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INNOVATIVE ANALYSIS OF BLOOD

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Abstract. The modern methods of blood analysis are analyzed in the article. The feasibility of their use for diagnosing diseases in the early stages is presented and investigated in the article, too. The object of the work is blood test of a human and the subject is methods of examining blood plasma, circulating tumor cells and mononuclear cells.
Keywords: innovative methods of blood analysis, immunological methods, matrix metalloproteinases 2 and 9, circulating tumor cells.

ИННОВАЦИОННЫЕ МЕТОДЫ АНАЛИЗА КРОВИ

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Аннотация. В работе анализируются современные методы анализа крови. А также целесообразность их использования для диагностики различных заболеваний на ранних стадиях. Объект данной работы – анализ крови человека, а предмет – современные методы исследования плазмы крови, опухолевых клеток.
Ключевые слова: инновационные методы анализа крови, иммунологические методы, матриксные металлопротеиназы 2 и 9, циркулирующие опухолевые клетки.

Current relevance. There has been frequent discussion about applying different techniques in blood analysis suitable for all types of examination of a

patient. The greatest controversy has centered on whether the modern methods should be used or not.

Innovative methods of blood analysis in the modern world are an integral part, and their relevance reaches its climax in mind environmental degradation and socio-economic conditions, accompanied by a prolonged stressful situation, which leads to a decrease of immune reactivity of the population increasing frequency of development of secondary immune deficiencies.

Subject and object. The object of study is human blood test.

The subject of study is methods of examining blood plasma, circulating tumor cells, mononuclear cells.

Main body. To start with, blood, fulfilling the body's most important metabolic functions (respiration, nutrition and excretion) is simultaneously a carrier of information that allows it to induce the body if there is a necessity to incorporate your adaptive reserves, correcting its vital functions, including the protection and rehabilitation of organs, systems and organism as a whole.

Blood is a complex fluid tissue composed of a liquid portion, plasma, and cellular components. Plasma is a mixture of dissolved proteins, salts and other chemicals. The blood cells are of three main types: red blood cells, which are called as erythrocytes, white blood cells which are called as leukocytes and platelets, which are called as thrombocytes.

The quality of the blood is immediately reflected in the haematopoiesis and morphological features of the cells of peripheral blood flow. These reactive states of morphological features of the cells of peripheral blood flow are the object of study and disease diagnosis in a laboratory of her research, since they reflect a particular pathology of the organism as an integrated living system.

To understand the methods of examining blood, it should be stated that «a blood test is a laboratory analysis performed on a blood sample that is usually extracted from a vein in the arm using a needle, or via fingerprick. Multiple tests for specific blood components (such as a glucose test or a cholesterol test) are often grouped together into one test panel called a blood panel or blood work.

Blood tests are often used in health care to determine physiological and biochemical states, such as disease, mineral content, pharmaceutical drug effectiveness, and organ function. Typical clinical blood panels include a basic metabolic panel or a complete blood count. Blood tests are also used in drug tests to detect drug abuse. In some of the United States, a blood test is required before marriage; historically, this was previously true in more states» [Wikipedia, e-doc].

Local and systemic changes in immunity can be detected through immunological study of blood using the basic traditional and modern methods. Immunological methods are required to create new diagnostic and therapeutic technologies, including pathogenetically substantiated tailored immunotherapy with the features of the immune system of the individual patient. Timely correct diagnosis of immune disorders, allowing their correction, allows reducing the dose and duration of use of antibiotics, to prevent the occurrence of allergic reactions.

The main parameters of the immune status are the number and activity of circulating lymphocytes, natural killer and phagocytic cells, the concentration of serum immunoglobulin, the content of specific antibodies [Кулаков, 2009]. Immunological methods allow characterizing the immunological background, which develops the majority of gynecological and obstetrical diseases, and monitor the effectiveness of treatment, primarily immune modulatory drugs.

