

CYTOLOGICAL CHARACTERISTICS OF LYMPHOID ORGANS OF PURE-LINE MICE

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The relative weights, karyocyte counts, and cytological composition of the thymus, spleen, and mesenteric lymph node were determined in 101/H, CC57W, A2G, CBA/Lac, B6W^Y, and C57BL/6 mice. Interlinear differences in the numbers of the various types of cells are evaluated.

KEY WORDS: thymus; spleen; mesenteric lymph node; cytology of organs; pure-line mice.

The wide use of pure-line animals in experimental practice necessitates determination of their physiological state in a form suitable for description by standardized normal indices. In particular, when immunologic reactions are studied it is important to know the morphological parameters of the lymphoid tissue.

This paper gives the results of a cytological investigation of the thymus, spleen, and mesenteric lymph node of mice belonging to six pure lines.

EXPERIMENTAL METHODS

Sixty sexually mature mice of lines 101/H, CC57W, A2G, CBA/Lac, B6W^Y, and C57BL/6 (in groups of 10), obtained from the Scientific-Research Laboratory of Experimental Biology Models, Academy of Medical Sciences of the USSR, were used. To evaluate the state of the animals' lymphoid organs, the relative weights of the thymus, spleen, and lymph node as a percentage of the body weight and the number of nucleated cells (karyocytes) in them were determined. The quantitative cytological characteristics of the organs are given on the basis of counting 500 cells identified in squashed preparations.

EXPERIMENTAL RESULTS

As Table 1 shows, the highest relative weight of the thymus was found in B6W^Y, CC57W, and A2G mice and the lowest in CBA/Lac mice. The number of karyocytes in the thymus of most lines of mice did not differ significantly, except in B6W^Y and 101/H, in which the highest (76.57 ± 10.90 million) and the lowest (35.47 ± 4.32 million) indices, connected with the number of thymocytes in the organ, were obtained.

A high relative weight of the spleen and an increased number of karyocytes in it (Table 2) were found only in C57BL/6 and B6W^Y mice. Cytological analysis of the spleen revealed considerable differences in the

TABLE 1. Number of Karyocytes and Absolute Numbers of Cells in Thymus of Pure-Line Mice ($M \pm m$)

Index	Mice					
	101/H	CC57W	A2G	CBA/Lac	B6W ^Y	C57BL/6
Relative weight of thymus	1.30 ± 0.15	1.71 ± 0.38	1.69 ± 0.17	1.19 ± 0.02	1.78 ± 0.14	1.36 ± 0.20
Number of karyocytes, millions	37.48 ± 4.57	61.30 ± 13.70	58.50 ± 6.40	50.66 ± 5.70	76.57 ± 10.90	57.65 ± 9.60
reticulocytes	0.05 ± 0.016	0.04 ± 0.01	0.07 ± 0.03	0.06 ± 0.03	0.11 ± 0.03	0.04 ± 0.01
blast cells	1.87 ± 0.28	2.19 ± 0.50	2.16 ± 0.32	2.57 ± 0.32	4.07 ± 0.79	3.16 ± 0.64
thymocytes, medium-sized	2.37 ± 0.35	2.76 ± 0.57	2.74 ± 0.38	2.98 ± 0.33	4.27 ± 0.73	3.82 ± 0.69
thymocytes, small	33.10 ± 3.99	56.24 ± 6.42	53.52 ± 9.01	44.85 ± 5.11	67.87 ± 9.80	50.49 ± 8.33
total number of thymocytes	35.47 ± 4.32	59.00 ± 10.90	56.26 ± 9.36	47.83 ± 5.41	72.14 ± 10.50	54.31 ± 8.98
plasma cells	0.04 ± 0.015	0.005 ± 0.001	0	0.04 ± 0.02	0.04 ± 0.02	0.03 ± 0.01
neutrophils	0.05 ± 0.01	0.04 ± 0.01	0.01	0.13 ± 0.06	0.18 ± 0.03	0.08 ± 0.04
eosinophils	0	0.02 ± 0.01	0	0.03 ± 0.01	0	0
mast cells	0	0	0	0	0.03 ± 0.01	0.03 ± 0.01

