

Topic of the lesson: PATHOPHYSIOLOGY OF WHITE BLOOD SYSTEM

Aim: To be able to make pathophysiologic analysis of the situations associated with the development of leukocytosis and leucopenia.

Main questions over the topic of the lesson:

1. The characteristic and definition of “leukocytosis”, “leucopenia”, “aleukia”, “agranulocytosis”.
2. Leucopenia. Causes, types, mechanisms of development. Classification. Clinical meaning.
3. Leukocytoses: types, etiology, clinical meaning.
4. Changes of leukogram by leukocytoses and leucopenies.
5. Types of nuclear shift of neutrophils: changes of nuclear shift index.
6. Similar to leucosis reactions: characteristics, types, mechanisms of development, clinical meaning.

Literature: 1. General and clinical pathophysiology/Gozhenko A.I. - Odessa National Medical University. - 2002. - p. 124-143
2. Pathophysiology/Gozhenko A.I., Gurkalova I.P. - Odessa National Medical University. - 2003. - p. 201-215

CONTROL QUESTIONS

№	Instructions to the execution of the task	Answers of the students with the additions at the lessons
1.	What quantity and quality changes of leucocytes can appear by pathological processes in an organism? a, b, c, d	
2.	What is leukocytosis? What is the classification of leukocytoses? a, b, c, d	

3.	Give examples of physiological changes of leucocytes (a, b, c, d, e, f) and pathological leukocytoses a, b, c	
4.	What is the reactive leucocytosis? What are mechanisms of its development? a, b	
5.	What features are characters for relative leukocytosis? a, b, c	
6.	What is leukopenia? What is the classification of leukopenia? a, b, c, d	
7.	What is a granulocytosis? Mechanism of development. (a, b). Consequence.	
8.	Explain the mechanism of medicament agranulocytosis.	

9.	What is leucogram shift, types of it? –a, b	
10.	What kinds of left leucogram shift? a, b, c, d,	

TASK 1. Which diseases are associated with neutrocytosis?

1. _____
2. _____
3. _____

TASK 2. Which diseases are associated with eosinophilia?

1. _____
2. _____
3. _____

TASK 3. Which diseases are associated with basophilia?

1. _____
2. _____
3. _____

TASK 4. Which diseases are associated with lymphocytic leukocytosis?

1. _____
2. _____

3. _____

TASK 5. Which diseases are associated with monocytosis?

1. _____

2. _____

3. _____

TASK 6. Name hematological changes that are characteristic for every type of agranulocytosis?

1. _____

2. _____

3. _____

4. _____

TASK 7. Give the characteristic of myeloplastic agranulocytosis according to such data:

1. The level of leucocytes in blood _____

2. The percentage level of neutrophils _____

3. The percentage level of lymphocytes _____

4. The level of thrombocytes in blood _____

5. The level of erythrocytes in blood _____

6. The cytogenetic research of red marrow cells according to Ph- chromosome presence in cells with nucleus

TASK 8. In hemogrammas:

- assess the changes of general level of leucocytes in the unit of volume of peripheral blood
- give the characteristic of abnormality of relative and absolute quantity of every type of leucocytes (preliminary calculate their absolute quantity in blood.
- Mark the nuclear shift and its direction, type and the evidence of shift (calculate the index of the shift)
- detect the type of leucocytosis (leucopenia) according to the type of changes of leucocytes
- name the mechanisms of leucocytosis (leucopenia) development.

Hb	85 g/l
Erythrocytes	3,4 x 10 ¹² /l
Color index	calculate
Reticulocytes	2,1%
Thrombocytes	190,0 x 10 ⁹ /l
Leucocytes	17,0 x 10 ⁹ /l
Neutrophils	
Myelocyte	0%
Metamyelocytes	4,5%-5%
Band forms	16%
Segmented neutrophil	59,5%-60%
Eosinophiles	2%
Basophiles	0%
Lymphocytes	12%
Monocytes	5%

Hb	122 g/l
Erythrocytes	3,6 x 10 ¹² /l
Color index	calculate
Reticulocytes	0,8%
Leucocytes	3,4 x 10 ⁹ /l
Neutrophils:	
Myelocytes	0%
Metamyelocytes	0%
Band forms	23%
Segmented neutrophil	14%
Eosinophiles	1%
Basophiles	0%
Lymphocytes	55%
Monocytes	7%
Toxogenic granularity of neutrophils	

Conclusion:

TASK 9. *Solve the clinic-patophysiological tasks.*

A 38- year- old worker was delivered to the medical unit after burns during the fire in the manufacturing department. He has first-degree, second-degree burns on his right half of body (about 10% of body surface). Moderately severe condition. His temperature is 37,8°C. On the seventh day his condition got worse due to the infection of burned skin. The signs of the suppurative- exudative inflammation of skin and hypodermic tissue, his temperature is 40,2°C. The bloods analysis was carried out twice:

