

Blood sampling for examination

Blood is the biological material that is most often taken for examination. The sampling method is determined by the examination methodology in the laboratory and its technical equipment. A blood test examines whole blood, plasma or serum. When examining plasma, an anti-coagulant solution must be added to the collected blood sample. For blood serum testing, coagulated blood is collected and serum is obtained by spinning. Serum does not contain coagulation factors. Anticoagulants are in liquid form (mixed in a certain ratio with the patient's blood in a collection tube) or in crystalline form (crystalline vapor on the walls of the collection containers). The most common anticoagulants are: heparin, sodium citrate 3.8%, K2 EDTA (ethylene diamine, tetracel salt). After collection, it is necessary to mix the blood with the anticoagulant by '*rotation, not inversion!* With the blood taken, **we don't shake!** In order to make the blood serum easier to bottle in the laboratory, coagulable blood is collected in a test tube. These are plastic granules that prevent the release of fibrin and thus prevent hemolysis. Most analyzes are performed from venous blood. Capillary blood is most often examined for: glycemia, acid-base balance, bilirubin, screening examination for phenylketonuria and hypothyroidism in newborns, hematological examination in children.

Practical implementation of blood sampling

Blood collection devices

sampling tube, needles for blood sampling, lancets, cups for capillary sampling, tourniquet, disinfectant, squares of pulp or tampons, tools for OH&S at work, emission tray, container for used needles, syringes.

Venous blood sampling

It is performed from accessible peripheral veins. Possible injection sites: v. median, v. basilica, v. cephalica in the elbow fossa, veins on the forearm, back of the hand, legs, veins in the parietal and temporal region (infants, toddlers).

Recommendation for venous collection

For people with clearly visible veins, it is advisable to perform a **sampling from the unstretched arm**. However, this method cannot be implemented in all patients. In this case, we proceed as follows. We pull the arm **briefly**. We disinfect the injection site. After impaling the vein, we immediately release the tourniquet to collect free-flowing blood. Before sampling, the patient should not exercise the whole arm, but open and close the fist. Sampling from a longer retracted arm and with previous exercise is a problem for a number of examinations - most notably for mineral examinations (for potassium cation, its concentration in the serum can rise by up to 30%), also for examinations of creatine kinase, lactate dehydrogenase isoenzymes, lactic acid, in hematological examinations it changes mainly hemoglobin, hematocrit values. If the patient has difficult-to-access veins and the sampling cannot be performed in this way, it is necessary to indicate on the request form that it is a sampling from the retracted arm with exercise, so that the doctor can take this fact into account when interpreting the results of the laboratory tests. A venous blood sample for hematological examination should always be taken first, as the ratio between plasma and blood elements may change with prolonged venous congestion.

Ways of closed subscription system

Vacuum blood sampling

The sampling system consists of 3 parts: a special double-sided needle, a holder and a vacuum tube.

Method:

- prepare tools and put on protective gloves,
- we place the patient's arm with the selected vein comfortably and support it with a protective pad,
- we pull a tourniquet over the injection site of the arm,
- we disinfect the injection site,
- we remove the lower cover of the needle and screw the thread of the needle holder onto the thread of the cone,
- remove the cover of the needle intended for injection,
- insert the needle into the vein,
- we select the test tube for the required sampling and insert it into the holder (inserter) so that the short part of the needle penetrates the stopper of the test tube, the test tube will automatically fill with the required amount of blood,

- we exchange the filled test tube for another one - for the next sampling (the rubber protection of the needle prevents blood from leaking out of the vein),
- release the tourniquet,
- we take out the needle, firmly press the tampon to the injection site, compress the injection for 3-5 minutes.

We know from experience that we cannot use a vacuum for all patients (it is not recommended for children and the elderly, as the vein may collapse).

A closed system using a piston or vacuum

The sampling system consists of 2 parts: a special double-sided needle that has a modified cone with notches, a syringe with a modified cone.

First, we evaluate the condition of the patient's veins. If the patient has thin veins, we collect blood using a piston, which regulates the outflow of blood from the vein and thus prevents its collapse. If the patient has strong enough veins, we can use the vacuum, which we prepare just before sampling by pulling out and locking the plunger on the syringe. After the end of sampling, we break off the piston on the syringe and the syringe thus becomes closed a tube in which the blood cannot become contaminated, broken or otherwise degraded.

Removal using a piston

- We will prepare tools and put on protective gloves;
- we place the patient's arm with the selected vein comfortably and support it with a protective mat;
- we pull a tourniquet over the injection site of the arm;
- we disinfect the injection site;
- we place the needle with the groove on the protrusion of the syringe, press it lightly and turn it clockwise;
- we puncture the vessel, release the strap and draw the blood by pulling the piston;
- we disconnect the syringe, the needle remains in the vessel, we change the syringe for the next sampling;
- the needle is removed from the vessel only after disconnecting the last syringe;
- lock the syringe piston and break off the piston rod.

Removal by vacuum

- Before starting the sampling, the needle must already be inserted in the blood vessel, it is possible to prick the vessel with the needle itself or perform the first sampling using a piston, only then use vacuum sampling;
- before sampling, pull the piston all the way to the stop of the syringe, lock it, break off the rod;
- put the vacuum syringe on the needle;
- if the blood stops flowing, disconnect the syringe from the needle;
- remove the needle from the vein.

Capillary blood sampling

It is performed from the belly of the fingers or from the heel in newborns and infants. The advantage of taking capillary blood is that its composition is close to arterial blood and it is not necessary to punctate the artery for its collection, and the concentrations of individual substances can be related to arterial concentrations better than when taking venous blood. In practice, it is most often used for determining glycemia or analyzing blood gases according to Astrup. We also use capillary blood for newborn screening.

Method:

- ensure good circulation of the injection site (warm, massage),
- disinfection, injection from the side of the abdomen (deep enough), wiping off the first drop (a large admixture of tissue fluid),
- sampling into capillaries (without air bubbles), sampling into a kep (microtubes),
- let the blood drip freely, without forceful squeezing,
- treatment of the injection site.



Blood sampling from the foot for newborn screening

Examination of acid-base balance according to Astrup from capillary blood

When collecting capillary blood, we respect the following principles:

- sampling is carried out in 2 heparinized capillaries,
- the injection site must be well supplied with blood, it is recommended to warm it up, e.g. in a water bath,
- the injection site is disinfected with alcohol - ether,
- blood is taken directly from the puncture into the capillary,

- the column of blood in the capillary must not be interrupted by air bubbles,
- the ends of the capillary are closed with putty, plasticine or plastic flaps are placed on them,
- mixing is done using a metal wire and a magnet,
- capillaries must be transported in a horizontal position,
- the examination must be performed within 30 minutes after collection.

Related Articles

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- Blood
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- Biochemical blood analysis ■ Laboratory examination of acid-base balance
- Blood culture ■ CRP ■ PCT