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TABLE 2. Number of Karyocytes and Absolute Numbers of Cells in Spleen of Pure-Line Mice (M $\pm$ m)

Index	Mice					
	101/H	CC57W	A2G	CBA/Lac	B6W ^y	C57BL/6
Relative weight of spleen	2,76 $\pm$ 0,03	3,41 $\pm$ 0,24	3,25 $\pm$ 0,28	3,31 $\pm$ 0,10	4,40 $\pm$ 0,34	4,71 $\pm$ 0,20
Number of karyocytes, millions	103,12 $\pm$ 9,60	103,87 $\pm$ 9,00	100,40 $\pm$ 9,50	99,16 $\pm$ 6,80	146,77 $\pm$ 7,70	127,58 $\pm$ 8,70
lymphoblasts	4,14 $\pm$ 0,66	2,90 $\pm$ 0,35	2,01 $\pm$ 0,18	1,86 $\pm$ 0,24	2,17 $\pm$ 0,26	2,40 $\pm$ 0,25
lymphocytes, medium sized	5,43 $\pm$ 0,78	4,18 $\pm$ 0,40	3,50 $\pm$ 0,26	3,56 $\pm$ 0,55	5,48 $\pm$ 0,72	5,01 $\pm$ 0,58
lymphocytes, small	79,04 $\pm$ 7,40	84,78 $\pm$ 7,38	81,32 $\pm$ 5,15	84,60 $\pm$ 4,66	110,71 $\pm$ 6,60	99,09 $\pm$ 7,81
total number of lymphoid cells	88,61 $\pm$ 8,61	91,86 $\pm$ 7,90	86,83 $\pm$ 5,37	90,01 $\pm$ 5,28	118,36 $\pm$ 7,07	106,50 $\pm$ 8,39
reticulocytes	0,42 $\pm$ 0,12	0,40 $\pm$ 0,12	0,58 $\pm$ 0,12	0,55 $\pm$ 0,16	1,13 $\pm$ 0,16	0,88 $\pm$ 0,15
plasma cells	2,48 $\pm$ 0,65	0,65 $\pm$ 0,13	0,62 $\pm$ 0,17	0,99 $\pm$ 0,15	1,37 $\pm$ 0,38	2,45 $\pm$ 0,51
immature myeloid cells	0,14 $\pm$ 0,05	0,05 $\pm$ 0,02	0,10 $\pm$ 0,03	0	0,71 $\pm$ 0,19	0,19 $\pm$ 0,03
juvenile neutrophils	0,19 $\pm$ 0,05	0,13 $\pm$ 0,04	0,14 $\pm$ 0,04	0,02	0,18 $\pm$ 0,07	0,09 $\pm$ 0,02
stab cells	0,54 $\pm$ 0,17	0,75 $\pm$ 0,18	0,70 $\pm$ 0,20	0,32 $\pm$ 0,09	2,72 $\pm$ 0,84	0,63 $\pm$ 0,21
polymorphonuclear neutrophils	3,26 $\pm$ 0,62	3,53 $\pm$ 0,68	3,56 $\pm$ 0,46	2,88 $\pm$ 0,32	4,40 $\pm$ 0,99	5,67 $\pm$ 0,90
total number of myeloid cells	4,13 $\pm$ 0,76	4,46 $\pm$ 0,84	4,50 $\pm$ 0,71	3,22 $\pm$ 0,33	8,01 $\pm$ 1,60	6,58 $\pm$ 0,91
eosinophils	0	0,13 $\pm$ 0,04	0,08 $\pm$ 0,02	0,37 $\pm$ 0,12	0,08 $\pm$ 0,02	0
monocytes	0,23 $\pm$ 0,06	0,29 $\pm$ 0,06	0,16 $\pm$ 0,03	0,17 $\pm$ 0,06	0,39 $\pm$ 0,09	0,53 $\pm$ 0,07
erythroid cells	7,18 $\pm$ 1,38	6,05 $\pm$ 1,56	7,60 $\pm$ 2,04	3,75 $\pm$ 0,75	17,38 $\pm$ 3,11	10,64 $\pm$ 1,98
mast cells	0,03	0,04	0	0	0,03	0
megakaryocytes	0,04	0,01	0,03	0,09 $\pm$ 0,02	0,02	0

