

# Collection of biological material

This is a laboratory processing of biological material, which is essential for determining the correct diagnosis and for timely and effective treatment. The accuracy of laboratory results depends on the laboratory's own processing and the correctness of material collection.

## Blood collection

Blood is the most common biological material that is sent to laboratories for processing. This material is collected for therapeutic and diagnostic purposes (the results inform us well about the changes and composition of the internal environment of the organism). Blood is most often taken in the morning and on an empty stomach. In urgent cases, we take blood immediately - STATIM. We take samples from arterial, capillary and venous blood (mostly is taken from venous blood).

### Collection of the arterial blood

We take it most often to examine acid-base balance (so-called Astrup). We determine the pH of the blood, the level of bicarbonate and carbon dioxide.

### Collection of the venous blood

The veins on the forearm and around the elbow are suitable for blood collection in adults and older children. In newborns and infants, we collect blood from the veins on the forehead and temples.

### Collection of the capillary blood

Capillary blood is taken from the tip of the fingers of the upper limbs (index finger or middle finger) or from the earlobe. We most often find out the level of blood glucose.

### Blood collection errors

Hemolysis (breakdown of red blood cells) - bothers most biochemical and hematological tests, especially because many substances have passed from erythrocytes into serum or plasma and the released hemoglobin turns the serum red.

### Biochemical blood tests

#### Blood collection for erythrocyte sedimentation FW

According to Fahraeus and Westergren, it is a basic examination of the body's condition, taken from patients with inflammatory diseases, before the use of antibiotics and after treatment with them, use, before operations, during pregnancy, etc.

#### Blood collection for electrolytes

Trace elements, plasma proteins, substrates, enzymes, vitamins, tumor markers, infectious serology, immunoglobulins, autoantibodies, hormones, glucose, ammonia, lactate, etc.

#### Blood collection for analysis of acid-base balance, blood gases

Astrup - the sample taken must not contain air bubbles, it must be stored in crushed ice and transported to the laboratory as soon as possible.

### Hematological examinations of blood

- **Blood collection for blood count** – provides an overview of the level of hematopoiesis, it is an examination of the number of red and white blood cells, platelets and the amount of red dye.
- **Blood collection for hemocoagulation examination:**
  - Quick test - prothrombin test, performed in patients with liver disease and in patients treated with anticoagulant drugs.
  - APTT (activated partial thromboplastin time) - is performed in patients with various bleeding conditions, before surgery and also during control with anticoagulants, heparin, etc.

### Microbiological examinations of blood

#### Blood collection for blood cultivation

It is taken when septic disease is suspected in order to capture microbes released into the bloodstream, before the use of ATB. It is best to take it when the cold comes and the body temperature rises. We must follow a strictly aseptic procedure and repeat the collection 3 times in a row, always after half an hour, we will record the time of collection and properly (numerically I., II., III.,) mark the test tubes. It is collected in sterile test tubes with special

nutrient medium. Injection sites must be properly and repeatedly disinfected, disinfection must dry on the skin. The stopper of the collection tube is also disinfected several times, we put a new, sterile needle on the syringe and we spray the blood into the culture tube. The sample is immediately sent to the laboratory.

## Collection of the urine

### Basic qualitative examination of urine and urinary sediment

We detect the presence of proteins, glucose, ketone bodies, urobilinogen, bilirubin, blood elements. Examination of the urinary sediment will determine the number of erythrocytes, leukocytes, cylinders, epithelia, crystals, etc. present.

Quantitative biochemical urine tests (balance collection): performed over a period of time, most often in 24 hours. Basic urine examination using Lachema-Nova Phan paper indicators.

### Microbiological examination of urine

The sample must be obtained by aseptic technique (urine is sterile in a healthy person). We take a medium stream of urine or, exceptionally, by catheterizing the patient. Prior to collection, the patient should be instructed in proper hygiene, genital cleansing, and safe handling from a sterile test tube, including a cap. Urine is collected in sterile test tubes and immediately sent to the laboratory.

## Collection of the stool

We monitor the regularity of bowel movements throughout the patient's stay. We are interested in its quantity, frequency and color. Stools are examined for the presence of blood, undigested striated muscle, undigested starch, undigested fats, and parasites.

### Biochemical examination

Qualitative examination for occult bleeding. Stool collection for the presence of undigested food (a sample is taken after a three-day weight-intensive diet rich in protein, sugars and fats). Determination of fat in the stool (the content of neutral fat is determined, it is performed after a three-day diet with a content of 1.5 g fat/day, it is taken for diseases of the bile ducts, pancreas, intestines, etc.).

### Microbiological examination

It is performed when an infectious disease of the digestive tract is suspected. It is performed by swabbing the rectum with a sterile brush, which is inserted into a sterile test tube and carefully closed (the brush is inserted about 3-4 cm deep).

### Parasitological examination

A special "parasitological kit" is intended for this examination, which contains 3 test tubes, where the collection is repeated 3 times, every other day. If we examine the stool on the pinworm, 3 laboratory slides with isolepe are attached to the set, which we glue on the anal opening, peel off and glue on the slide with the sticky side, the sampling is repeated (3 × every other day).

## Collection of the sputum

Sputum is an enlarged secretion of the airways, which we take for microbiological examination (strains of viruses, bacteria and fungi are cultured and identified in sputum).

### Microbiological examination

Microscopic examination reveals the presence of leukocytes, mycobacteria, tuberculosis, tumor cells, etc., sputum is collected in sterile wide test tubes, in the morning, on an empty stomach, the patient first cleans his mouth, spits saliva into the pulp, then takes a deep breath and coughs the sputum into a test tube.