There is quantitative determination of subpopulations of lymphocytes using monoclonal antibodies – antibodies that are identical because they are produced by one type of immune cell, all clones of a single parent cell; a single type of antibody that is directed against a specific antigenic determinant (epitope).

Division of human lymphocytes to T-lymphocytes, B-lymphocytes and natural killer cells based on their biological functions and expression of their cell surface antigens (AG), determine the level which is called the full. The method is based on binding of fluorescent labeled monoclonal at the surface of AG lymphocytes and profitability analysis using laser flow cytometer or fluorescent microscopy.

The aim of the study is the cell count of a particular population, or spectrum of AG, expressed on these cells.

From the patient's vein, take blood in a tube with heparin (20 U/ml). The blood is treated with lysing solution to destruction of erythrocytes or by using a gradient centrifugation of the isolated fraction of mononuclear cells. The cell suspension is incubated in the dark for 15-30 min with the appropriate fluorescent labeled monoclonal at.

The results recorded on a flow cytometer or by using a fluorescent microscope within 6 h. the lymphocytes were fixed with 1% paraformaldehyde can be stored at +2-8 °C for up to 24 h. The analysis allows to estimate the number of lymphocytes in subpopulations, the results are compared with standard values, calculate the ratio of T-helper and T-cytotoxic lymphocytes (immune regulatory index), the content of activated T-lymphocytes. Determination of the percentage of T-lymphocytes, b-lymphocytes and NK-cells are used for the characterization of immunodeficiency and autoimmune conditions, neoplastic and viral diseases. The full cells used to confirm the diagnosis and monitor the condition of the immune system of the patient in the treatment process [Кулаков, 2009]. The sensitivity and specificity of the method depends on the quality of reagents used.

There is a method for determining the activity of matrix metalloproteinases 2 and 9 (MMP2 and MMP9) in serum (zymography). Expression MMP2 and MMP9 in the tissue reflect the processes of tissue remodeling in both normal (menstruation, ovulation, implantation), and pathology (inflammatory and hyperplastic processes, fibrosis). MMP2, MMP9 tissue and penetrate into the blood in concentrations proportional to their expression in tissues. Measuring their concentration in serum gives information about the status of tissue reconstruction and allows assessing the dynamics of the manifestations of the pathological process and the effectiveness of treatment [Савельева, 2009].

The aim of the study is the diagnosis of inflammatory and hyperplastic processes in the female reproductive system and monitoring the flow and effectiveness of treatment. It is necessary to mention, that female reproductive

system is very complicated. It «contains two main parts: the uterus, which acts as the receptacle for the male'ssperm, and the ovaries, which produce the female's egg cells. These parts are internal; the vagina meets the externalorgans at the vulva, which includes the labia, clitoris and urethra. The vagina is attached to the uterus through thecervix, while the uterus is attached to the ovaries via the Fallopian tubes. At certain intervals, the ovaries release anovum, which passes through the Fallopian tube into the uterus» [FRS, 2010]. Thus, its testing need careful and attentive analysis of blood and its components.

The blood plasma is separate of venous blood which is explored in such kind of testing. Serum samples applied to polyacrylamide gel, containing a substrate for MMP2 and MMP9, whey proteins are separated under the action of electric current. Next, the gel is incubated, while being in it MMP2 and MMP9 destroy the substrate. Next, the gel is incubated, while being in it MMP2 and MMP9 destroy the substrate. These bands correspond in these areas MMP2 and MMP9. The colour intensity of the bands is proportional to concentration MMP2 and MMP9 [Савельева, 2009].

Equally important is the analysis of circulating tumor cells (CTC) in the blood. «Circulating tumor cells are cells that have shed into the vasculature or lymphatics from a primary tumor and are carried around the body in the circulation. CTCs thus constitute seeds for the subsequent growth of additional tumors (metastases) in vital distant organs, triggering a mechanism that is responsible for the vast majority of cancer-related deaths» [Wikipedia, e-doc].

