5. Establish a connection between silicosis and harmful working conditions		
6. List possible expert decisions regarding the professional suitability and work capacity of a patient with silicosis, determine the patient’s condition and working conditions, under which each of the decisions will be made.		

2. Practical works (tasks) to be performed

1. To analyze the changes in indicators of laboratory, functional and radiation methods of diagnosis in silicosis using real or conditional case histories of patients with silicosis;
2. Develop a silicosis treatment program.
3. Determine the methods of prevention of silicosis in workers at individual factories.

3. Test tasks for self-control

1. What pathology can be observed in fiberglass production workers?
 - a) Bronchial asthma
 - b) Microtraumatization of the skin
 - c) Conjunctivitis
 - d) Hepatitis
 - e) + All the above listed

2. What work recommendations should be given to a patient with pneumoconiosis of the first stage from exposure to plastic dust without impaired respiratory functions?
 - a) + Able to work in his profession subject to compliance with sanitary and hygienic standards of work
 - b) Able to work in his profession with some limitations
 - c) Needs a temporary transfer to another job
 - d) Needs rational employment, retraining
 - e) Incapacitated

3. Which dust is the most dangerous for coniosis?
 - a) Lead
 - b) + Coal
 - c) Wooden
 - d) Sugar
 - e) Tobacco

4. What kind of dust causes the development of alveolitis?
 - a) + Compound feed
 - b) Asbestos
 - c) Copper
 - d) Graphite

5. What means of X-ray examination is the main one in the diagnosis of pneumoconiosis?

- a) Radioscopy
- b) + Radiography
- c) Tomography
- d) Bronchography
- e) Scintigraphy

6. Which X-ray symptom is most characteristic of the interstitial form of pneumoconiosis?

- a) Rounded shadows
- b) Large spotted shadows
- c) Branchy shadows
- d) + Charming shadows
- e) Ring-shaped shadows

7. Which X-ray symptom is most characteristic of dust bronchitis?

- a) + Excessive pulmonary pattern in basal zones
- b) Eclipse area
- c) Spotted shadows
- d) Focal eclipses

8. What type of respiratory failure is most characteristic of stage 1 pneumoconiosis?

- a) Obstructive
- b) + Restrictive
- c) Diffusive
- d) Restrictive-obstructive
- e) All the above listed

9. What type of respiratory failure is most characteristic of pneumoconiosis complicated by bronchitis?

- a) Obstructive
- b) Restrictive
- c) Diffusive
- d) + Restrictive-obstructive
- e) Absence of impaired respiratory function

10. What type of respiratory failure is most characteristic of berylliosis?

- a) Obstructive
- b) Restrictive
- c) + Diffusive
- d) Restrictive-obstructive
- e) Absence of impaired respiratory function

11. What complaints are characteristic of stage 1 silicosis?

- a) Shortness of breath during physical exertion
- b) Non-intense and changeable cough
- c) Moderate chest pains
- d) Fatigue at the end of the work shift
- e) + All the above listed

12. What symptoms are characteristic of stage 2 silicosis?

- a) Shortness of breath during moderate physical exertion
- b) Moderate chest pains
- c) Pulmonary sound with a box tone
- d) Speckled shadows 1.5–3 mm in diameter on the X-ray of the lungs
- e) + All the above listed

13. What symptoms are characteristic of stage 3 silicosis?

- a) Shortness of breath with light physical exertion
- b) Acrocyanosis, pallor of the skin
- c) The difference between percussion sound and breathing noises
- d) Shading on the X-ray of the lungs
- e) + All the above listed

14. What work recommendations should be given to a patient with stage 1 anthracosilicosis, chronic bronchitis with bronchiectasis, stage 2–3 pulmonary emphysema, stage 3 respiratory failure, stage 2B–3 pulmonary heart disease?

- a) Able to work in his profession with some limitations
- b) Temporarily (up to 2 months) transfer to another job
- c) Working capacity is limited, requires rational employment and re-training
- d) + Unable to work

15. What expert decision should be taken in the case of a newly established diagnosis of pneumoconiosis of an electric welder without impaired respiratory function?

a) + Able to work in his profession, but outside of closed containers and in compliance with sanitary and hygienic standards of work

b). Issue a professional bulletin for 2 months for the period of requalification

c) Issue a sick leave

d) Send to medical commission

Note. It is suggested to use test tasks (for those seeking higher education who have to take part in the licensing test exams this year, it is more appropriate to use tests of the “KROK” type) and tests compiled by the departments for rector’s control.

4. Individual tasks for applicants of higher education on the topic:

1. A 45-year-old man has been working in a coal mine for 20 years. He went to the polyclinic with complaints of a cough with dark-colored mucous sputum, chest pain, and shortness of breath. From the anamnesis of the disease, it is known that he has been sick for 5 years. During the last month, sputum of dark color appeared, shortness of breath. Objectively: the chest is expanded. Wet wheezes are heard in the lungs against the background of weakened breathing. The lower edge of the lungs is assumed. The mobility of the lower edge of the lungs is limited. Percussion box sound. What form and degree of pneumofibrosis will we find during X-ray examination?

2. What treatment should be carried out and what work recommendations should be given to a coal mine worker with 15 years of work experience in conditions of high dustiness, who is suffering from stage 1 anthracosilicosis, chronic bronchitis with bronchiectasis, emphysema of the lungs of the 2nd–3rd degree, respiratory failure of the 3rd degree, pulmonary heart 2B-3 stage?

5. List of recommended literature (main, additional, electronic information resources)

Main

1. Occupational diseases / V. A. Kapustnik, I. F. Kostyuk, H. O. Bondarenko et al. ; edited by V. A. Kapustnik, I. F. Kostyuk. Kyiv : AUS Medicine Publishing, 2018. 496 p.
2. Occupational pathology. Manual for independent work of students. Odesa, 2017. 98 p.

Electronic information resources

1. Chronic obstructive pulmonary disease (CORD). World Health Organization (WHO), 2024. URL: <http://www.who.int/detail>
2. Silica, Crystalline, Protecting Workers From Silica Hazards in the Workplace: Occupational Safety and Health administration us Department of labor. URL: <http://osha.gov/silica-crystalline/health-effects>

Topic 3. Occupational Neurotoxicosis. **Mercury, Lead, Manganese Intoxication**

Goal: to expand and specify knowledge about the main occupational neurotoxicosis; to expand knowledge about the manifestations, diagnosis, treatment and prevention of mercury, lead, and manganese intoxications, as well as the algorithm for investigating an accident at work in case of poisoning.

Basic concepts: neurotoxicosis; toxicity, acute and chronic poisoning; saturnism, antidote therapy, manganese parkinsonism.

Plan

1. Theoretical questions (main theses).
2. Practical works (tasks) to be performed.
3. Test tasks for self-control.
4. Individual tasks for applicants of higher education on the topic.
5. List of recommended literature (main, additional, electronic information resources).

1. Theoretical questions (main theses)

Allocate classes of substances according to toxicity.

Class I — extremely toxic substances. Such are derivatives of hydrocyanic acid, compounds of lead, mercury, manganese, arsenic, etc. The maximum permissible concentration (MPC) of such substances, that is, the value at which these substances do not have a negative effect on the body for an indefinite period of time, for class 1 is less than 0.1 mg/m³ in the air of the working area.

Class II — highly toxic substances. They are found in many industrial and agricultural productions (methyl alcohol, carbon tetrachloride, etc.). For them, the MPC is from 0.1 to 1.0 mg/m³.

Class III — moderately toxic substances, mainly aromatic hydrocarbons (benzene).

Class IV — low-toxic substances (urea derivatives, etc.).

In the clinic of occupational diseases, there are 3 ways of poison entering the worker's body — through the lungs, through the gastrointestinal

tract and through the skin. Depending on the routes of entry, toxicity can vary significantly.

Lead intoxication is acute or chronic (saturnism) poisoning of workers with lead compounds with damage to the blood, nervous system, liver, etc.

There are four stages in the development of lead poisoning.

I. Carrying lead. The presence of elevated concentrations of lead in blood (over 0.09–0.32 $\mu\text{mol/l}$) or urine (over 0.13–0.9 $\mu\text{mol/l}$), feces (over 0.66 $\mu\text{mol/l}$), and a lead border is manifested.

II. Mild poisoning. Mild forms of asthenic or asthenovegetative syndrome and polyneuropathy. Reticulocytosis up to 4% of the total number of erythrocytes, an increase in the number of erythrocytes with basophilic granularity up to 0.6%. The level of lead in the blood is not higher than 0.386 $\mu\text{mol/l}$. The content of 6-aminolevulinic acid in urine is up to 190 $\mu\text{mol/g}$ of creatinine, coproporphyrin — up to 763 nmol/g of creatinine.

III. Moderate poisoning. A slightly pronounced lead colic. Toxic hepatitis. Asthenovegetative syndrome. Sensory polyneuropathy. Decreased hemoglobin content (below 2.4 mmol/l). Further increase in the content of reticulocytes, erythrocytes with basophilic granules, 6-aminolevulinic acid and coproporphyrin.

IV. Severe poisoning. Pronounced lead colic. Paralysis, encephalopathy. Anemia (hemoglobin content below 1.8 mmol/l), high reticulocytosis, a significant increase in the number of erythrocytes with basophilic granularity, urinary excretion of 6-aminolevulinic acid and coproporphyrin.

Treatment based on the principle of excretory therapy. Effective use of complexing agents that form strong, low-toxic soluble compounds with lead that are easily removed by the kidneys. The use of these substances increases the removal of lead from the body by 100 times or more, which can lead to an exacerbation of the process, therefore, a cyclic method is used in the treatment (take the drug for 2–3 days, then take a break for 3–5 days). The course of treatment consists of 2–3 cycles.

The presence of lead is an important signal for the implementation of health measures. Dynamic supervision is carried out, and careful clinical examination is periodically performed. However, the mere presence of a lead carrier cannot be a reason for transfer to another job.

There are 3 stages of manganese poisoning:

Stage I — characterized by asthenia, increased drowsiness, paresthesias and dull pains in the limbs, decreased activity, insignificance of complaints, mild hypomimia, muscle hypotonia, invigoration of tendon reflexes, distal type hypoesthesia.

