

**ANATOMO-PHYSIOLOGICAL PECULIARITIES, METHODS OF EVALUATION,
PARACLINICAL METHODS OF INVESTIGATION AND SEMEIOLOGY OF THE
BLOOD AND IMMUNE SYSTEM DISEASES IN CHILDREN**

Academic discipline «Pediatric Propedeutics»

Teacher's guide for the 3rd year

English medium students

**АНАТОМО-ФІЗІОЛОГІЧНІ ОСОБЛИВОСТІ, МЕТОДИ ОБСТЕЖЕННЯ ТА
СЕМІОТИКА ЗАХВОРЮВАНЬ КРОВІ ТА ІМУННОЇ СИСТЕМИ У ДІТЕЙ**

З дисципліни «Пропедевтика педіатрії»

МЕТОДИЧНІ РОЗРОБКИ

ДО АУДИТОРНОЇ РОБОТИ ВИКЛАДАЧІВ

МІНІСТЕРСТВО ОХОРОНИ ЗДОРОВ'Я УКРАЇНИ
Харківський національний медичний університет

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Затверджено
Вченою радою ХНМУ
Протокол № від

Харків
ХНМУ

2016

Anatomo-physiological peculiarities, methods of evaluation, paraclinical methods of investigation and semeiology of the blood and immune system diseases in children: Teacher's guide for the 3rd year English medium students / compiled by.: V.A Klymenko., T.V. Sirenko, O.S. Lupaltsova – Kharkiv: KhNMU, 2016. – 12 p.

Compiled by: Klymenko V.A.
Sirenko T.V.
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Анатомо-фізіологічні особливості, методи обстеження та семіотика захворювань крові та імунної системи у дітей метод. вказ. до аудиторної роботи викладачів / упор. В.А.Клименко, Т.В. Сіренко, Ю.В.Карпушенко. – Харків, ХНМУ, 2016. – 12 с.

Упорядники: Клименко В.А.
Сіренко Т.В.
Лупальцова О.С.

Amount of educational hours: self-dependent work – 1;
practical training – 4.

Contents

The knowledge of peculiarities of the blood and immune system in children in different age periods, methods of clinical-laboratory examination and semiotics of the main haematological syndromes (anaemic, haemolytic, haemorrhage and others) is necessary for diagnosing diseases in children. The immune system determines whether the organism stays healthy or get sick. The immune system is a complex array of organs, cells and chemicals that determine self from non-self, identify potential dangers to the body and eliminate them by mounting an immune response. If it is intact and in working order, this defence system activates the various immune cells that can rapidly and effectively overcome any threat from a viral or bacterial attack. Children are more susceptible to various infections, than adults. The reason for this is their developing immune system in different age period. The knowledge of main principles of functioning of blood and immune system in children according to the age is important for the practical work of a doctor.

Specific goals

- To define modern aspects of anatomical and physiological characteristics, methods of investigation diseases of the blood and immune system in children.
- To conduct clinical examination of the immune system and blood according to age.
- To differentiate the clinical signs of immunodeficiency, anemia, leading syndromes detect lesions of blood and immune system.
- To detect leading lesions in syndromes of blood and immune system.
- To interpret the results of laboratory and instrumental methods of investigation of the blood and immune system.

To know:

1. To define the anatomical and physiological characteristics of the blood and the immune system in children.
2. To define the peculiarities of the blood system in children of different age periods.

3. To define methods of clinical and laboratory investigation of children with diseases of the blood system.
4. To identify the clinical and hematological semiotics of major syndromes (anemic, hemolytic, haemorrhagic and other diseases of the blood system in children.
5. To define the peculiarities of the immune response in vaccinated children.
6. To define the term “immunodeficiencies», classification and semiotics immunodeficiencies.
7. To identify the clinical and immunological semiotics of HIV infection in children.