TABLE 3. Number of Karyocytes and Absolute Numbers of Cells in Mesenteric Lymph Node of Pure-Line Mice (M $\pm$ m)

Index	Mice					
	101/H	CC57W	A2G	CBA/Lac	B6W ^y	C57BL/6
Relative weight of lymph node	0,98 $\pm$ 0,06	0,51 $\pm$ 0,09	0,64 $\pm$ 0,10	0,26 $\pm$ 0,03	0,51 $\pm$ 0,02	0,83 $\pm$ 0,14
Number of karyocytes, millions	22,65 $\pm$ 2,57	9,58 $\pm$ 0,67	8,12 $\pm$ 1,30	5,14 $\pm$ 0,64	9,91 $\pm$ 1,41	15,51 $\pm$ 2,90
reticulocytes	0,34 $\pm$ 0,08	0,04 $\pm$ 0,01	0,07 $\pm$ 0,03	0,04 $\pm$ 0,01	0,10 $\pm$ 0,01	0,20 $\pm$ 0,01
lymphoblasts	0,56 $\pm$ 0,11	0,34 $\pm$ 0,03	0,33 $\pm$ 0,05	0,19 $\pm$ 0,03	0,30 $\pm$ 0,04	0,41 $\pm$ 0,06
lymphocytes, medium sized	0,84 $\pm$ 0,12	0,54 $\pm$ 0,03	0,46 $\pm$ 0,14	0,25 $\pm$ 0,04	0,41 $\pm$ 0,07	0,50 $\pm$ 0,10
» small	18,63 $\pm$ 2,40	8,54 $\pm$ 0,62	7,02 $\pm$ 1,50	4,56 $\pm$ 0,72	8,76 $\pm$ 1,30	13,52 $\pm$ 2,67
total number of lymphoid cells	20,03 $\pm$ 2,60	9,42 $\pm$ 0,67	7,81 $\pm$ 1,65	5,00 $\pm$ 0,77	9,47 $\pm$ 1,40	14,43 $\pm$ 1,83
plasma cells	2,21 $\pm$ 0,44	0,09 $\pm$ 0,01	0,21 $\pm$ 0,09	0,09 $\pm$ 0,03	0,28 $\pm$ 0,09	0,81 $\pm$ 0,20
neutrophils	0,06 $\pm$ 0,02	0,02 $\pm$ 0,005	0,02 $\pm$ 0,004	0,01	0,06 $\pm$ 0,01	0,06 $\pm$ 0,01
eosinophils	0,01	0,01	0,005	0	0	0,006

numbers of the various cells. The highest values were found for the numbers of lymphoid, myeloid, and erythroid cells in the spleen of C57BL/6 and B6W^y mice. The smallest number of erythroid cells in the spleen was found in CBA/Lac mice (3.75 $\pm$ 0.75 million). A significant difference in the number of plasma cells compared with the majority of groups was observed in 101/H (2.48 $\pm$ 0.65 million) and C57BL/6 mice (2.45 $\pm$ 0.51 million).

Analysis of the state of the lymph node showed that highest figures for relative weight and number of karyocytes were obtained with 101/H and C57BL/6 mice, and lowest values for CBA/Lac mice, for which the numbers of lymphoid cells and plasma cells respectively were mainly responsible (Table 3).

On the basis of this investigation standardized normal values for the central (thymus) and peripheral (spleen, mesenteric lymph node) lymphoid organs could be determined and interlinear differences revealed. The latter can be briefly characterized as follows. The highest values of the various indices studied were observed in mice of line B6W^y and C57BL/6, and the lowest in mice of line CBA/Lac. All the parameters studied were found to be practically identical in CC57W and A2G mice.