Stage II — symptoms of toxic encephalopathy increase: apathy, drowsiness, memory impairment, mnesic-intellectual defect is revealed. Pathognomonic signs of extrapyramidal insufficiency: hypomimia, bradykinesia, pro- and retropulsion, muscle dystonia. Manifestations of polyneuropathy are increasing.

Stage III (manganese parkinsonism) is characterized by gross extrapyramidal disorders: facial masking, dysarthria, bradykinesia, spastic-paretic, or cock-like gait, a “cogwheel” symptom. Criticism of the disease is lowered, there is violent crying, laughter, significant mnesic-intellectual defect.

The course of the disease progresses chronically, organic changes are irreversible. If even initial symptoms of intoxication are detected, further contact with manganese is prohibited.

Note. Depending on the complexity and specificity of the educational topic, the availability of modern educational and scientific literature, this section can be presented with different levels of detail (the right to choose the form of displaying the content remains with the department).

Questions for self-control

1. At which industries can the lead intoxication occur?
2. What is the toxic effect of lead on the body?
3. How many degrees of lead intoxication do you know?
4. Clinical syndromes of moderate chronic lead poisoning:
5. List the diagnostic criteria for chronic lead poisoning:
6. What contraindications to working with lead and its compounds do you know?

Approximate tasks for theoretical material training:

Main tasks	Instructions	Answers
1. To determine the MPC of lead and works on which this MPC is exceeded		
2. To establish pathogenetic mechanisms in case of lead poisoning		
3. Determine the stages of development of anemia in chronic lead poisoning		

Main tasks	Instructions	Answers
4. To determine the forms of damage to the nervous system in chronic lead poisoning		
5. List the groups of occupational diseases according to the current legislation		
6. To characterize the clinical picture of chronic lead intoxication		

2. Practical works (tasks) to be performed

1. Make an algorithm for diagnosing acute lead poisoning at work;
2. Make an algorithm for establishing the occupational nature of the disease.

3. Test tasks for self-control

1. What are not medical contraindications to employment in contact with mercury?

- a) Anemia
- b) Psychosis
- c) Dental diseases
- d) Vegetative disorders

2. Which of the listed manifestations of chronic mercury poisoning occur more often in women?

- a) Violation of the menstrual cycle
- b) Hyperfunction of the thyroid gland
- c) The percentage of the development of psychoses is increasing
- d) The number of erythrocytes and hemoglobin concentration increases

3. Patient K. works at a factory for the production of X-ray tubes. After the accident at the plant, she felt sharp weakness, nausea, vomiting, and a metallic taste in her mouth. Diagnosis:

- a) Poisoning (acute) by mercury vapors
- b) Benzene poisoning
- c) Manganese poisoning
- d) Acute FOS poisoning

Note. It is suggested to use test tasks (for those seeking higher education who have to take part in the licensing test exams this year, it is more

appropriate to use tests of the “KROK” type) and tests compiled by the departments for rector’s control.

4. Individual tasks for applicants of higher education on the topic

1. A fitter repairing control and measuring devices (10 years of work experience) came to the polyclinic with complaints of abdominal pain, diarrhea, severe weakness, swelling and pain in the gums, a metallic taste in the mouth. For several days, he carried out urgent repairs of devices, after which the mentioned complaints appeared. During the examination: the abdomen is painful when palpating segments of the small and large intestines, blood in the stool. Swelling of the gums, the presence of ulcers on them, increased salivation. Invigoration of tendon reflexes. A diagnosis of chronic mercury poisoning was established. How should we confirm the occupational nature of the disease?

2. A 33-year-old woman has been working for 11 years at a factory for the production of mercury rectifiers and mercury pumps. Complaints of headache, dizziness, loss of memory, irritability, small and frequent tremors of fingers of outstretched hands, eyelids and tongue, bleeding gums, hypersalivation, gingivitis. The preliminary diagnosis is mild chronic mercury poisoning. Appoint for examination, treatment and provide recommendations for further work with mercury.

5. List of recommended literature (main, additional, electronic information resources)

Main

1. Occupational diseases / V. A. Kapustnik, I. F. Kostyuk, H. O. Bondarenko et al. ; edited by V. A. Kapustnik, I. F. Kostyuk. Kyiv : AUS Medicine Publishing, 2018. 496 p.

2. Occupational diseases. Manual for independent work of students. Odesa, 2017. 79 p.

Electronic information resources

1. Neurotoxicity: Definition, Causes and More. Medical News Today. URL: <http://medicalnewstoday.com/2023/4/09>

2. Official Website of the Ministry of Health of Ukraine. <https://www.moz.gov.ua>

Topic 4. Professional Intoxication with Benzene, Amino- and Nitro Compounds of Benzene

Goal: to systematize and deepen knowledge about professional intoxication with benzene, amino-, nitrocompounds of benzene, to expand knowledge about changes in blood tests in these poisonings, to specify knowledge about treatment, prevention and examination of incapacity for work in this pathology.

Basic concepts: acute and chronic benzene poisoning; anemia; toxic anemia; aplastic anemia

Plan

1. Theoretical questions (main theses).
2. Practical works (tasks) to be performed.
3. Test tasks for self-control.
4. Individual tasks for applicants of higher education on the topic.
5. List of recommended literature (main, additional, electronic information resources).

1. Theoretical questions (main theses)

Ukrainian industry uses more than 600 compounds that have toxic properties. Along with this, about 2/3 of all registered cases of industrial intoxication are caused by the effect on the body of working organic solvents, which primarily include benzene and its derivatives. Benzene intoxication is an acute or chronic poisoning of workers by benzene vapors with damage to the blood, red bone marrow, nervous system, liver, genitals, etc. The MPC of benzene vapors in the air of an industrial zone is 5 mg/m³.

Benzene is a cyclic hydrocarbon, a colorless liquid that evaporates at room temperature. Benzene and its derivatives have the properties of universal solvents, well dissolving compounds that are not soluble in water, which leads to its extremely widespread use in the production of water-resistant compounds.

Works that may exceed the MPC of benzene — manufacture and use of solvents, paints, varnishes, glue, mastic, enamel, rubber, resins. The main areas of application are paintwork, rubber, footwear, in the production of synthetic rubber, artificial leather, in mechanical engineering, when

painting machines and parts with varnishes, paints and diluting them to the viscosity required by technology, during preventive and repair work with using solvents, etc.

Pathogenesis of benzene poisoning. Depending on the concentration of benzene and the time of exposure, benzene poisoning can be chronic or acute. The development of chronic poisoning is due to long-term, multi-year exposure to working concentrations of benzene slightly exceeding the MPC. Acute poisoning is caused by the effect of concentrations many times exceeding the MPC, and can develop simultaneously or over the course of several days.

Benzene belongs to volatile fat-soluble compounds. It easily enters the body through the skin and respiratory tract. The concentration in the blood is equal to the concentration in the air of an industrial zone. It is excreted unchanged by the kidneys and through the respiratory tract. In the body, benzene penetrates through all barriers and has a direct toxic effect mostly on dividing cells, such as bone marrow stem cells, and tissues rich in lipids — nerve tissue, liver parenchyma, etc. Since benzene directly affects cell mitosis, it can lead to metaplasia and the development of malignant neoplasms — acute and chronic leukemias, bladder cancer, etc.

Chronic benzene poisoning

Pathogenesis

Chronic benzene poisoning is characterized by pathological changes — damage to the blood system, neuroencephalopathy, damage to the glands, mostly the liver and gonads.

Blood lesions in chronic benzene poisoning develop in the following order: bone marrow irritation, hypoplasia, aplasia, and fatty degeneration of the bone marrow:

— bone marrow irritation is manifested by moderate leukocytosis, pathological granularity of neutrophils, reticulocytosis, etc.;

— hypoplasia is manifested by a hemorrhagic syndrome (positive pinch and tourniquet symptoms, petechial hemorrhages on the skin, moderate bleeding gums), persistent leukocytopenia (up to 3.5 G/l) and normochromic anemia;

— bone marrow hypoplasia-aplasia is manifested by pancytopenia and accompanying syndromes — severe hemorrhagic syndrome (frequent nosebleeds, petechial rash, subcutaneous hematomas, muscle hemorrhages, hypermenorrhea, gastrointestinal bleeding), pancytopenia — leukocytes

less than 3 G/l, platelets less than $120 \cdot 10^9/l$), ulcerative necrotic syndrome, anemic syndrome, organ hypoxia, etc.;

— aplasia with fatty degeneration of the bone marrow is manifested by progressive pancytopenia with a decrease in the level of leukocytes to 0.5 G/l and below.

Neuroencephalopathy in chronic benzene poisoning is mostly functional in nature. Chronic benzene poisoning affects all glandular tissues of the body equally, but the liver is most affected. Benign toxic hepatitis develops in workers, which is manifested mostly by a violation of lipid metabolism and the synthetic function of the liver in the production of blood albumins. Subsequently, with a significant period of action of benzene, toxic hepatitis can lead to the development of liver cirrhosis. In addition to the liver, other glands, including the sex glands, suffer from the effects of benzene. Penetrating through the hemato-testicular and hemato-ovarian barriers, benzene inactivates spermatozoa and damages eggs. And if in men the function of spermatogenesis is able to recover over time, women can lose their fertility after a seemingly short-term exposure to benzene concentrations that exceed the MPC.

Clinical picture

The clinic for chronic benzene poisoning is developing gradually. The employee notes weakness, reduced work capacity, headache, sleep disorders, decreased appetite, and dyspeptic symptoms. Bleeding gums, nosebleeds, bruises, etc. appear. Complaints about pain in the chest and epigastric area are added. In the initial stages, patients develop neurasthenic syndrome, neurocirculatory dystonia and other non-specific functional disorders. With the progression of bone marrow damage, agranulocytosis, thrombocytopenia, and aplastic anemia develop, which are accompanied by a significant deterioration of the patient's general condition and clinical manifestations on the part of many organs and systems. The patient may develop toxic encephalopathy with focal symptoms, sensitive polyneuropathy, hyperkinesia. The leading syndrome remains anemic — patients complain of sharp weakness, dizziness, inability to perform physical work, etc.

With a severe degree of chronic poisoning and the development of pancytopenic syndrome, the patient also has organic symptoms of brain damage, such as manifestations of toxic encephalopathy, organic liver damage, etc.