Be able to:

1. To collect anamnesis of children with diseases of the blood and immune system.
2. To demonstrate the conduction of the objective examination of the immune system and blood in children according to age.
3. To identify the major syndromes diseases of the blood and immune system.
4. To differentiate the clinical signs of immunodeficiency, anemia.
5. To interpret the results of laboratory and instrumental methods of investigation of the blood and immune system. Peculiarities of myelogram in children.

Providing an initial level of knowledge-abilities

To apply the materials of the guidelines for independent extra-curricular activities of students to the subject 1.

Materials needed for methodological support:

1. Case history of children with diseases of the blood and immune system.
2. Graphical structure of the topic «Organs of the hematopoietic system»- Appendix 1.
Graphical structure of the topic «Organs of immune system»- Appendix 2.
Graphical structure of the topic «Syndromes of blood diseases»- Appendix 3.
Graphical structure of the topic «Types of immunodeficiencies»- Appendix 4.

The technological card of the lesson

№	Step of the lesson	Study time (min)	Tutorials		Place of the lesson
			Learning tools	Equipment	
1.	Determination of the initial level of knowledge	20	Testing	Tests	Classroom
2.	Determination of the main positions of the topic	25	Quiz, discussion	Graphical structure of the topic, case history of childrens with diseases of the blood and immune system.	Classroom
3.	Break	10			
4.	Solution for the training tasks of the topic	45	Independent work of a student under the guidance of a teacher - training of practical skills	Premises and equipment of the hospital	Departments of the hospital
5.	Break	30			
6.	Solution for the training tasks of the topic	45	Independent work of a student under the guidance of a teacher - training of practical skills. Completion of the diary of practical training.	Premises and equipment of the hospital	Departments of the hospital

7.	Break	10			
8.	Determination of the output level of skills readiness.	20	Checking of the practical skills of a student while work in the departments.	Premises and equipment of the hospital	Departments of the hospital
9.	Determination of the output level of knowledge and skills readiness.	15	Solving and discussion of situational assignments Checking entries in the diary of practical training	Situational tasks	Classroom
10	Summation of the lesson. Assignment to the next lesson.	10	Quiz, discussion		Classroom

The estimated basis of the action in performance of the learning objectives of the topic (sections 4, 6):

1. Self classroom work in immunological department department – skill of clinical and paraclinical methods of examination of blood and immune system: interrogation, inspection, palpation, percussion, auscultation, determining pathological changes of an immune system, evaluation of blood and immune tests.
2. Determining pathological symptoms, combining them into syndromes. Care of children with diseases of blood and immune system.

Assignments for testing the final level of knowledge

Situational tasks

Task №1

During hystological analysis of the lymph node situated in the posterior neck triangle of an 10-year-old child a morphologist detected a cluster of cells including the following: isolated multinucleate Reed-Sternberg cells, large and small Hodgkin's cells and numerous lymphocytes, isolated plasma cells, eosinophils. What is your estimation of this hystological analysis. What disease has developed in child?

Answer: Reed-Sternberg cells represent a histopathologic hallmark for Hodgkin lymphoma. Lymphogranulomatosis has developed in child

Task №2

Parents of a 5-year-old boy report him to have frequent colds that develop into pneumonias, presence of purulent rashes on the skin. Laboratory tests have revealed the following: absence of immunoglobulins of any type, and naked cells are absent from the lymph nodes punctate. What kind of the immune disorder is it? What is pathogenesis of this disease? What are the main methods of diagnosis in this case?

