CLINICAL MORPHOLOGICAL CRITERIA OF LEUKOCYTES

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White nucleated blood cells - leukocytes make up the third largest population of shaped blood elements. White blood cells, or leukocytes, are the basis of the body's antimicrobial defense. This heterogeneous group of "defenses" includes the main effectors of immune and inflammatory reactions.

Key words: leukocytes, neutrophil, granulocytes, eosinophils, basophils, monocytes, lymphocytes, peroxidase.

The term "leukocyte" refers more to the appearance of the cell (leukos - white Greek) observed in a blood sample after centrifugation.

Neutrophilic granulocytes are the largest group of circulating leukocytes. The term "neutrophilic" describes the appearance of cytoplasmic granules during Wright-Giemse staining. Together with eosinophils and basophils, neutrophils belong to the class of granulocytes. Due to the presence of a characteristic multi-lobed (segmented) nucleus, neutrophils are also called polymorphonuclear leukocytes (PMYLS), granulocytes have sizes of 9-15 microns, exceeding those of erythrocytes. Granularity is detected in the protoplasm of all granulocytes: aurophilic and special. Auerophilic granules contain mainly acid phosphatase, while special ones contain alkaline phosphatase. The main function of granulocytes is phagocytosis.

The phagocytic activity of neutrophils is most pronounced in young people, and it decreases in old age. In addition to phagocytosis, granulocytes exhibit secretory activity during inflammation, I isolate a number of antibacterial agents: peroxidases, bactericidal lysosomal cationic proteins and other substances. These highly specialized cells migrate to the foci of infection, where they recognize, capture and destroy bacteria. This function is possible due to the ability of neutrophils to chemotaxis, adhesion, movement and phagocytosis. They have a metabolic apparatus for producing toxic substances and enzymes that destroy microorganisms.

Granulocytes live for 1-6 days, on average 6-9 days, while their residence time in the bone marrow is 2-6 days. They circulate with blood from 60-90 minutes to 24 hours, sometimes up to 2 days. A small part of granulocytes is destroyed in the blood, most of them enter the tissues and complete their physiological existence.

Granulocytes are destroyed by macrophages of the lungs, spleen, and liver. Some of the granulocytes are excreted from the body with secretions and excretions, sputum, saliva, bile, urine, and feces.

Eosinophils have a two-lobed nucleus and a cytoplasm filled with clearly visible granules that turn red after Wright-Giemse staining. The main (positively charged) proteins of these granules turn red due to their high affinity for eosin. Although eosinophils undergo the same stages of maturation as neutrophils, however, due to their small number, eosinophil precursors in the bone marrow are detected less frequently (with the exception of some pathological conditions: worms, allergies).

Eosinophils play a special role in the fight against parasites and allergy control. Since they are rarely found in peripheral blood, their role in protecting against bacterial infections is unclear. However, like neutrophils, eosinophils are capable of chemotaxis, phagocytosis and have bactericidal activity. Eosinophilic granules contain a special group of bactericidal proteins, including eosinophilic cationic protein, Charcot-Leyden protein crystals and eosinophilic peroxdase.

Basophils are the smallest group of circulating granulocytes, making up less than 1% of leukocytes. Large cytoplasmic granules of basophils contain sulfated or carboxylized acidic proteins, such as heparin, which turn blue when stained according to Wright-Giemse. Basophils mediate allergic reactions, especially those based on IgE-dependent mechanisms. They express IgE receptors and, with appropriate stimulation, release histamine in response to exposure to IgE and antigen.

Monocytes circulate in the peripheral blood in the form of large cells with a blue/gray cytoplasm and a kidney-shaped or folded nucleus containing gently reticulated chromatin. Monocytes are a derivative of COE-GM (a common precursor for granulocytes and monocytes) and COE-M (a precursor of monocytic germ only). Monocytes spend only about 20 hours in the bloodstream, and then enter the peripheral tissues, where they transform into macrophages of the reticuloendothelial system (RES). These tissue macrophages, or histiocytes, are large cells with an eccentrically arranged nucleus and vacuolated cytoplasm containing numerous inclusions.

