

HEMATOLOGICAL CHARACTERISTICS OF SOME LINES OF MICE

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UDC 612.11/.12-019:599.323.4

The results of investigations of the peripheral blood, bone marrow, and spleen of healthy mice of lines BALB/c, CC57BR, CBA, and CBA T6T6 are described.

Sciences

Despite the wide use of pure-line mice in experimental hematology, as yet no complete comparative investigation has been made of the normal hematopoietic indices of these animals. The literature contains mainly information on the peripheral blood indices, but even these data are few in number and often contradictory in nature [1-3, 5, 8, 9].

The object of this investigation was to make a comparative study of the morphological picture of the circulating blood, bone marrow, and spleen of healthy sexually mature mice of lines BALB/c, CBA, and CC57BR and of the subline CBA T6T6, and to compare their hematological characteristics with their genotype.

EXPERIMENTAL METHOD

Experiments were carried out on 40 mice of the above-mentioned lines (10 animals of each line) of both sexes, aged 3 months, obtained from the nursery of Academy of Medical Sciences of the USSR (Stolbovaya Station). The animals were kept in a well built animal house, with intake and extraction ventilation and an air temperature maintained at 18-22°. The diet was the same for all animals throughout the experiment and corresponded to the standard laid down by the Ministry of Health of the USSR. The experiments were carried out during the spring, in the morning, before feeding.

Blood for morphological analysis was obtained from the caudal vein using a Pyatnitskii's pipet [6]. The erythrocyte, leukocyte, and platelet counts and the hemoglobin concentration were determined in one

TABLE 1. Morphological Indices of Peripheral Blood in Pure-Line Mice

Index	Mice of line			
	BALB/c	CBA	CBA T6T6	CC57BR
Erythrocytes (in millions)	7,6±0,4	7,6±0,6	7,1±0,6	6,0±0,7
Hemoglobin (in g%)	18,8±1,1	18,2±0,8	16,7±0,7	15,4±0,6
Leukocytes (in thousands)	10,4±2,1	15,1±1,9	9,5±2,8	10,7±1,5
Lymphocytes (in %)	77,5±8,7	82,4±5,7	81,6±4,5	61,7±6,9
(in thousands)	8,1±2,0	12,5±1,9	7,2±1,7	6,7±1,1
Monocytes (in %)	0,6±0,7	1,1±1,0	2,0±1,1	5,0±2,6
(in thousands)	0,1±0,1	0,1±0,1	0,2±0,1	0,5±0,3
Eosinophils (in %)	0,7±0,7	0,8±0,8	1,0±0,9	0,5±0,7
(in thousands)	0,1±0,1	0,1±0,1	0,1±0,1	0,1±0,1
Metamyelocytes (in %)	0,2±0,1	0	0	0
Stab cells (in %)	2,3±2,1	1,4±1,4	4,1±2,1	5,7±3,6
Polymorphonuclear neutrophils (in %)	18,7±0,8	14,3±4,2	11,3±3,8	26,9±6,7
All neutrophils (in %)	21,2±8,7	15,8±5,3	15,4±3,9	32,8±6,1
(in thousands)	2,2±0,9	2,4±0,9	1,3±0,5	3,6±0,9
Platelets (in thousands)	1001±111	1258±124	1368±199	1800±120

Experimental Animals Unit and Laboratory of Experimental Hematology, Department of Radiation Pathophysiology, Institute of Medical Radiology, Academy of Medical Sciences of the USSR, Obninsk. (Presented by Academician of the Academy of Medical sciences of the USSR A. P. Avtsyn.) Translated from Byulleten' Éksperimental'noi Biologii i Meditsiny, Vol. 68, No. 9, pp. 121-123, September, 1969. Original article submitted July 18, 1968.

TABLE 2. Relative Percentages of Myelokaryocytes in Bone Marrow of Pure-Line Mice ($M \pm \sigma$)