Answer:

1. X-linked hypogammaglobulinemia (Bruton type agammaglobulinemia) has developed in child.
2. Bruton type agammaglobulinemia is a rare X-linked genetic disorder. The patients with X-linked hypogammaglobulinemia do not generate mature B cells, which manifests as a complete lack of antibodies in their bloodstream. A mutation occurs at the Bruton's tyrosine kinase gene that leads to a severe block in B cell development (at the pro-B to pre-B cell stage) and a reduced immunoglobulin (antibody) production in the serum. The main methods of diagnosis are immunity blood tests.
3. X-linked hypogammaglobulinemia diagnosis is probable when blood tests show the complete lack of circulating B cells (determined by the B cell marker CD19 and/or CD20), as well as low levels of all antibody classes, including IgG, IgA, IgM, IgE and IgD. When XLA is suspected, it is possible to do a Western Blot test to determine whether the Bruton's tyrosine kinase protein is being expressed. Results of a genetic blood test confirm the diagnosis and will identify the specific Bruton's tyrosine kinase gene mutation, however its cost prohibits its use in routine screening for pregnancies.

Task №3

Routine preventive vaccinations against poliomyelitis involve using live vaccine that is administered orally. What immunoglobulins are responsible for the development of local post-vaccination immunity in this case?

Answer: Secretory IgA

Task №4

After an attack of bronchial asthma a child had his peripheral blood tested. What changes can be expected?

Answer: Eosinophilia can be expected in Complete Blood Count.

Task №5

A 16-year-old child's blood test revealed the following: erythrocyte count is $6 \cdot 10^{12}/l$, hemoglobin is 10,55 ммоль/l. Vaquez's disease was diagnosed. Name the leading part of pathogenesis? What are signs of the disease?

Answer: 1. Neoplastic erythroid hyperplasia.

2. Primary polycythemia (or Vaquez's disease) is a disease which evolves progressively with few specific symptoms. There is often a permanent reddening of the skin (erythrosis), appearing mainly in the face and palms of the hands, and which shows also in the mucous membranes (mouth and conjunctiva). Patients may complain of head-aches, vertigo, flies flying in front of their eyes, buzzing in the ears, and pins and needles at the tips of their fingers. Acute erythro-myalgia is a typical symptom of the disease, but is not always present: this involves periods of pain at the extremities of hands or feet, accompanied by reddening and burning sensations. A very typical sign is when strong itching (pruritus) is triggered by contact with hot water.

Task №6

A 14-year-old child is diagnosed with chronic atrophic gastritis attended by deficiency of Castle's intrinsic factor. What type of anemia does the patient have?

1. What are causes vitamin B12 deficiency anemia else? 2. What are signs of disease?

Answer: 1. B12-deficiency anemia refers to low blood levels of vitamin B₁₂.

2. Vitamin B12 deficiency anemia usually happens when the digestive system is not able to absorb the vitamin. The causes vitamin B12 deficiency anemia are:

- The autoimmune attack on the parietal cells of the stomach that help absorb vitamin B12;
- Problems with the way body digests food, such as sprue (also called celiac disease), Crohn's disease, bacteria growth in the small intestine, or a parasite;
- Surgery to remove part of the stomach or the ileum.

3. Symptoms can include diarrhea or constipation; fatigue, lack of energy, or light-headedness when standing up or with exertion; loss of appetite; pale skin; problems concentrating; shortness of breath, mostly during exercise; swollen, red tongue or bleeding gums.

Task №7

HIV has gp41 and gp120 on its surface interacts with target cells of an organism. 1. Which of the following human lymphocyte antigens is gp120

complementary bound with? 2. What are signs of acute HIV infection and AIDS?
3. What are the main methods of acquired immune deficiency syndrome?

Answer: 1. lymphocyte -CD 4.

2. The initial symptoms of acute HIV infection may include: headache, diarrhea, nausea and vomiting, fatigue, aching muscles, sore throat, red rash that doesn't itch, usually on the torso, fever.