Monocytes and macrophages are long-lived cells whose functional features are in many ways similar to those of granulocytes. They more effectively capture and absorb microbacteria, fungi and macromolecules; their role in phagocytosis of pyogenic bacteria is less significant. In the spleen, macrophages are responsible for the utilization of sensitized and aging red blood cells. Macrophages play an important role in the processing and presentation of antigens to lymphocytes during cellular

and humoral immune responses. Their production of cytokines and interleukins, interferons and complement components promotes coordination in the integrated immune response.

Normally, monocytes make up from 1 to 10% of circulating leukocytes. When the number of monocytes exceeds 100 /μl, we can talk about monocytosis, which is observed in patients with chronic infections (tuberculosis, chronic endocarditis) or inflammatory processes (autoimmune diseases, inflammatory bowel diseases).

Lymphocytes make up a significant population of leukocytes. According to their structure, they are conditionally divided into small (5-9 microns), medium (10 microns) and large (11-13 microns). The lymphocyte is currently considered as the main cell of the immune system. These are small mononuclear cells that coordinate and carry out an immune response by producing inflammatory cytokines and antigen-specific binding receptors.

Lymphocytes are divided into two main categories: B cells and T cells - and several less numerous classes, for example, natural ("natural", normal) killer cells. Lymphocyte subgroups differ in the place of their formation and the effector molecules they express, but have a common feature - the ability to mediate a highly specific antigenic response. Lymphocytes are able to move, to penetrate into other cellular elements. A small part of lymphocytes has phagocytic activity. The main function of the lymphocyte is to participate in immune reactions. For example, T lymphocytes are active participants in the rejection reaction, the graft-versus-host reaction, and B lymphocytes produce antibodies that cause a humoral immune response.

Lymphocytes can retain immunological memory for a long time. Under the influence of a number of immune and chemical (mutogens) factors, they are able to proliferate.

The origin of lymphocytes in an adult occurs mainly in the bone marrow and goiter gland.

The lifespan of lymphocytes varies: in short-lived (obviously, which are involved in immune reactions) - 3-4 days, in long-lived 100-200 days and even 580 days. Their presence in the circulating blood does not exceed 40 minutes. The total number of circulating lymphocytes in an adult is 7.5 x 10.9 lymphocytes, and in the body, taking into account the reserve of these cells in the bone marrow, spleen, lymph nodes, thymus, tonsils and Peyer plaques - 6.0x10.12.

Old lymphocytes die in circulating blood and are eliminated by reticular-macrophage elements of capillaries.

B lymphocytes express unique antigenic receptors - immunoglobulins - and are programmed to produce them in large quantities in response to antigenic stimulation. B cells are formed from bone marrow stem cells. The term B cells comes from the Latin name of the fabricius sac (bursa Fabricius), an organ necessary for the maturation of B cells in birds. There is no similar organ in humans; the maturation of B cells occurs mainly in the bone marrow.

The immune system contains a large population of individual B-lymphocyte clones. Each clone expresses a unique antigenic receptor that is basically identical to the immunoglobulin molecule it produces. These molecules differ from each other and bind only to a limited number of antigens.

Mature B lymphocytes with characteristic surface antigens - CD19 and CD20 - are found mainly in the germinal centers of the cortex of the lymph nodes and in the white pulp of the spleen. B cells make up less than 20% of circulating lymphocytes.

T lymphocytes play a key role in cellular immunity. Sensitized T cells mediate delayed-onset hypersensitivity, allograft rejection, graft-versus-host disease, contact allergy, as well as immunity against tumors and intracellular parasites. Cell-mediated immunity involves the destruction of various cells directly by cytotoxic T cells; it is enhanced by the action of cytokines, which are produced as a result of the complex interaction of T cells and macrophages. In addition, T lymphocytes are actively and selectively involved in the regulation of B cell proliferation and the production of immunoglobulins.

Formed from bone marrow stem cells, T cells necessarily undergo a stage of development in the thymus (thymus gland), as a result of which mature, functionally complete T cells are generated.

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