Diagnostics

The diagnostic process has its own peculiarities, primarily related to the pathogenetic mechanism of blood damage. The primary task of the doctor when examining a person working under the influence of solvents is to establish the degree of bone marrow damage, which has significant difficulties in its implementation, due to the discrepancy between the level of anemia, the degree of aplastic process in the bone marrow and the rate of progression of the aplastic process determined by the concentration of benzene.

Depending on the level of hemoglobin, anemia is divided into 3 stages. The aplastic process in the bone marrow (conditionally) can be divided into 3 stages:

— stage of hypoplasia — independent recovery of erythrocytes persists (there is reticulocytosis), but it is not enough to maintain normal values of the level of erythrocytes/hemoglobin. In the case of medical measures, normal levels of blood indicators are established;

— stage of hypoplasia/aplasia — independent recovery of erythrocytes is practically absent (on the background of anemia, reticulocytes are not detected or <1%), the level of erythrocytes gradually decreases, but the response to medical agents remains, although it does not allow to completely restore normal blood parameters;

— the stage of aplasia and fatty degeneration of the bone marrow — there is no independent recovery of blood, rigidity to the use of medicines.

The rate of development of changes in the bone marrow is directly dependent on the concentration of benzene in the air of the working area.

Given the frequency of periodic medical examinations, when a worker is first diagnosed with anemia, a doctor is not able to establish the presence, degree of aplastic process and the speed of its progression based on a single blood test, without the results of treatment. In many cases, the origin of anemia also raises doubts, since with frequent checking of the hemoglobin content in the blood (which can be carried out by this worker 3–4 times a year), we are able to detect early manifestations of the hypoplastic process with still preserved reticulocytosis and a slight deficiency of hemoglobin. Therefore, the task of diagnosing the nature and degree of bone marrow damage in the conditions of periodic medical examinations cannot be solved.

The following difficulties in the diagnosis of chronic benzene intoxication are associated with liver damage. Working with benzene leads to

the development of benign toxic hepatitis in workers with minor clinical and laboratory manifestations. But for those workers who suffered general clinical and infectious diseases of the liver before starting work, working under conditions of exposure to benzene can lead to severe forms of hepatitis, development or progression of liver cirrhosis. It can be difficult or impossible to establish the origin of liver damage in such cases, in addition to this, a pathological decrease in liver function will also impose restrictions on the ability to work under conditions of increased concentration of benzene.

Depending on the changes in the blood, chronic benzene poisoning is divided into 3 degrees:

I degree — unstable leukopenia $<4.0 \cdot 10^9/l$, neutropenia, reticulocytosis;

II degree — macrocytic anemia, leukopenia $3.5-3.0 \cdot 10^9/l$, thrombocytopenia $150-120 \cdot 10^9/l$, signs of reticulocytosis; increase in bleeding time up to 6 minutes;

III degree — pronounced anemia with a significant decrease in the number of erythrocytes, severe leukopenia $<2.0 \cdot 10^9/l$, thrombocytopenia up to $70 \cdot 10^9/l$ and below, absence of reticulocytes, an increase in ESR up to 50/h and a sharp increase in bleeding time.

The criteria for a severe form of aplastic anemia are:

— granulocytes $<0.5 \cdot 10^9/l$;

— thrombocytes $<20 \cdot 10^9/l$;

— reticulocytes $<1\%$.

Establishing the occupational nature of chronic benzene poisoning, like other diseases of occupational origin, consists of an analysis of work experience, sanitary and hygienic classification of working conditions, and data from previous medical examinations. The first signs of chronic benzene poisoning may appear in 2 years, but no earlier than 3 months after the start of work.

Acute benzene poisoning

Pathogenesis

Acute benzene poisoning in modern industry develops only under the conditions of an accident, accidents or gross violation of safety rules. Acute poisoning proceeds according to the type of drug intoxication with gasoline, ethers and other volatile compounds.

Clinical picture

The clinic of acute poisoning by benzene vapors is characterized by an acute onset associated with exposure to high concentrations of benzene. The initial stage resembles intoxication and is manifested by excitement, confusion, headaches, dizziness, vomiting. With the progression of poisoning, excitement is replaced by retardation or loss of consciousness, muscle twitches that can turn into convulsions, breathing disorders, and pulse acceleration. The patient develops a coma — the reaction of the pupils to light is reduced, breathing is slow, blood pressure is sharply reduced, the pulse is frequent and thready. In the absence of help, death occurs from stopping the respiratory and vascular centers. When exposed to high concentrations of benzene vapors, death can occur instantly. An increase in the concentration of benzene in the blood during acute poisoning can also lead to acute hemolysis of erythrocytes, acute toxic damage to the liver, lungs and other organs.

Diagnostics

The diagnosis of acute benzene poisoning of occupational origin is based on the data of an accident/accident at work and a typical clinic of poisoning by volatile compounds.

Treatment of chronic benzene poisoning

Specific antidote therapy for benzene poisoning has not been developed. In the case of chronic poisoning, the treatment is symptomatic, depending on the clinical manifestations of poisoning in an individual patient.

1. Patients are placed on ward and, in the absence of liver damage, a full diet is recommended.

2. In the early stages of chronic poisoning, the bone marrow still retains its regenerative properties, moreover, to compensate for inhibition by benzene, regeneration is increased and, outside of contact with benzene, the number of formed blood elements quickly returns to normal. Therefore, in the absence of data on persistent suppression of the bone marrow, the appointment of hemostimulators is inappropriate.

3. With the development of persistent disorders of leukopoiesis, patients are prescribed sodium nucleic acid, leukogen, pentoxyl. In case of erythropoiesis disorders — hematogen, autohemotherapy, iron preparations, vitamin B12, folic acid, potassium orotate, etc. To improve plastic processes, anabolic steroids are prescribed — retabolil, phenobolil.

4. In the case of a severe form of aplastic anemia, resistant to the use of other drugs, it is possible to use direct hemostimulators — recombinant hematopoietin. In some cases, a blood transfusion or a bone marrow transplant may be required.

Examination of working capacity

Changes in initial forms of chronic benzene poisoning are reversible, the prognosis is favorable. Patients are temporarily, for 2–4 months, removed from work with benzene and its homologues, appropriate treatment is carried out. Work in previous conditions or employment with the action of other toxic substances, high temperatures, significant physical stress can contribute to the progression of the disease. Sometimes with rational employment there is a progression of the disease — the transition of functional disorders of the nervous system into organic ones or the development of aplastic changes in the blood. Therefore, timely retraining and rational employment should be considered the most correct decision, even in the case of mild poisoning.

Prevention

It is necessary to be careful when working with benzene and its homologues, to avoid getting them on the skin and in the respiratory tract. Given the increased sensitivity to benzene, it is advisable not to allow women to work with this substance.

Regular periodic medical examinations are required (at least once a year). According to Clause 1.35 of Appendix 4 of the Order of the Ministry of Health of Ukraine No. 246, workers engaged in work in conditions of increased benzene concentration, during periodic medical examinations, in addition to general examinations, undergo the following examinations:

- general blood analysis with determination of reticulocytes and platelets;
- determination of bilirubin level;
- determining the level of liver enzymes — ALT, AST, etc.;
- consultation with a neurologist and dermatologist.

Contraindications to employment are pronounced vegetative dysfunctions, chronic diseases of the stomach, liver, biliary tract, benign tumors, hemoglobin content less than 130 g/l, leukocytes less than $4.5-10^9/l$, platelets less as $150 \cdot 10^9/l$.

Note. Depending on the complexity and specificity of the educational topic, the availability of modern educational and scientific literature, this section can be presented with different levels of detail (the right to choose the form of displaying the content remains with the department):

Questions for self-control

1. What factors can lead to the development of toxic hepatitis at work?
2. List the main groups of hepatotoxic industrial poisons.
3. What are the main clinical syndromes of industrial toxic hepatitis do you know?
4. What treatment is most appropriate in case of acute toxic hepatitis?
5. Which method is the most important for preventing the development of toxic hepatitis at work?

Approximate tasks for theoretical material training

Main tasks	Instructions	Answers
1. To determine the MPC of benzene and works at which this MPC is exceeded		
2. To establish pathogenetic mechanisms in case of benzene poisoning		
3. Determine the stages of development of anemia in chronic benzene poisoning		
4. Determine forms of liver damage in chronic benzene poisoning		
5. List the groups of occupational diseases according to the current legislation		
6. To characterize the clinical picture of chronic benzene intoxication		

2. Practical works (tasks), which will be performed

1. Build an accident investigation algorithm at work;
2. Build an algorithm for establishing the occupational nature of the disease.

3. Test tasks for self-control

1. What method of excreting therapy can be used for toxic hepatitis?
 - a) Operation of partial blood replacement
 - b) Hemodialysis (artificial kidney)
 - c) Detoxification hemosorption
 - d) Peritoneal dialysis

2. What treatment should be carried out for severe toxic hepatitis?
 - a) Intravenous drip infusions of 5–10% glucose solution
 - b) Vitamins of group B, vitamin E, ascorbic acid parenterally, lipotropic agents
 - c) Antiproteinase drugs (kontrikal, trasylol, etc.)
 - d) All the above listed

3. When should an investigation of a case of acute toxic hepatitis at work begin?
 - a) During the first day
 - b) During 7 days
 - c) During the month
 - d) Within a day from the time of application to the SES

4. What expert decision should be taken in case of acute toxic hepatitis that ended in recovery?
 - a) Continue work in compliance with sanitary and hygienic labor standards
 - b) Transfer to work outside the influence of toxic substances
 - c) Issue a sick leave
 - d) Send to medical commission

5. What blood changes are observed in chronic benzene intoxication of the 1st stage?
 - a) Leukocytosis
 - b) Leukopenia
 - c) Reticulocytosis
 - d) Erythrocytosis
 - e) Anemia

6. What blood changes are observed in chronic benzene intoxication of the 2nd stage?

- a) Leukocytosis and reticulocytosis
- b) Leukopenia, thrombocytopenia
- c) Eosinophilia and leukocytosis
- d) Leukocytosis and eosinopenia
- e) Anemia and leukopenia

7. What blood changes are observed in chronic benzene intoxication of the 3rd stage?

- a) Leukocytosis, neutrophilia, eosinopenia
- b) Leukopenia, thrombocytopenia, anemia
- c) Erythrocytosis, reticulocytosis, leukocytosis
- d) Anemia, leukocytosis, eosinopenia
- e) Leukocytosis, eosinophilia

8. What clinical syndromes are most characteristic of severe forms of chronic benzene intoxication?

- a) Hepatic syndrome
- b) Toxic nephropathy
- c) Toxic encephalopathy
- d) Gastrointestinal syndrome
- e) Hemorrhagic syndrome

9. What complication of chronic benzene intoxication of the 4th stage leads to death?

- a) Acute renal failure
- b) Hapatargia
- c) Pulmonary failure
- d) Disorders of cerebral circulation
- e) Septicopia

10. What drugs are primarily used for chronic benzene intoxication?

- a) Tranquilizers
- b) Sedatives
- c) Lipotropic
- d) Complexons
- e) Hemostimulants

11. What expert decision should be taken after effective treatment in a hospital for mild chronic benzene intoxication in the form of moderate leukopenia?