Index	Mice of line			
	BALB/c	CBA	CBA T6T6	CC57BR
Reticulo-endothelial cells	1,4±1,1	2,1±0,7	4,2±1,6	2,4±1,0
Hemocytoblasts	0,2±0,1	0,1±0,2	0,1±0,1	0,2±0,2
Erythroblasts	0,9±0,4	0,8±0,4	0,3±0,2	0,5±0,2
Pronormoblasts	1,6±0,6	1,5±0,5	1,2±0,5	1,7±0,5
Basophilic normoblasts	2,8±0,7	3,7±0,9	3,8±0,8	4,8±1,0
Polychromatophilic normoblasts	21,6±4,7	21,4±3,0	24,7±2,7	22,0±3,4
Oxyphilic normoblasts	0,1±0,2	0,2±0,3	0,1±0,1	0,1±0,1
Mitoses of erythroid series	0,4±0,2	0,5±0,3	0,4±0,2	0,4±0,3
All cells of erythroid series	27,2±5,0	28,3±3,9	30,4±2,8	27,4±7,6
Megakaryocytes*	4,4±1,6	2,9±0,8	2,6±0,5	2,8±0,5
Myeloblasts	0,5±0,3	0,5±0,5	0,2±0,1	0,2±0,1
Promyelocytes	1,3±0,7	1,3±0,6	1,0±0,5	0,9±0,4
Myelocytes	4,8±2,3	4,2±1,4	2,3±0,5	3,8±0,7
Metamyelocytes	6,1±1,6	6,5±1,0	4,5±3,0	6,8±1,8
Stab cells	13,3±2,3	13,8±2,5	16,3±2,3	15,0±1,1
Polymorphonuclear neutrophils	9,7±1,4	5,2±2,1	3,6±0,9	8,3±0,7
Eosinophils	8,3±2,3	4,6±1,9	4,1±0,7	3,7±1,9
All granulocytes	43,9±5,2	36,3±2,3	32,1±3,6	38,6±2,3
Lymphocytes	25,8±4,8	31,4±2,7	30,7±2,3	27,0±4,0
Monocytes	0,9±0,5	0,7±0,4	0,7±0,3	1,1±0,5
Plasma cells	0,2±0,2	0,3±0,2	0,3±0,3	0,2±0,2
Mitoses of myeloid series	0,2±0,3	0,6±0,2	0,6±0,3	0,5±0,3
All myelokaryocytes*	6570±900	6278±1100	6520±1401	7890±2045

* Number of megakaryocytes and myelokaryocytes given in thousands.

TABLE 3. Relative Percentages of Splenokaryocytes in Spleen of Pure-Line Mice ($M \pm \sigma$)

Index	Mice of line			
	BALB/c	CBA	CBA T6T6	CC57BR
Reticulo-endothelial cells	3,3±2,0	6,0±0,9	6,1±1,1	5,6±1,6
Lymphocytes	80,7±4,6	76,7±3,4	78,9±3,1	67,5±5,3
Erythroid cells	8,2±2,4	11,1±2,3	9,8±2,1	14,3±4,1
Granulocytes	6,5±1,3	4,8±2,0	3,9±1,7	10,6±2,1
Plasma cells	0,4±0,2	0,3±0,2	0,5±0,3	0,2±0,2
Megakaryocytes*	1,7±1,5	0,5±0,3	1,4±1,6	5,8±3,3
Monocytes	0,5±0,3	0,5±0,4	0,5±0,3	0,7±0,3
Mitoses	0,3±0,2	0,5±0,3	0,2±0,2	1,0±0,4
All splenokaryocytes*	248±47	179±22	210±25	268±42

* Number of megakaryocytes given in thousands, number of splenokaryocytes in millions.

blood sample [4, 7]. The total number of myelokaryocytes in the femoral bone marrow and the number of splenokaryocytes in the spleen were counted in Goryaev's chambers after decapitation of the animals. The number of megakaryocytes in these organs was determined by means of Fuchs - Rosenthal chambers. The differential blood count, myelogram, and splenocytogram were studied in films stained by Pappenheim's method.

EXPERIMENTAL RESULTS

Several differences were observed in the hematological characteristics of mice belonging to the different lines (Table 1). The erythrocyte count and hemoglobin concentration in CC57BR mice were much lower than in the animals of other lines; meanwhile, the mean hemoglobin content per erythrocyte was about equal in all animals. The leukocyte count was highest in CBA mice, as a result of an increased content of lymphocytes. The differential blood count of the CBA and CBA T6T6 mice was identical, but animals of line CC57BR had a higher absolute and relative number of neutrophils and monocytes. The blood of all studied lines of mice was virtually free from basophils and plasma cells, and reticulocytes and normoblasts were very rare.

The number of myelokaryocytes in the femur was about equal in the mice of different lines (Table 2). However, the myelograms of these animals showed a number of distinctive features. The number of cells of the erythroid and granulocyte series and the number of monocytes were higher in the CC57BR mice than in mice of other lines, although the relative percentages of these marrow cells differed only slightly. The lymphocyte count was lower in BALB/c mice than in the animals of other lines.

The total number of splenokaryocytes was smallest in CBA mice, mainly due to a lower number of lymphocytes (Table 3). CC57BR mice had a higher content of reticuloendothelial and erythroid cells than of granulocytes than animals of the other lines. At the same time, no significant interlinear differences were found in the number of plasma cells and mitotically dividing cells in the spleen.

Analysis of the pattern of hematopoiesis thus shows that the mice of different lines differ in their hematological characteristics, and that these differences are connected with their genotype. The most closely related of the lines studied (CBA and CBA T6T6), for instance, possess similar hematological characteristics, while the genetically more distant line CC57BR has a significantly higher number of granulocytes and platelets in the blood and of cells of the granulocyte series in the bone marrow and spleen. These hematological differences may perhaps be responsible for differences in the reaction of mice of different lines to various extreme stimuli (infection, ionizing radiation, and so on), when the state of hematopoiesis as a whole and of its individual branches is of considerable importance.

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