Today more than 1 million people is treated from cancer in Ukraine. Every year doctors record 160-200 thousand new cases of the disease. Every day 450 people in Ukraine know that had cancer, and this statistic continues to grow. More than 30% of all cancer cases are diagnosed at later stages. Diagnosis of the disease in the early stages, it is fast and quality of healing [Колесник, 2016].

Cancer is the uncontrolled growth of cells in the body. Over the past several decades, the realizing of cancer has improved a lot. «Cancer is an extremely complex disease composed of various molecular alterations and phenotypic

changes. The vast majority of cancer deaths occur due to metastasis of the primary tumor to distant sites via circulating tumor cells in the circulation. Circulating tumor cells are extremely rare. Over the past 5–10 years, various methodologies and platforms have been developed to isolate circulating tumor cells for further characterization and molecular analyses. The emergence of these technologies have spurred a great interest in circulating tumor cells and researchers and clinicians are realizing the importance of circulating tumor cells in cancer biology as well as their use in cancer diagnosis and therapy» [NDR].

The aim of the circulating tumor cells study is to determine the presence of tumor cells circulating in the blood.

The analysis of circulating tumor cells allows you to recognize cancer cells, their number and even able to identify the type of cancer much earlier than existing imaging systems such as positron emission tomography (PET/CT), magnetic resonance imaging (MRI), computed tomography (CT) or ultrasonography (us). The analysis of circulating tumor cells is able to recognize cancer cells in the blood when tumor size 0.5 mm [Балоглу, 2016].

The technique allows carrying out accurate and early detection of cancer cells. Scientific data show that the tumor cells penetrate into the bloodstream before the tumor is still very small. This technology distinguishes these cells from the blood, identifies with specific antibodies (monoclonal antibodies to epithelial antigens. The system can detect one tumor cell among a billion blood cells. Any change in the number of tumor cells in blood provides doctors with unique information on the progress of the disease at a very early stage.

In order to analyze circulating tumor cells, you need 10 ml of blood. The technology of drawing blood requires a rejection of the first 2 ml, to epithelial cells at the puncture site did not affect the accuracy of the analysis. This new method recognizes the tumor cells, determining their number and identificeret type of cancer. All these steps can be done in just 1 day.

The analysis of circulating tumor cells recognizes epithelial tumors, which account for 90% of all echnologically diseases. The technique with 100% accuracy

identifies 5 sources of circulating tumor cells in lung cancer, breast cancer, colorectal cancer, thyroid cancer, prostate cancer.

The analysis of circulating tumor cells gives absolutely precise data for epithelial tumours, is more than 0, 5 mm, since ultra-small tumors still do not allocate cells in the blood. A major advantage of the technique is that it does not give falsely positive diagnoses, i.e. the patient will never say that he has cancer, if his body there [Балоглу, 2016].

This innovative method allows us to trace the process of treatment of each patient. Using existing methods of diagnosis of cancer, such as PET/CT, the treatment outcome can be assessed only after 3 months, while subjecting the patient to radiation. The analysis of circulating tumor cells after 2 weeks of therapy gives accurate information about the change in the number of tumor cells before and after treatment. The analysis of circulating tumor cells enables oncologists routinely and quickly analyze whether the acts prescribed therapy and, if the result is positive, continue to monitor.

Conclusion. Blood is a source of information about a human in general and about his / her health in particular. It is a key to patient's treatment. It should be mentioned, that there are many modern types of blood test which are applied in medicine to treat different diseases. Innovative analysis of blood provides the opportunity for timely and correct diagnosis of various diseases: neoplastic, viral, immunodeficiency and autoimmune states. Early diagnosis allows carrying out quick and quality treatment of these diseases.

This information can be used for theoretical use in learning hematology, for practical use in work with testing blood. Thus, it can be used as the material for developing knowledge in blood and its analysis for medical students, interns and junior practitioners.

LIST OF LITERATURE:

1. Ankirskaya A.S., Murav'yova V.V. Laboratornaya diagnostika opportunisticheskih infekcij vlagalishcha [Text] // Cons. medic. — 2005. —№ 3 — S. 206–210.