- a) Continue work in compliance with sanitary and hygienic labor standards
- b) Issue a professional bulletin to confirm the effect of treatment for a period of 2 months
- c) Issue a sick leave for 2 months
- d) Send to medical commission

12. What expert decision should be made after treatment for chronic benzene intoxication of moderate severity in the form of persistent leukopenia and thrombocytopenia with hemorrhagic syndrome?

- a) Continue work in compliance with sanitary and hygienic labor standards
- b) Issue a professional bulletin to confirm the effect of treatment for a period of 2 months
- c) Issue a sick leave for 2 months
- d) Send to medical commission

13. What labor recommendations should be given for a mild form of chronic benzene intoxication after treatment with a good effect?

- a) Capable of working in his profession
- b) Temporarily (up to 2 months) transfer to another job
- c) Limited work capacity, needs rational employment and retraining
- d) Incapacitated

14. What labor recommendations should be given in case of chronic benzene intoxication of medium severity in the presence of leukopenia and thrombocytopenia after treatment?

- a) Capable of working in his profession
- b) Temporarily (up to 2 months) transfer to another job
- c) Limited work capacity, needs rational employment and retraining
- d) Incapacitated

Note. It is suggested to use test tasks (for those seeking higher education who have to take part in the licensing test exams this year, it is more appropriate to use tests of the “KROK” type) and tests compiled by the departments for rector’s control.

4. Individual tasks for applicants of higher education on the topic

1. Patient B., 52 years old, has been under the dispensary observation of a cardiologist for mild arterial hypertension for the past 7 years. From the anamnesis, it is known that he works at a machine-building enterprise in direct contact with carbon chloride. Initial signs of toxic liver damage were detected during a periodical medical examination of the patient. How will these data affect the treatment of cardiac pathology and further labor prognosis?

2. He was brought to the intensive care unit of the hospital in an unconscious state chemical laboratory worker. It is known from the anamnesis that the place was rough violation of safety rules when working with chlorinated hydrocarbons. After returning to consciousness, the patient complained of weakness, dizziness, nausea, vomiting, pain in the right hypochondrium, dyspeptic disorders. Objectively — signs of hepatomegaly, in laboratory tests — cytolytic syndrome. The diagnosis was made — acute toxic hepatitis, severe discharge. Prescribe treatment, provide work recommendations.

5. List of recommended literature (main, additional, electronic information resources)

Main

1. Occupational diseases / V. A. Kapustnik, I. F. Kostyuk, H. O. Bondarenko et al. ; edited by V. A. Kapustnik, I. F. Kostyuk. Kyiv : AUS Medicine Publishing, 2018. 496 p.

2. Occupational diseases. Manual for independent work of students. Odesa, 2017. 79 p.

Electronic information resources

1. Poisoning of amino- and nitrocompounds of benzene / V. S. Tkachyshin. 2022. Publishing House Zaslavsky URL : <https://emergency.zaslavsky.com.ua>

2. Guidance Nitrobenzene: toxicological overview UK Health Security Agency. 2024. URL : <https://www.gov.uk/publications/nitrobenzene-properties>

Topic 5. Professional Intoxication with Compounds Used in Agricultural Work

Goal: to expand and specify knowledge about professional intoxication with compounds used in agricultural work, to systematize knowledge about the clinic, diagnosis, treatment, prevention, and examination of work capacity for organochlorine compounds (OCC) and organophosphorus compounds (OPC) poisoning.

Basic concepts: pesticides; organochlorine compounds, organophosphorus compounds, toxic nephropathy, chronic renal failure.

Plan

1. Theoretical questions (main theses).
2. Practical works (tasks) to be performed.
3. Test tasks for self-control.
4. Individual tasks for applicants of higher education on the topic.
5. List of recommended literature (main, additional, electronic information resources).

1. Theoretical questions (main theses)

Pesticides are chemical means of combating pests and diseases of agricultural crops. Contact with these substances occurs during transportation, storage and release of drugs, pickling of seeds and their sowing, pollination and spraying of plants, soil fumigation. Depending on their chemical nature, pesticides belong to certain groups, the most important of which are mercury-, chlorine-, organophosphorus, and arsenic-containing compounds.

Intoxication by organic chlorine compounds. Organic chlorine compounds are used to control pests of fruit trees, cereals, vegetables and field crops. They are used in the form of aerosols, dusts, emulsions and solutions. Chlorindane, heptachlor, chlorthene, polychlorocamphene, and hexachlorobenzene are of the greatest practical importance. They dissolve poorly in water and well in organic solvents, including fats. OCCs are heat-resistant, have pronounced cumulative properties.

Pathogenesis. The biochemical mechanism of action is related to the blockade of cellular respiratory enzymes — cytochrome oxidase. Some

OCCs, such as chlorindane, heptachlor, are capable of suppressing and blocking the SH-groups of thioenzymes and proteins.

Clinical course. Acute intoxication. Immediately after the poison enters the body or after some time, clinical symptoms of poisoning appear: sharp weakness in the legs, headache, dizziness, nausea, vomiting, an increase in body temperature up to 39°C (1st degree of severity). Sometimes there is retardation, twitching in the arms and legs, their tremors (2nd degree of severity). Shortness of breath, cyanosis, heart failure, loss of consciousness (3rd degree of severity) appear later. As the disease progresses, symptoms of damage to the liver, kidneys, and lungs appear. All this is accompanied by pronounced acidosis. The biggest changes take place in the central nervous system.

The clinical picture of acute poisoning resembles that of toxic encephalitis with predominant damage to the subcortical region. In severe cases, ataxia, clonic-tonic convulsions, mental disorders, and visual disturbances are observed. Sometimes patients develop asthmatic bronchitis, tracheitis. In the peripheral blood, leukopenia, relative lymphocytosis, accelerated ESR. Protein is detected in the urine.

Chronic intoxication. Headaches, dizziness, insomnia appear, appetite decreases, mental and physical fatigue, increased irritability. In the future, symptoms of trembling of the limbs, pain in them, especially along the course of the nerve trunks, emotional lability, increased sweating develop. Patients often suffer from a dry cough, palpitations, and heart pain. In such cases, neurocirculatory dystonia is detected, more often of the hypotonic type. The borders of the heart are enlarged to the left. The tones are muffled. Muscle changes are determined on the ECG. All this fits into the picture of myocardopathy. Characteristic functional disorders of the central nervous system, which most often occur according to the type of astheno-vegetative syndrome.

In the clinical course, astheno-vegetative, polyneurotic, cardiovascular, and hepatic syndromes are conditionally distinguished.

Treatment. Clean the skin and rinse the mucous membranes with a 2% sodium bicarbonate solution. Oxygen inhalations are indicated. Administer 20 ml of 40% glucose solution and 500 milligrams of ascorbic acid intravenously, cocarboxylase (50–100 milligrams) intramuscularly. When excited, barbiturates are used (carefully!), phenobarbital.

Working capacity. The prognosis for mild forms is favorable, for severe cases residual effects (functional insufficiency of the liver, kidneys, cardiovascular pathology, etc.) are possible, leading to a long-term de-

crease in working capacity, requiring referral to the medical commission.

Intoxication by organic phosphorus compounds. OPCs are used as pesticides in the fight against pests of cotton, grain crops, fruit trees, grasses, in everyday life, etc.

OPC include: karbofos, phosphamide (relatively low-toxic drugs); chlorophos and compounds close to it (effective insecticides of medium toxicity); thiophos, metaphos, methylmercaptophos) (have a wide spectrum of insecticidal activity, are very toxic to humans).

Pathogenesis. OPC poisoning leads to suppression of enzymes related to esterases, in particular cholinesterase, which plays an important physiological role (destroys acetylcholine).

Clinical picture. All clinical symptoms of poisoning are divided into muscarinic-like, exposed to atropine (nausea, vomiting, abdominal cramps, salivation, diarrhea, difficulty in the chest, breathing disorders, bradycardia, narrowing of the pupils, sweating), nicotinic-like (twitching of the eye muscles, facial and other facial muscles, the appearance of nystagmus, fibrillar twitching of the muscles of the whole body) and central, unresponsive effects of atropine (mental disorders, speech changes, ataxia, disorientation, tremors, clonic and tonic convulsions, depression and paralysis of the medulla oblongata).

According to the degree of severity, there are 3 stages of poisoning.

Stage I. Early signs of poisoning are: the appearance of anxiety, psychomotor agitation, salivation, lacrimation, nausea, vomiting, abdominal pain, a moderate increase in blood pressure, tachycardia, miosis. During the penetration of OPC through the gastrointestinal tract, nausea, vomiting, and intestinal disorders prevail; when penetrating through the skin — local fibrillations and so on. In the case of inhalation of poison, the symptoms of resorptive action, which are initially characterized by a disorder of the function of higher nervous activity, may later be joined by changes in the cardiovascular system.

Stage II is characterized by a change in psychomotor excitement to suppression of psychophysical activity, hyperkinesia chorea-like and clonic-like types appear. Miosis is so pronounced that there is no reaction to light. In addition, there are: sharp hyperhidrosis, hypersalivation, bronchorrhoea, tenesmus, diarrhea, accelerated urination. Blood pressure rises to 280/160 mm Hg.

Stage III — deep coma. Muscle tone is reduced, convulsions are replaced by paralytic muscle relaxation. Areflexia, rare breathing, paralysis

of the respiratory muscles, arterial hypotension, bradycardia are detected — Breathing 40–20 per 1 min.