3. Acquired immune deficiency syndrome (AIDS) is the advanced stage of HIV infection. When the CD4 T-cell number drops below 200, people are diagnosed with AIDS. The symptoms of acquired immune deficiency syndrome may include: being tired all of the time, swollen lymph nodes in the neck or groin, fever lasting for more than 10 days, night sweats, unexplained weight loss, purplish spots on the skin that don't go away, shortness of breath, severe, long-lasting diarrhea, yeast infections in the mouth, throat, or vagina, easy bruising or unexplained bleeding

Task №8

Blood test of a patient suffering from atrophic gastritis gave the following results: RBCs - $2,0 \cdot 10^{12}/l$, Hb- 87 g/l, colour index - 1,3, WBCs - $4,0 \cdot 10^9/l$, thrombocytes - $180 \cdot 10^9/l$. Anaemia might have been caused by the following substance deficiency. What are the main methods of diagnosis in this case?

Answer: Vitamin B12. Methods of diagnosis may include Complete blood count, Reticulocyte count, a lactate dehydrogenase test (LDH level), Vitamin B12 level. Other procedures that may be done include Esophagogastroduodenoscopy (EGD) to examine the stomach, Enteroscopy to examine the small intestine, Bone marrow biopsy if the diagnosis is not clear.

Task №9

A 3-year-old child has eaten some strawberries. Soon he developed a rash and itching. What was found in the child's leukogram?

Answer: Eosinophilia can be expected in Complete Blood Count.

Task №10

The child, aged 5 years, had acute pulmonary insufficiency resulting from pneumonia. Pneumonia was not treated with antibacterial and antifungal therapy. Mother of child had HIV-infections. Histological investigation of lungs using biopsy has revealed interstitial pneumonia, alveolocyte desquamation and metamorphoses: alveolocyte enlargement, large intranuclear inclusions surrounded by lightly-coloured areas. Transformed cells resemble owl's eye. The

causative agent of pneumonia - cytomegalovirus, was identified by enzyme-linked immunosorbent assay method.

What are the main methods of diagnosis in this case?

Answer: The HIV-infections can be expected in child

Distribution points that can receive the student

The **maximum number of points** which may be consequently obtained by students is 200 points; this includes 120 points for current educational activity and 80 points for the final lesson.

Current educational activity of students is controlled during practical classes according to specific goals in the course of each practical class as well as during self-training in the hospital department. It is recommended to apply the following means of diagnostics of the students' level of readiness: control of practical skills, solving cases and test control of theoretical knowledge.

The current assessment of students on respective topics is conducted in the traditional 4-point grade scale ("excellent", "good", "satisfactory" and "unsatisfactory") with further conversion into a multiscore scale.

The grade "Excellent" is given when the student knows the program in toto, illustrating the answers with various examples; gives clear and comprehensive answers without any hints; delivers the material without any inaccuracies or errors; performs practical tasks of a different degree of complexity.

The grade "Good" is given when the student knows the whole program and understands it well, gives correct, consistent and structured but not completely comprehensive answers to questions, although he is able to answer additional questions without mistakes; solves all cases and performs practical tasks experiencing difficulties only in the most complex situations.

The grade "Satisfactory" is given to the student based on his satisfactory level of knowledge and understanding of the entire subject. The student is able to solve modified tasks with the help of hints; solves cases and applies practical skills experiencing difficulties in simple cases; is unable to deliver a consistent answer, but answers direct questions correctly.

The mark "Unsatisfactory" is given when the student's knowledge and skills do not meet the requirements of the grade "satisfactory".

Given the number of practical classes the grades are converted into the multiscore scale as follows:

The mark "Excellent" – 72-80 scores

The mark "Good" – 60-71 scores

The mark "Satisfactory" – 50-59 scores

The mark "Unsatisfactory" – 0 scores

Навчальне видання

**Анатомо-фізіологічні особливості, методи обстеження та семіотика захворювань
крові та імунної системи у дітей**

Упорядники: Клименко Вікторія Анатоліївна
Сіренко Тетяна Вадимівна
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Відповідальний за випуск: Клименко В.А.

Комп'ютерна верстка

Ум. друк. арк. ____ . Тираж ____ прим. Зам. № ____ .
