

## Table of contents

<b>Chapter I</b>	
The methodology of prescribing laboratory and paraclinical investigations .....	7
<b>Chapter II</b>	
Blood tissue exploration.....	9
<b>Chapter III</b>	
Morpho-functional exploration of the red series .....	16
<b>Chapter IV</b>	
Exploring the white series (leukocytes) .....	32
<b>Chapter V</b>	
Exploring the megakaryo-platelet series .....	39
<b>Chapter VI</b>	
Primary hemostasis.....	42
<b>Chapter VII</b>	
Secondary hemostasis .....	50
<b>Chapter VIII</b>	
Pathophysiology of carbohydrate metabolism .....	63
<b>Chapter IX</b>	
Pathophysiology of lipid metabolism.....	73
<b>Chapter X</b>	
Pathophysiology of protein metabolism.....	84
<b>Chapter XI</b>	
Pathophysiology of hydroelectrolytic balance .....	100
<b>Chapter XII</b>	
The pathophysiology of acid-base balance .....	119
<b>Chapter XIII</b>	
Pathophysiology of the nervous system .....	127
<b>ANNEXES</b> .....	139
<b>References</b> .....	149

# Chapter I

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## **The methodology of prescribing laboratory and paraclinical investigations**

**Laboratory examination** - it involves the analysis of biological products (physiological or pathological) collected from the patient, but does not require the presence of the patient. It is performed in specialized laboratories, and the result is released together with the normal reference values (Appendix 1).

**Paraclinical examinations** - represents the explorations performed on a patient by the doctor, outside of the clinical examination. It requires the presence of the patient and consists of laboratory examinations, functional explorations (BP, AV monitoring) and imaging (ultrasound, radiography, CT, MRI).

**Mandatory laboratory tests** to any patient, regardless of condition:

- CBC;
- fasting blood sugar;
- urea and creatinine;
- ESR;
- urine summary.

### **Further investigations:**

- ⇒ Tests to support the presumptive diagnosis:
  - paraclinical investigations will be recommended depending on the affected organ, suggested by the history, clinical examination and laboratory examination;
  - they will establish the type of suffering, the topography, the clinical form (acute/chronic) or they will deny the clinical assumption;

- example: fever, cough, increased white blood cells⇒possible lung damage⇒lung x-ray, sputum examination, bronchoscopy are recommended.
- ⇒ Tests for assessing the degree of suffering;
- ⇒ Tests for differential diagnosis;
- ⇒ Tests for the evaluation of another organic disorder discovered at the same time;
- ⇒ Tests for monitoring the evolution of the disease in dynamics.

**Conditions for taking blood samples** for carrying out hematology and biochemistry laboratory investigations:

- ✓ explaining the procedure to the patient and obtaining informed consent;
- ✓ sample collection is done with the patient in basal conditions (in the morning, between 7-9 am, in "fasting" conditions);
- ✓ for the assessment of lipid metabolism, it is recommended that the collection be carried out 12 hours after the last meal;
- ✓ when blood samples are not collected in basal conditions, possible changes in parameters such as physical effort, emotional state or heart rate must be taken into account;
- ✓ the patient is invited to sit in a comfortable position (sitting or supine);
- ✓ collection of biological samples can be in the form of a single sample (for example, for the determination of basal blood glucose) or in the form of multiple samples (for example, oral glucose tolerance test or 24-hour urine collection);
- ✓ special attention must be paid to the correctness of the patient's demographic data and the appropriate labeling of the collection container.

## Chapter II

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### Blood tissue exploration

#### The structure of blood tissue:

- ⇒ circulating compartment:
  - plasma: yellowish-white aqueous solution containing proteins (albumins, globulins, fibrinogen), lipids, carbohydrates, electrolytes;
  - figurative elements (blood cell mass/ globular volume):
    - erythrocytes (red blood cells);
    - leukocytes (white blood cells);
    - thrombocytes (platelets).
- ⇒ hematofforming compartment (hematogenous marrow).

#### Total blood volume (volume):

- plasma volume + globular volume;
- 9% of body weight;
- $VN = 5-6 \text{ l} = 55-70 \text{ ml/kgc} = 2.5-3.1 \text{ l/m}^2$ ;
- higher in newborn (85 ml/kgc);
- in men the volume is about 10% higher than in women:
  - ⇒ plasma volume:
    - 55% from the total blood volume;
    - 5% of body weight;
    - ↓dehydration, burns;
    - ↑hyperhydration, edematous states, anasarca.
  - ⇒ blood cell mass:
    - 45% from total blood volume (normocythemia).

## Volume changes

⇒ physiological

↓

- physical effort – slight decrease in volume through the opening of new capillaries at the level of active muscle tissue and the passage of an additional amount of liquid into the interstitial space;
- gravitational - prolonged orthostatism reduces volume by increasing the capillary hydrostatic pressure at the level of the lower limbs and amplifying the extravasation of plasma fluid from this level.

↑

- postprandial – slight increase in volume through the absorption of liquids at the intestinal level;
- pregnancy – significant increase in volume (20-30%), determined both by the increase in plasma volume (hydrosaline retention and increase in plasma protein synthesis) and in the globular volume (increased secretion of erythropoietin).

⇒ pathological:

↓hypovolemia: acute anemia, shock, dehydration, malnutrition;

↑hypervolemia: polyglobulia, heart failure, renal impairment, intravenous infusion.

## Methods of exploring blood tissue

**CBC**– automatic (electronic) counting of figured elements, evaluation of different types of leukocytes, determination of cellular indices (erythrocytic, thrombocytic), hemoglobin (Hb) and hematocrit (Ht).

**Peripheral blood smear**– highlights the number of figured elements, the number of reticulocytes and the morphology of the figured elements.

⇒ Directions:

- changes to automatically determined parameters;
- previous smear changes.