Severe forms are extremely rare. In the clinical picture of severe acute POC poisoning, three stages are distinguished: the stage of excitement, convulsive and paralytic.

Treatment. In case of acute OPC poisoning, the victim is removed from the contaminated area as soon as possible. The skin is washed with soap, treated with a 2% solution of sodium hydrogen carbonate or a 5–10% solution of ammonia, a 2–5% solution of chloramine B. If OPC gets into the eyes, they should be immediately washed with a jet of clean water followed by instillation of a 30% solution of albuclid.

Antidote therapy involves the use of cholinolytics, which include atropine. In case of mild poisoning, subcutaneous or intramuscular injection of 1–2 ml of 0.1% solution of atropine sulfate is indicated, in case of moderate or severe poisoning — 3–5 ml of 0.1% solution intramuscularly or intravenously. In cases of lack of therapeutic effect or when symptoms of intoxication increase, intramuscular injections of atropine (1–2 ml each) are repeated every 1–2 g until the symptoms of poisoning disappear and signs of atropine overdose appear (dry mucous membranes, narrowing of the pupils).

Effective use of cholinesterase reactivators, in particular, dipiroxime, in the form of a 15% solution of 1 ml subcutaneously in combination with atropine. Dipiroxime can be re-injected after 1–2 hours. Isonitrosine is a less toxic cholinesterase reactivator. In case of a mild form of poisoning, it is administered intramuscularly in 3 ml of a 40% solution, and in severe cases — intravenously in 3 ml of a 40% solution every 30 minutes, until the cessation of muscle fibrillation, convulsions and clarity of consciousness. The total dose of isonitrosine is up to 4 years.

Working capacity. The prognosis for mild forms is favorable, for severe cases residual effects are possible (cardiovascular, bronchopulmonary pathology, functional insufficiency of the liver, kidneys, etc.), which lead to a long-term decrease in working capacity, requiring referral to the medical commission.

Note. Depending on the complexity and specificity of the educational topic, the availability of modern educational and scientific literature, this section can be presented with different levels of detail (the right to choose the form of displaying the content remains with the department):

Questions for self-control

1. Specify the main groups of industrial poisons that have a nephrotoxic effect.
2. What pathogenetic mechanisms of the development of toxic nephropathy do you know?
3. What manifestations does the clinic of toxic nephropathy consist of?
4. What diagnostic criteria of toxic nephropathy do you know?
5. What complications of toxic nephropathy do you know?

Approximate tasks for theoretical material training

Main tasks	Instructions	Answers
1. Specify the main pathogenetic mechanisms of pesticide action		
2. To determine the MPC of organophosphorus compounds and jobs where this MPC is exceeded		
3. To establish pathogenetic mechanisms in poisoning with organophosphorus compounds		
4. Determine the forms of damage to the nervous system, liver and glands in case of OPC poisoning		
5. To characterize the clinical picture of acute OPC intoxication		
6. Establish a connection between seizures and harmful working conditions		

2. Practical works (tasks), which will be performed

1. Build an accident investigation algorithm when using OPC.
2. To build an algorithm for establishing the professional nature of acute OPC poisoning.

3. Test tasks for self-control

1. What pathogenetic mechanism is the main one in intoxication with organomercury pesticides?

- a) Inactivation of cholinesterase
- b) Formation of methemoglobin
- c) + Blockade of sulfhydryl groups
- d) Blockade of tissue respiration enzymes
- e) Blockade of cholinergic receptors

2. What is the effect of organophosphate pesticides on the nervous system?

- a) Nicotine-like
- b) Muscarinic
- c) Central
- d) Nicotine- and muscarinic
- e) + All the above listed

3. What pathogenetic mechanism is the main one in intoxication with organophosphorus compounds?

- a) + Inactivation of cholinesterase
- b) Formation of methemoglobin
- c) Blockade of sulfhydryl groups
- d) Blockade of tissue respiration enzymes
- e) Blockade of cholinergic receptors

4. What symptom usually occurs with a mild form of acute OPC intoxication?

- a) Metallic taste in the mouth
- b) Sensation of the presence of hair, threads in the mouth
- c) Thirst
- d) + Feeling of lack of air
- e) All the above listed

5. What complaint is characteristic of acute OPC intoxication of moderate severity?

- a) Increased sweating
- b) Increased salivation
- c) Colic-like abdominal pain
- d) Difficulty breathing
- e) + All the above listed

6. What symptom usually occurs with acute OPC intoxication?

- a) Blepharospasm
- b) + Miosis
- c) Dry skin and mucous membranes
- d) Increase in cholinesterase activity in blood serum and erythrocytes

7. What symptom occurs in acute OPC intoxication of moderate severity?

- a) Miosis
- b) General hyperhidrosis
- c) Bronchospasm
- d) Hyperthermia
- e) + All the above listed

8. What drug is used for acute OPC intoxication?

- a) Aminazine
- b) Proserin
- c) Reserpine
- d) Chromosmon
- e) + Atropine

9. What drugs are used for acute OPC intoxication with a predominantly nicotine-like effect?

- a) Complexons
- b) + Ganglioblockers
- c) Adrenoblockers
- d) Atropine
- e) Tranquilizers

10. Which group of pesticides has the ability to accumulate?

- a) Organophosphorus compounds
- b) + Organochlorine compounds
- c) Synthetic pyrethroids
- d) Derivatives of carbamic acids
- e) All the above listed

Note. It is suggested to use test tasks (for those seeking higher education who have to take part in the licensing test exams this year, it is more appropriate to use tests of the “KROK” type) and tests compiled by the departments for rector’s control.

4. Individual tasks for applicants of higher education on the topic

1. After spraying a tree in the garden, which he carried out without gloves, mask, glasses, the patient did not wash his hands and drank the usual dose of alcohol. After a few minutes, sweating, tachycardia, and hypersalivation appeared. He became restless, worried, walked around the house, went outside. After that, he became dizzy, lying in bed, thinking incoherently, hallucinating, experiencing fear. Blood pressure rose sharply, diarrhea, frequent urination, hyperkinesis appeared. What therapeutic tactics should be used for this patient?

2. A 54-year-old patient complains of headache, nausea, vomiting, abdominal pain, general weakness, difficulty breathing. On the day of the illness, I unpacked and loaded bags with chlorophos and polychloropinene. General hyperhidrosis, hypersalivation, pupils are narrowed. Cholinesterase activity is 64.8%. The preliminary diagnosis is acute FOS (chlorophos) poisoning of the 1st stage. Carry out treatment, provide work recommendations.

5. List of recommended literature (main, additional, electronic information resources)

Main

1. Occupational diseases / V. A. Kapustnik, I. F. Kostyuk, H. O. Bondarenko et al. ; edited by V. A. Kapustnik, I. F. Kostyuk. Kyiv : AUS Medicine Publishing, 2018. 496 p.

2. Occupational diseases. Manual for independent work of students. Odesa, 2017. 79 p.

Electronic information resources

1. Occupational acute pesticide poisoning: a cross-sectional study of Turkish vegetable and fruit farmers based on self-reported symptoms and job characters. Celaletlin Cevik, Raziye Ozdevir, Sezgin Ari. 2020 Aug 31. National Library of Medicine. URL : <https://pubmed.ncbi.nlm.nih.gov/articles/pmc7809959>

2. ScienceDirect.com. Occupational exposure to pesticides: Genetic danger to farmworkers and manufacturing workers – A meta-analytical review. Science of the Total Environment. Vol. 748, 15, December, 2020 URL:<https://www.sciencedirect.com/science/article/abs/pii/S0048969720349111>

Topic 6. Occupational Diseases are Associated with the Action of a Biological Factor: Infectious (COVID-19), Parasitic

Goal: to systematize and deepen knowledge on the topic: “Occupational diseases associated with the action of a biological factor”, to expand knowledge about the algorithm for establishing an occupational disease in medical workers related to COVID-19.

Basic concepts: coronavirus disease (COVID-19), SARS-CoV-2 coronavirus, saturation, “frosted glass” symptom, PCR diagnostics, ELISA diagnostics, Decree of the CMU of April 17, 2019 under No. 337.

Plan

1. Theoretical questions (main theses).
2. Practical works (tasks) to be performed.
3. Test tasks for self-control.
4. Individual tasks for applicants of higher education on the topic.
5. List of recommended literature (main, additional, electronic information resources).

1. Theoretical questions (main theses)

Main occupational infectious diseases

Disease	Pathogen	Source of infection	Path of transmission	Risk groups	Clinical manifestations
Bacteria					
Anthrax	Bacillus Anthracis	Herbivorous animals (goats, sheep, etc.), their wool and bones	Contact, Inhalation, Transmissible	Workers of meat processing plants, veterinarians, sorters of wool, hides, weavers	Skin: painless papules, large ulcers with necrotic changes. Lungs: upper respiratory tract infection, pneumonia

Disease	Pathogen	Source of infection	Path of transmission	Risk groups	Clinical manifestations
Brucellosis	Brucella abortus, B. melitensis, B. suis, B. canis	Pigs, cattle, sheep, goats	Contact, Aerogenic	Workers of meat processing plants, agriculture, butter factories, veterinarians	Lymphadenopathy, musculoskeletal system: bursitis, tendovaginitis; chronic hepatitis
Tuberculosis	Mycobacterium tuberculosis	tuberculosis Infected person,	Inhalation	Medical and laboratory personnel, workers zoos, kennels	Lungs, systemic damage to others organs and systems
Leptospirosis	Leptospira spp.	Rodents	Contact with infected urine, entry of the causative agent through the scrotum or mucous membrane	Slaughterhouses, meat processing plants, agriculture (when working in wet areas), veterinarians	Jaundice and fever: hepatitis, kidney failure. Fever without Jaundice
The simplest					
Echinococcosis	Echinococcus granulosus, E. multilocularis	Feces of infected dogs, foxes, other canids	Contact	Animal breeders, veterinarians	CNS, lungs, liver