### Cytological examination

Cytological examination of sputum (we determine the origin, structure, function and pathology of cells, usually it is necessary to collect 3 samples).

## Swabs and smears

We perform swabs from mucous membranes and smears from skin areas with a sterile brush in a sterile package, to which the brush is returned after collection and sent to the laboratory. Smears are most often sent for microbiological and cytological examination.

### Collection points

- Swab from the oral cavity (before wiping the patient must not brush his teeth, eat, drink or smoke);
- Swab from the nasal cavity (it is always performed before the application of ointments and drops, usually in the morning, we introduce the brush deep into the nose and wipe it thoroughly with a circular motion);
- Smear from tonsils (we compress the root of the tongue with a tongue blade and wipe the surface of the tonsils with a brush, the patient's preparation is the same as when swabbing the oral cavity);
- Wound swabs and skin surface swabs (when swabbing the wound, it is necessary to remove directly pus or part of the pathological process). Swabs and smears are most often taken from skin defects, conjunctiva, nasal cavity, ears.

## Collection of the gastric contents

We obtain samples of gastric and duodenal juices for biochemical, microbiological and cytological examinations, and send the sample in a sterile test tube.

### The collection is taken:

- Through a gastric tube;
- From the emesis bowl during vomiting;
- During endoscopic examination.

## Puncture

A procedure in which a puncture needle is inserted into a body cavity or organ. It is performed for therapeutic or diagnostic purposes in rooms intended for small operations (aseptic environment). Performed by a doctor with the assistance of a nurse. Patient preparation, both physical and mental, is important. **CAVE! Informed consent is required.**

### Collection of the cerebrospinal fluid

The cerebrospinal fluid (liquor) is taken strictly aseptically from the spinal canal during a lumbar puncture performed by a doctor with the assistance of a nurse. During lumbar puncture, a needle is inserted into the subarachnoid space of the spinal canal and the cerebrospinal fluid is removed, the injection being made between the third and fourth or fourth and fifth lumbar vertebrae. Liquor is allowed to drip freely into a sterile tube in which 5-7 ml is sent for immediate processing (the temperature of the liqueur must be 37 ° C until processing). Liquor is normally clear and colorless. It is most often sent for macroscopic, microscopic, biochemical and cytological examinations.

### Collection of the fluid from the peritoneal cavity

Abdominal paracentesis is the removal of fluid from the peritoneal cavity when it multiplies and accumulates a large amount – ascites (eg. in liver cirrhosis). The goal is to obtain a fluid sample for laboratory examination and relieve pressure on the abdominal organs. Before the puncture, the patient is on an empty stomach. The procedure is performed in a semi-sitting position so that fluid accumulates in the lower part of the abdominal cavity. It is necessary to maintain contact and control the patient's condition, because if the operation is associated with the removal of ascites, hypovolemic shock can occur, which is caused by the loss of large amounts of fluids.

### Collection of the fluid from the pleural cavity

Thoracocentesis is the collection of fluid or air from the pleural cavity, the increased amount of fluid being pumped out for diagnostic and therapeutic reasons. It is performed as a sterile, puncture needle, on which we place a three-port valve to prevent air from entering the pleural cavity. We suck about 15 ml of puncture into a syringe attached to the puncture needle via a three-port valve and immediately send it to the laboratory.

## Biopsy

Examination of a sample of a living human organ or tissue. Samples are most often examined histologically and cytologically. The biopsy is performed by a doctor with the assistance of a nurse in aseptic conditions, usually in a room designed for small procedures.

### Collection of the bone marrow

The composition of blood elements is determined from bone marrow samples, which reveal blood diseases. The most common site for a bone marrow biopsy is the sternum. The procedure is performed under local anesthesia, under strictly aseptic conditions. The doctor inserts a biopsy needle with a stylet/mandrin through the skin and bone (we warn the patient that he may hear a "crunch" and the possibility of a feeling of pressure). Then we insert the stylet/mandrin back into the needle, pull out the needle and cover the injection site aseptically. Samples are immediately sent to the laboratory in sterile test tubes. **CAVE! Detailed informed consent is required.**

### Collection of the renal tissue

Diagnostic examination performed by a doctor, strictly sterile. Before the procedure, we will check the laboratory values of blood clotting and the number of platelets.

The procedure is performed under local anesthesia, the doctor uses ultrasound to determine the position of the kidney and marks the injection site. After proper disinfection and checking the effectiveness of the anesthesia, the doctor will insert a biopsy needle – after pulling out, renal tissue remains in the needle, which is immediately sent to the laboratory in a sterile tube, and lightly compress the injection site with a sterile swab with a patch. After the operation, the patient stays in bed for 24 hours, we monitor physiological functions and check the color of the urine. AWe actively give enough fluids (approx. 2000 ml)). **CAVE! Informed consent is required** (and instructions about possible complications).

### Collection of the liver tissue

The procedure is usually performed for diagnostic reasons in liver disease, under strictly sterile conditions with a biopsy kit. Before the procedure, we check laboratory tests for prothrombin test and platelet count. After proper disinfection and local anesthesia, we ask the patient to take several deep breaths and hold his breath for about 10 seconds after the last exhalation. The doctor inserts a needle and aspirates the liver tissue, after which the patient can breathe normally. The needle is inserted between the two lower ribs on the right side or across the abdomen under the right rib arch. After pulling out, we cover the injection site aseptically and apply an ice pack over the bandage. After collection, the patient must take a position on the right side with a pad under the biopsy site - he must remain in this position for several hours. We check the physiological functions, the injection site and whether the patient does not report abdominal pain. **CAVE! Informed consent is required.**

## Sources

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