2. Baloglu H. Innovacionnye metody diagnostiki raka [Text] / H. Baloglu [Elektronnyj resurs]. – Rezhim dostupa: http://ru.bookimed.com/article/intervu-s-professorom-husejnom-baloglu/

3. Kolesnik E. A. Rannyaya diagnostika raka v Ukraine: malen'kie shagi k resheniyu bol'shoj problemy [Text] / E. A. Kolesnik [Elektronnyj resurs]. – Rezhim dostupa: http://www.likar.info/onkologiya/article-75986-rannyaya-diagnostika-raka-v-ukraine-malenkie-shagi-k-resheniyu-bolshoj-problemy/

4. Kulakov V. I. Nacional'noe rukovodstvo po ginekologii [Text] / V.I. Kulakov, G.M. Savel'eva, I.B. Manuhin, 2009. – S. 45-56

5. Soboleva G.M., Suhih G.T. Semejstvo matriksnyh metalloproteinaz: obshchaya harakteristika i fiziologicheskaya rol' [Text] // Akusherstvo i ginekologiya. — 2007. — № 1. — S. 5–8.

6. FRS: Female reproductive system (human) [Elektronnyj resurs]. – Rezhim dostupa: http://en.academic.ru/dic.nsf/enwiki/322524

7. NDR: Neoplastic disease rewievs [Elektronnyj resurs]. – Rezhim dostupa: http://cancer-reviews.ru/encirculating-tumor-cells.html

8. Purves William K. Life: The Science of Biology [Text] / William K. Purves. – 7th. – Sunderland, Mass: Sinauer Associates, 2004. — P. 954.

9. Rapini R.P. Dermatology [Text] / R.P. Rapini, J.L. Bolognia, J.L. Jorizzo. — St. Louis: Mosby, 2007.

10. Wikipedia [Электронный ресурс]. – Режим доступа: https://en.wikipedia.org/wiki/

ЛИТЕРАТУРА:

1. Анкирская А.С., Муравьёва В.В. Лабораторная диагностика оппортунистических инфекций влагалища [Текст] // Cons. medic. — 2005. — № 3 — С. 206–210.

2. Балоглу Х. Инновационные методы диагностики рака [Текст] / Х. Балоглу [Електронный ресурс]. – Режим доступа: http://ru.bookimed.com/article/intervu-s-professorom-husejnom-baloglu/

3. Колесник Е. А. Ранняя диагностика рака в Украине: маленькие шаги к решению большой проблемы [Текст] / Е. А. Колесник [Электронный ресурс]. – Режим доступа: http://www.likar.info/onkologiya/article-75986-rannyaya-diagnostika-raka-v-ukraine-malenkie-shagi-k-resheniyu-bolshoj-problemy/

4. Кулаков В. И. Национальное руководство по гинекологии [Текст] / В.И. Кулаков, Г.М. Савельева, И.Б. Манухин, 2009. – С. 45-56

5. Соболева Г.М., Сухих Г.Т. Семейство матриксных металлопротеиназ: общая характеристика и физиологическая роль [Текст] // Акушерство и гинекология. — 2007. — № 1. — С. 5–8.

6. FRS: Female reproductive system (human) [Электронный ресурс]. – Режим доступа: http://en.academic.ru/dic.nsf/enwiki/322524

7. NDR: Neoplastic disease rewievs [Электронный ресурс]. – Режим доступа: http://cancer-reviews.ru/encirculating-tumor-cells.html

8. Purves William K. Life: The Science of Biology [Text] / William K. Purves. – 7th. – Sunderland, Mass: Sinauer Associates, 2004. — P. 954.

9. Rapini R.P. Dermatology [Text] / R.P. Rapini, J.L. Bolognia, J.L. Jorizzo. — St. Louis: Mosby, 2007.

10. Wikipedia [Электронный ресурс]. – Режим доступа: https://en.wikipedia.org/wiki/