Disease	Pathogen	Source of infection	Path of transmission	Risk groups	Clinical manifestations
Toxoplasmosis	Toxoplasma gondii	Feces of cats. Dogs. pigs	Contact	Laboratory workers, veterinarians, hunters	Reticuloendothelial system, eyes
Rickettsia					
Ornithosis	Chlamydia Psittaci	Isolation of infected poultry	Inhalation	Workers of poultry farms and zoos, sellers of pet stores	Lungs: pneumonia; liver, Kidneys
Viruses					
Rabies	Rabies virus	Dogs, cats, livestock	Direct transfer to the internal environment of the body	Cattle breeders, veterinarians	Prodrome: fever, local paresthesia Acute neuroinfection: impaired consciousness, seizures, emotional lability, laryngospasm, coma
Hepatitis B	Hepatitis B virus	Human blood and its products	Parenteral. Contact	Maxillofacial surgeons, dentists, hemodialysis workers, laboratory assistants, nursing staff for the sick	Liver: acute and chronic hepatitis
AIDS	HIV	Fluid of infected people	Contact	Medical workers, laboratory workers	Immune system

Disease	Pathogen	Source of infection	Path of transmission	Risk groups	Clinical manifestations
Coronavirus disease (COVID-19)	SARS-CoV-2 coronavirus	An infected person	Air-drop	Medical workers, laboratory workers, service area	Increasing of the body temperature; cough (dry or with a small amount of sputum) in 80% of cases; shortness of breath; fatigue; feeling of congestion in the chest

The government decided that the coronavirus disease (COVID-19) is included in the list of occupational diseases. Victims of COVID-19 can be medical workers who, in accordance with the order of the head of the health care institution and the job description, are assigned to directly provide medical care to patients with coronavirus, worked in special institutions with the causative agent of COVID-19 or participated in disinfection measures. It should also be taken into account that at the same time such medical workers do not violate the rules of occupational health and safety and have undergone additional training on compliance with the requirements of the anti-epidemic regime, biological safety and biological protection when identifying a person who meets the definition of a 2019-nCoV case. In the case of the presence of COVID-19 in a medical worker, the investigation must be carried out taking into account the requirements and recommendations of the Resolution of the Cabinet of Ministers of Ukraine No. 211 dated 11.03.2020.

By order of the Ministry of Health dated 29.12.2021 No. 2911/99/738 registered in the Ministry of Justice of Ukraine on February 14, 2022 under No. 202/37538, the norms of the Instructions on the application of the list of occupational diseases were corrected. According to the changes made, the diagnosis of an acute occupational disease (intoxication) will be established by the doctor of the health care institution to which the patient sought medical help, if there is information (from the patient or other per-

sons) that the disease may be caused by the influence of factors of the industrial environment and work process.

Note. Depending on the complexity and specificity of the educational topic, the availability of modern educational and scientific literature, this section can be presented with different levels of detail (the right to choose the form of displaying the content remains with the department):

Questions for self-control

1. What are the causes of an occupational infectious or parasitic disease?
2. What are the groups of occupational infectious diseases?
3. Basic laboratory tests to confirm an occupational infectious or parasitic disease
4. Features of examination of working capacity in patients with occupational infectious or parasitic disease?

Approximate tasks for theoretical material training

Main tasks	Instructions	Answers
1. Specify the causes and methods of infection with an occupational infectious or parasitic disease		
2. List the main preventive measures for various forms of occupational infectious or parasitic disease		
3. List the main clinical manifestations of COVID-19		
4. Write an algorithm for diagnosing COVID-19		
5. List the complications of COVID-19		
6. To establish the differences in the examination of work capacity and prevention in various forms of occupational infectious or parasitic disease		

2. Practical works (tasks) to be performed

1. Build an accident investigation algorithm at work;
2. Build an algorithm for establishing the occupational nature of the disease.

3. Test tasks for self-control

1. Among the workers of which industries is it possible to develop an occupational infectious and parasitic disease?

- a) Milkmaids of livestock farms
- b) Meat processing plant workers
- c) Geologists of reconnaissance parties
- d) Animal farm workers
- e) All the above listed

2. Which of the infectious diseases can be occupational?

- a) Intestinal infections
- b) Respiratory tract infections
- c) Infections of external integuments
- d) Genital infections

3. Among the workers of which professions brucellosis most often occurs?

- a) Calves
- b) Milkmaids
- c) Shepherds
- d) Workers of the veterinary service
- e) Mechanics

4. In most cases, what is the localization of occupational tuberculosis caused by the bovine or avian type of mycobacteria?

- a) Skin and lymph nodes
- b) Kidneys
- c) Sexual organs
- d) Eyes
- e) Bronchi

5. What parasitic diseases can be occupational?

- a) Helminth infections
- b) Protozoonosis
- c) Entomoses
- d) Akarios
- e) Tuberculosis

6. Workers of which professions are most often affected by occupational toxoplasmosis?

- a) Pigs
- b) Milkmaids
- c) Rabbits
- d) Meat processing plant workers
- e) Builders

7. What form of the disease most often occurs in occupational anthrax?

- a) Leather
- b) Legeneva
- c) Intestinal
- d) Septic

8. What are the main criteria for diagnosing occupational infectious and parasitic diseases?

- a) Group nature of the disease
- b) Seasonal diseases
- c) The presence of unfavorable farms in the region for the disease
- d) Predominant damage to open areas of the skin
- e) Inherited tendency

9. Which group has the greatest risk of occupational infection with HIV infection?

- a) Scientific collaborators of the Scientific Research Institute for the production of medicines from blood
- b) Surgeons, dentists, obstetricians-gynecologists
- c) Nurses of manipulation offices
- d) Nursing staff serving HIV-infected patients in the ICU
- e) Drug addicts

10. Which blood cells are primarily affected by the human immunodeficiency virus?

- a) B-lymphocytes
- b) Helper T-lymphocytes
- c) Macrophages
- d) T-lymphocytes-suppressors

Note. It is suggested to use test tasks (for those seeking higher education who have to take part in the licensing test exams this year, it is more appropriate to use tests of the “KROK” type) and tests compiled by the departments for rector’s control.

4. Individual tasks for applicants of higher education on the topic

1. Patient D, 42 years old, a therapist at a multidisciplinary hospital, turned to the Center for Primary Health Care. For 4 weeks, he was receiving outpatient treatment for acute coronavirus disease caused by COVID-19, non-hospital polysegmental pneumonia. BI 0, on the issue of closing sick leave and returning to work.

While performing the duties of a doctor, patient D. repeatedly examined, consulted and treated patients whose diagnosis of coronavirus infection was subsequently confirmed in the laboratory. He treated at least 3 patients shortly before contracting Covid. When working, he used protective equipment — a mask, seals, disinfectant. means, etc. Other sources of the disease — in everyday life, during travels, visits to other countries, etc. not found. Complaints: slight weakness, cough when laughing, sweating during physical exertion.

Objectively: The patient’s condition is satisfactory. The patient is active. During the examination, individual wheezes are noted during auscultation.

Laboratory studies: CBA — without special features. Coagulogram — without features. Used indicators are normal. PCR for Covid is negative (the previous one, 3 weeks ago, was positive). ELISA IgM ≤ 2 , IgG ≥ 10 Examination of the external respiratory function is normal. CT scan of the lungs — final phenomena after pneumonia with positive dynamics in 1 month. Describe the occupational nature of the disease and its impact on work capacity and professional suitability. Describe the possibility of re-infection with Covid upon return to work by a treating physician and determine the measures that will prevent it.

5. List of recommended literature (main, additional, electronic information resources)

Main

1. Occupational diseases / V. A. Kapustnik, I. F. Kostyuk, H. O. Bondarenko et al. ; edited by V. A. Kapustnik, I. F. Kostyuk. Kyiv : AUS Medicine Publishing, 2018. 496 p.

2. Occupational diseases. Manual for independent work of students. Odesa, 2017. 79 p.

Electronic information resources

1. Work-related diseases from biological agents — EU-OSHA European Agency for Safety and Health at Work. URL: <https://osha.europa.eu/en/themes/work-related-diseases/biological-agents>. 2020

Topic 7. Vibration Disease. **Altitude and Caisson Sickness**

The goal: to expand and specify the knowledge about vibration sickness that is developing at work. To expand and specify knowledge about altitude sickness and caisson disease, methods of diagnosis, prevention and carrying out performance examination.

Basic concepts: local and general vibration, vibration sickness, altitude sickness, caisson sickness.

Plan

1. Theoretical questions (literature).
2. Practical works (tasks) to be performed.
3. Test tasks for self-control.
4. Individual tasks for applicants of higher education on the topic.
5. List of recommended literature (main, additional, electronic information resources).

1. Theoretical questions (literature)

1. Kravchuk V. T., Dzyubenko V. G., Dedecek O. H. Study of vibration parameters and protection against it : methodical guidance for performing laboratory work for students of all specialties and forms of education. Educational and methodological edition, 2017.

2. Semeryak O. M., Solovyov O. I. Hygienic assessment of the working conditions of coal mine miners with occupational pathology from the action of general vibration. State institution “Y. I. Kundiyeu Institute of Occupational Medicine of the National Academy of Medical Sciences of Ukraine”, Kyiv, 2018.

3. Tkachyshyn V. Work under increased atmospheric pressure: how to prevent diseases. Labor Health Service. August 7, 2019, <https://propop.com.ua/article/861-robota-za-pdvishchenogo-atmosfernogo-tisku-yak-zapobgti-zahvoryuvannyam>

Note. Depending on the complexity and specificity of the educational topic, the availability of modern educational and scientific literature, this section can be presented with different levels of detail (the right to choose the form of displaying the content remains with the department):

Questions for self-control

1. What works accompanied by changes in atmospheric pressure do you know?
2. Describe the pathogenesis of the effect of increased pressure on the body of workers.
3. How many degrees of acute decompression sickness do you know?
4. Clinic for decompression sickness of medium severity?
5. Name the main clinical manifestations of chronic decompression sickness.
6. What complications of decompression sickness do you know?
7. What is a contraindication to work in conditions of increased atmospheric pressure?

Approximate tasks for theoretical material training

Main tasks	Instructions	Answers
1. To determine the etiology of the vibration disease, the peculiarities of normalization of the MPC in works related to vibration		
2. To determine the features of the pathogenesis of the chronic effect of vibration.		
3. Specify the features of the clinical course of vibration disease depending on the characteristics of vibration		
4. To resolve the issue of the ratio of local and general manifestations of vibration disease		
5. List the features of treatment of vibration disease depending on the course		

2. Practical works (tasks), which will be performed

1. Build an accident investigation algorithm at work;
2. Build an algorithm for establishing the occupational nature of the disease.