	Analyze A	Analyze B
Hb	125 g/l	125 g/l
Erythrocytes	$4,5 \times 10^{12}/l$	$4,7 \times 10^{12}/l$
Reticulocytes	0,5%	0,8%
Leucocytes	$10,5 \times 10^9/l$	$18,0 \times 10^9/l$
<i>Neutrophils:</i>		
Myelocytes	0%	1%
Metamyelocytes	0%	4%
Band forms	6%	14%
Segmented neutrophil	68%	60%
Eosinophiles	2%	0%
Basophiles	0%	0%
Lymphocytes	21%	16%
Monocytes	3%	5%

Questions:

1. Analyze the hemogramm A and B and make the conclusion of each of them. What is the difference between them?

2. The first analysis was carried by the admission, the second— on the 7th day. What hemogramm is typical for the patient on first day after the burn and for 7th day?

3. What are the mechanisms and causes of blood changes according to the dynamics of burn process?

TASK 10. *Solve the tests of self control*

1. A 38-year- old man who fought against a disaster on a nuclear power station has on examination: paleness of skin and visible tunica mucosa, respiratory rate- 22/min, pulse-95/min. Blood analyze: Hb-70 g/l, erythrocytes- $2,3 \times 10^{12}$ in 1 liter, leucocytes $3,3 \times 10^9$ /l, thrombocytes- 130×10^9 /l. How can you estimate the changes in blood?

- A. thrombocytopenia
- B. erythrocytopenia
- C. anemia
- D. leucopenia
- E. pancytopenia

2. A 29- year- old man was delivered to surgery clinic. He had acute pain in the right iliac region. On blood analysis: leucocytes 18×10^9 , Neutrophils- 78%, band forms - 9%, myelocytes- 2%, young- 7 %, segmentonuclear- 60 %, index of leukocyte nuclear shift- 0,30. What nuclear shift of leucogram can you see?

- A. left regenerative
- B. left degenerative
- C. left regenerative-degenerative
- D. left hyperregenerative
- E. left

3. A 35 –year- old woman was delivered to the surgery department. Her diagnosis is appendicitis, regional peritonitis. On blood analyze: leucocytes 23×10^9 , neutrophils- 77%, band forms - 12%, myelocytes- 2%, young- 8 %, segmentonuclear- 55 % What nuclear shift of leucogram can you see?

- A. left regenerative
- B. left degenerative
- C. left regenerative-degenerative
- D. hyperregenerative
- E. right

4. A 7- year- old child has an episodic sickness and vomiting. It was revealed ascariasis. What blood changes are associated with the helminthic invasion?

- A. neutrophilia

- B. basophylia
- C. eosynophylia
- D. monocytosis
- E. lymphocytosis

5. For which type of diseases are such blood changes typical:

erythrocytes- $2,1 \times 10^{12}$ in 1 liter, leucocytes $1,2 \times 10^9$ /l, thrombocytes- 80×10^9 /l, myelocytes- 0%, young-0 %, segmentonuclear- 22 %, lymphocytes- 57%, monocytes- 20%

- A. lymphocytosis
- B. acute inflammation
- C. agranulocytosis
- D. monocytosis
- E. neutropenia

6. It has been revealed that the 36 year old woman who lives near the Chernobyl nuclear power station has the decrease of general quantity of leucocytes to 2×10^9 and it has developed the myelotoxic leucocytopenia. What is the mechanism of it?

- A. antimetabolic
- B. idiosyncratic

- C. cytolytic
- D. immune;
- E. nothing from enumerated

7. Give the hematological characteristic of leicemoid reaction.

- A. decrease of general quantity of leucocytes
- B. decrease of young forms of leucocytes
- C. The left shift of leucogram with hyperregenerative character
- D. The left shift of leucogram with degenerative character
- E. appearing of blast forms of leucocytes

8. Give the characteristic of blood genesis by leucemoid reactions.

- A. similar to blood genesis by leucosis
- B. reactive hyperplasia of red marrow
- C. malignant transformation of red marrow
- D. possible hypofunction of red marrow
- E. reduction of mitotic nodes of lymphoid row

9. A 38- year -old man, who works for 12 years in the chemical complex where benzol is manufactured, was delivered to hospital. The blood analyze: leucocytes $3,0 \times 10^9$, neutrophils- 42%, band forms - 13%, myelocytes- 0%, young- 0%, segmentonuclear- 29 %, hypersegmentation of neutrophils. What nuclear shift of leucogram can you see?

- A. left regenerative
- B. left degenerative
- C. left regenerative-degenerative
- D. left hyperregenerative
- E. left

10. A 45- year- old man suffered from hepatitis last year. On blood analysis: decrease of leukocyte quantity: $3,6 \times 10^9$. He has a hypersplenism. What is the basic mechanism in the development of such symptoms?

- A. uneffective leukopoiesis
- B. disorder of leucocyte maturation
- C. destruction of leucocytes
- D. damage of hemopoietic cells
- E. disorder of leucocyte outcome from red marrow

For
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