3. Test tasks for self-control

1. What is the pathogenetic mechanism of vibration disease?
 - a) Neurohumoral disorders
 - b) Changes in vascular tone
 - c) Violation of microcirculation
 - d) The emergence of a focus of stagnant excitement
 - e) + All the above listed

2. What spectrum of local vibration before others causes the syndrome of cold angiospasm of the fingers?
 - a) Low frequency
 - b) Medium frequency
 - c) + High frequency
 - d) Low- and medium-frequency
 - e) All the above listed

3. What spectrum of local vibration contributes to the early appearance of the symptom of angiohypotonia (“blue fingers”)?
 - a) + Low frequency
 - b) Medium frequency
 - c) High frequency
 - d) High- and medium-frequency
 - e) All the above listed

4. Early onset of cold angiospasm of the fingers is possible in workers of which profession?
 - a) + Grinders
 - b) Cutters
 - c) Carers
 - d) Riveters
 - e) Passersby

5. Workers of which professional group are most likely to develop pathology of the musculoskeletal system of the upper extremities?
 - a) Sharpeners
 - b) Polishers
 - c) Drillers
 - d) Preparers
 - e) + Drillers of holes with a manual perforator

6. What is the most characteristic complaint in case of vibration disease from the influence of local vibration of the 1st stage?

- a) Constant pains and paresthesias in the hands
- b) + Pain and paresthesias in hands after work
- c) Angiospasm of fingers and toes
- d) Decreased strength in hands
- e) Cramps of fingers

7. What is the most characteristic complaint in case of vibration disease from the influence of local vibration of the 1st stage?

- a) + Frostbite of the hands
- b) Frequent angiospasm of the fingers
- c) Swelling of the fingers
- d) Cramps of the fingers
- e) Decreased hand strength

8. What is the most characteristic complaint in vibration disease from the influence of local vibration of the 2nd stage?

- a) + Frequent angiospasm of the fingers
- b) Angiospasm of fingers and toes
- c) Intermittent lameness
- d) Disturbance of balance
- e) All the above listed

9. What is the most characteristic complaint in vibration disease from the influence of local vibration of the 3rd stage?

- a) Constant pains and paresthesias in the hands
- b) Decreased strength in hands
- c) Angiospasm of fingers and toes
- d) Frostbite of hands and feet
- e) + All the above listed

10. What symptom often occurs with vibration disease from the influence of local vibration of the 1st degree?

- a) + "Marbling" of the palms
- b) Hypotrophy of hand muscles
- c) Swelling of the hands
- d) Frequent angiospasm of the fingers
- e) Angiospasm of fingers and toes

Note. It is suggested to use test tasks (for those seeking higher education who have to take part in the licensing test exams this year, it is more appropriate to use tests of the “KROK” type) and tests compiled by the departments for rector’s control.

4. Individual tasks for applicants of higher education on the topic

1. A 29 year-old patient works as a diver. When climbing from a great depth, in connection with a broken compressor, he was forced to accelerate the climbing. After 2 hours, complaints of sudden weakness, heaviness and headaches began to appear. Vomiting, severe abdominal pain, frequent defecation joined. Objectively: the pupils are dilated, nystagmus, bradycardia, the abdomen is tense, palpation is painful. What urgent care does the patient need?

2. Patient S., 25 years old, has been working as a diver for 5 months. After the dive, he went to the doctor with complaints of body itching. Objectively: pain in tender trunks of muscles and joints during palpation. The diagnosis was made: acute decompression sickness, mild form. Prescribe treatment, provide further work recommendations.

5. List of recommended literature (main, additional, electronic information resources)

Main

1. Occupational diseases / V. A. Kapustnik, I. F. Kostyuk, H. O. Bondarenko et al. ; edited by V. A. Kapustnik, I. F. Kostyuk. Kyiv : AUS Medicine Publishing, 2018. 496 p.

2. Occupational diseases. Manual for independent work of students. Odesa, 2017. 79 p.

Electronic information resources

1. Shen S. C., House R. A. Hand-arm vibration Syndrom // Can Fam Physician. 2017 Mar;63(3):206-210. <https://pubmed.ncbi.nlm.nih.gov/28292796/>

2. Official website of the Ministry of Health of Ukraine. <https://moz.gov.ua>

Topic 8. Sensorineural Deafness

Goal: to expand and specify the knowledge about sensorineural deafness that is developing at the workplace.

Basic concepts: industrial noise, sensorineural deafness.

Plan

1. Theoretical questions (literature).
2. Practical works (tasks) to be performed.
3. Test tasks for self-control.
4. Individual tasks for applicants of higher education on the topic.
5. List of recommended literature (main, additional, electronic information resources).

1. Theoretical questions (literature)

1. Peculiarities of the impact of industrial noise and accompanying hygienic factors on the condition of the auditory analyzer and the morbidity of operators bottling non-alcoholic and low-alcohol beverages of the “OBOLON” corporation / Yavorovskiy O. P. et al., 2017.

2. Occupational diseases. Manual for independent work of students. — Odesa, 2017. 79 p.

Note. Depending on the complexity and specificity of the educational topic, the availability of modern educational and scientific literature, this section can be presented with different levels of detail (the right to choose the form of displaying the content remains with the department):

Questions for self-control

1. What jobs accompanied by changes in atmospheric pressure do you know?
2. Describe the pathogenesis of the effect of increased pressure on the body of workers.
3. How many degrees of acute decompression sickness do you know?
4. Clinic for decompression sickness of medium severity?
5. Name the main clinical manifestations of chronic decompression sickness.
6. What complications of decompression sickness do you know?
7. What is a contraindication to work in conditions of increased atmospheric pressure?

Approximate tasks for theoretical material training

Main tasks	Instructions	Answers
1. To determine the etiology of sensorineural hearing loss, the peculiarities of normalization of MPC in works related to industrial noise		
2. To determine the features of the pathogenesis of sensorineural hearing loss		
3. Specify the features of the clinical course of sensorineural hearing loss, depending on the characteristics of industrial noise		
4. To resolve the issue of the ratio of local and general manifestations of sensorineural hearing loss		
5. List the features of treatment of sensorineural hearing loss, depending on the course		

2. Practical works (tasks), which will be performed

1. Build an accident investigation algorithm at work;
2. Build an algorithm for establishing the occupational nature of the disease.

3. Test tasks for self-control

1. A 47-year-old man R. came to the polyclinic with complaints of headache, weakness, reduced work capacity, sleep disturbances, unpleasant sensations in the heart area, tinnitus, palpitations, and hearing loss. It is known from the anamnesis that the patient has been working as a technologist at a water pumping station for 15 years. A few months ago, he underwent a course of treatment with lincomycin, he had the flu a Sunday ago. Objectively: organs of the cardiovascular system without pathology, blood pressure 140/90 mm Hg. Lability of the nervous system is revealed. On the audiogram, the threshold of sound perception is increased. Your diagnosis:

- a) Decreased hearing due to the use of lincomycin
- b) +Decreased hearing due to exposure to industrial noise
- c) Neuro-circulatory dystonia

- d) Infectious cochlear neuritis
- e) Hypertensive disease

2. A 46-year-old riveter, 19 years of professional experience, complains of hearing loss in both ears, tinnitus and head, headache, dizziness, periodic stabbing pain in the heart area. R — 78 ud. per minute, blood pressure — 140/80 mm Hg. Tones of the heart are rhythmic, sonorous. General hyperhidrosis, persistent diffuse red dermographism. During otoscopy: external auditory canals and eardrums are not changed. A tuning fork test indicates a violation of both air and bone conduction. Whispered speech is perceived from a distance of 0.5 m. On the ECG — sinus arrhythmia, moderate changes in the myocardium of metabolic origin. Formulate a diagnosis.

- a) Mesootite
- b) Acute otitis
- c) + Sensorineural deafness with significant hearing loss
- d) Minière's syndrome
- e) Otosclerosis

3. A 49-year-old man has been working as a conductor for 20 years. He has not heard any instruments for the last 2 months. Periodically there is a headache, dizziness. No changes were detected during general otoscopy. On the audiogram, there is an increase in the level of sensitivity. He can hear whispered speech normally. Roentgenogram of the bones of the skull without changes. Make a diagnosis:

- a) Otitis
- b) Otosclerosis
- c) Brain tumor.
- d) Cochlear neuritis
- e) Latent encephalitis

4. The men's work is related to the testing of high-power engines (jet aircraft). What spectrum of noise has the most adverse effect on the human body?

- a) +High frequency
- b) Low frequency
- c) Medium frequency
- d) Low- and medium-frequency
- e) All the above listed

5. In which department of the auditory analyzer are the changes that lead to the development of occupational deafness localized:

- a) Vestibular apparatus
- b) Drum membrane
- c) + Auditory receptor cells of the organ of Corti
- d) Auditory ossicles
- e) Everything is listed

6. What level of whispering perception is characteristic of occupational deafness with a mild degree of hearing:

- a) 5+1 m
- b) + 4+1 m
- c) 3+1 m
- d) 2+1 m
- e) 1+0.5 m

7. What level of perception of whispered speech is characteristic of professional deafness with a moderate degree of hearing:

- a) 5+1 m
- b) 4+1 m
- c) 3+1 m
- d) + 2+1 m
- e) 1+0.5 m

8. What syndrome can develop as a result of prolonged exposure to intense noise?

- a) Neurasthenic
- b) Asthenovegetative
- c) NCD by hypertensive type
- d) + All the above listed

9. What research method is used during periodic medical examinations for persons who work in conditions of intense noise?

- a) +Tone audiometry
- b) Determination of indicators of auditory adaptation
- c) Determination of the threshold of 100% speech intelligibility
- d) All the above listed

10. The use of which drugs is pathogenetically justified for occupational deafness?

- a) Vasodilating drugs
- b) Group B vitamins
- c) Biogenic stimulants
- d) Anticholesterol drugs
- e) + All the above listed

Note. It is suggested to use test tasks (for those seeking higher education who have to take part in the licensing test exams this year, it is more appropriate to use tests of the “KROK” type) and tests compiled by the departments for rector’s control.

4. Individual tasks for applicants of higher education on the topic

Patient C., 39 years old, has been working as an engine tester at a machine-building enterprise for 10 years, where noise at the workplace reaches 95–110 dB, mainly at high frequencies. In the last 3 years, he began to notice increased irritability, rapid fatigue, and occasional headaches. Later, during another medical examination, a decrease in tendon periosteal reflexes on the hands and feet, tremor of the fingers of outstretched hands, instability in Romberg’s pose, general hyperhidrosis, and persistent red dermographism were revealed. At the same time, he began to notice a decrease in hearing. No changes were detected in the otoscopic picture. Audiometry revealed an increase in hearing thresholds in the area of speech frequency perception in the range of 21–30 dB, at 4000 Hz — up to 65 (± 20) and a decrease in hearing for the perception of whispered speech up to 2 m (+1 m).

Tasks:

1. Establish a preliminary diagnosis.
2. Make a plan for the additional examination necessary for the final diagnosis.
3. Prescribe treatment, conduct a medical and occupational examination.

5. List of recommended literature (main, additional, electronic information resources)

Main

1. Occupational diseases / V. A. Kapustnik, I. F. Kostyuk, H. O. Bondarenko et al. ; edited by V. A. Kapustnik, I. F. Kostyuk. Kyiv : AUS Medicine Publishing, 2018. 496 p.
2. Occupational diseases. Manual for independent work of students. Odesa, 2017. 79 p.

Electronic information resources

1. National Institutes of Health (Nih) (gov) Sensorineural Hearing Loss Associated with the occupational noise Exposure: Effects of age-correction // URL : <https://pmc.ncbi.nlm.nih.gov/articles/pmc2672376/>

Topic 9. Occupational Diseases Associated with Overstrain of Some Organs and Systems

Goal: to expand and specify knowledge about the main occupational diseases associated with overstrain of individual organs and systems; to systematize knowledge about the clinic, diagnosis, treatment, prevention and resolution of questions on the examination of working capacity in patients with this pathology.

Basic concepts: Occupational dyskinesias, occupational tendovaginitis, myositis, ligamentosis, bursitis, polyneuropathy, radiculopathy, occupational neuroses.

Plan

1. Theoretical questions (main theses).
2. Practical works (tasks) to be performed.
3. Test tasks for self-control.
4. Individual tasks for applicants of higher education on the topic.
5. List of recommended literature (main, additional, electronic information resources).

1. Theoretical questions (main theses):

According to Section IV of List No. 1662, occupational diseases associated with overstrain of individual organs and systems develop among workers engaged in heavy and stressful work, which include:

1. Diseases of the musculoskeletal system — myositis, ligamentosis, bursitis, etc.
2. Diseases of the nervous system — polyneuropathy, radiculopathy, professional neuroses, etc.
3. Diseases of the organ of vision — progressive myopia;
4. Diseases of the ENT organs — chronic laryngitis, phonasthenia, etc.
5. Diseases associated with a forced standing position and general overstrain — varicose veins, prolapse of the uterus, etc.

In occupational pathology, according to order No. 246 “On the procedure for conducting medical examinations of employees of certain categories” of the Ministry of Health of Ukraine, the following types of overload of the musculoskeletal system are distinguished.

1. Heavy physical loads — carrying weights, moving substances, holding tools, etc., which are characterized by:

— cargo weight — more than 15 kg at a time or more than 850 kg per shift;

— the total weight per change of the retained tool is 45,000 kg per change.

2. Stereotypical movements in the limbs:

— with load — more than 20,000 movements per shift

— without load — more than 40,000 movements per shift

3. Tilts — more than 100 tilts and angles up to 300 per shift.

4. Forced kneeling position — more than 25% of working time.

Dissociative motor disorder (occupational dyskinesia) is an occupational disease caused by the worker performing highly coordinated movements at a fast, imposed pace. The mechanism of development of occupational dyskinesia includes complex disorders of the nervous regulation of motor function, which are accompanied by the impossibility of performing certain movements while preserving the functional abilities of the limbs.

By radiculopathies, we mean a group of acute and chronic disorders of the peripheral nervous system associated with damage to nerve roots, usually caused by pathological changes in the vertebrae, intervertebral discs and joints. Occupational radiculopathy is mostly chronic and associated with dystrophic changes of the intervertebral discs. The permissible load on the vertebral trunk is 100 tilts or turns at an angle of 30° per work shift.

Tendovaginitis is a group of occupational diseases, the basis of which are cicatricial changes of the tendon as a result of previous aseptic inflammation after stress alteration.

Occupational bursitis is a group of lesions of joint bags, which develops as a result of constant pressure on the joint, for example, when leaning on the knees, elbows, which leads to their traumatization and the formation of chronic inflammation.

Occupational myositis is a disease that develops as a result of significant physical exertion. Pathogenesis consists of muscle overstrain, dystrophic changes and subsequent ruptures of individual muscle fibers.

Note. Depending on the complexity and specificity of the educational topic, the availability of modern educational and scientific literature, this section can be presented with different levels of detail (the right to choose the form of displaying the content remains with the department).

Questions for self-control

1. What occupational factors lead to the development of occupational radiculopathy?
2. What variants of occupational radiculopathy do you know?
3. Describe the clinic of professional lumbosacral radiculopathy.
4. What complications of occupational diseases of the peripheral nervous system develop most often?
5. What studies are leading for the prognosis of work capacity in the development of occupational radiculopathy?

Approximate tasks for theoretical material training

Main tasks	Instructions	Answers
1. To determine the features of the pathogenesis of the main types of overstrain of the musculoskeletal system		
2. Specify the features of the clinical course of diseases of the musculoskeletal system depending on the type of overstrain		
3. List the complications of overvoltage		
4. To resolve the issue of the ratio of individual forms of diseases under the influence of several harmful factors		
5. To establish the differences in the examination of working capacity and prevention in various forms of overvoltage		

2. Practical works (tasks) to be performed

1. Build an accident investigation algorithm at work;
2. Build an algorithm for establishing the occupational nature of the disease.

3. Test tasks for self-control

1. What factor can lead to the development of occupational diseases of the musculoskeletal system?
 - a) High pace of work

- b) Homogeneity of movements
- c) Forced working posture
- d) Significant static and dynamic loads
- e) + All the above listed

2. Which syndrome is missing from the list of occupational (overstrain) diseases of the nervous system?

- a) Polyneuropathy of the upper limbs
- b) Compression neuropathies
- c) Cervical radiculopathy
- d) Lumbar-sacral radiculopathy
- e) + Encephalomyelopolyneuropathy

3. What syndrome is absent in the list of occupational diseases (from overstrain) of the musculoskeletal system?

- a) Chronic tendovaginitis
- b) Bursitis
- c) Styloidosis
- d) Aseptic osteonecrosis
- e) + Dupuytren's contracture

4. What syndrome is absent in the list of occupational diseases (from overstrain) of the musculoskeletal system?

- a) Stenosing ligamentosis
- b) Osteoarthritis
- c) Epicondylosis
- d) Spondyloarthrosis
- e) + Osteochondrosis of the spine

5. Most often, syndromes of occupational (overstrain) pathology develop in the muscles:

- a) Shoulder
- b) + Forearm
- c) Brushes
- d) Thighs
- e) Lower legs

6. What is the initial (functional) stage of muscle pathology from overstrain called?

- a) + Myalgia
- b) Myositis
- c) Myofasciitis
- d) Myofibrositis
- e) All the above listed

7. In which joint do the symptoms of occupational (overstrain) osteoarthritis most often develop?

- a) Shoulder
- b) + Elbow
- c) Radial and vertebral
- d) Interphalangeal
- e) Clavicle-acromial

8. What X-ray symptom can occur with osteoarthritis?

- a) Narrowing of the joint space
- b) Change in the contours of the epiphysis of the bones of the joint
- c) Subchondral osteosclerosis
- d) Marginal bone growths
- e) + All the above listed

9. The use of which drugs is most indicated for coordination neurosis?

- a) Vasodilating drugs
- b) + Tranquilizers
- c) Analgesics
- d) Nonsteroidal anti-inflammatory drugs
- e) All the above listed

10. What method of treatment is used for coordination neurosis?

- a) Autogenic training
- b) Psychotherapy
- c) Reflexology
- d) Balneotherapy
- e) + All the above listed

Note. It is suggested to use test tasks (for those seeking higher education who have to take part in the licensing test exams this year, it is more

appropriate to use tests of the “KROK” type) and tests compiled by the departments for rector’s control.

4. Individual tasks for students of higher education on the topic

**5. List of recommended literature
(main, additional, electronic information resources)**

Main

1. Occupational diseases / V. A. Kapustnik, I. F. Kostyuk, H. O. Bondarenko et al. ; edited by V. A. Kapustnik, I. F. Kostyuk. Kyiv : AUS Medicine Publishing, 2018. 496 p.

2. Occupational diseases. Manual for independent work of students. Odesa, 2017. 79 p.

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Occupational diseases : methodical guide for independent work for 6th year medical applicants of international faculty / Compiled by : O. Ignatyev, T. Oparina, O. Paniuta [et al.]. — Odesa : ONMedU, 2024. — 72 p.

The methodological guide was compiled by the staff of the Department of Occupational Pathology and Functional Diagnostics and Phthisiopulmonology with the aim of acquiring basic theoretical knowledge and professional competences in the diagnosis and treatment of occupational diseases by higher education students.

For independent work of 6th year medical students.

UDC 616-057(076)

Методичну розробку складено співробітниками кафедри професійної патології і функціональної діагностики та фтизіопульмонології з метою набуття здобувачами вищої освіти базових теоретичних знань та професійних компетентностей з питань діагностики та лікування професійних захворювань.

Для самостійної роботи здобувачів освіти 6 курсу медичного факультету.

Навчальне видання

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для самостійної підготовки здобувачів вищої освіти
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Англійською мовою

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Олександр Ігнат'єв, Тамара Опаріна, Олексій Паннюта,
Людмила Загородня, Тетяна Ямілова, Тетяна Прутян,
Вероніка Волянська

Формат 60x84/16. Ум.-друк. арк. 4,14. Тираж 100 пр. Зам. 2789

Одеський національний медичний університет
65082, Одеса, Валіховський пров., 2.

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