

NORMAL HEMOPIETIC INDICES FOR HEALTHY
GUINEA PIGS

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Guinea pigs are often used in laboratory investigations as a convenient object for mass experiments, especially in hematology. Information in the literature on the composition of the peripheral blood and hemopoietic organs of these animals is inadequate and contradictory [1-11]. Moreover, objective method of hematological investigation such as the study of the number of bone marrow cells per unit volume, direct counting of the absolute eosinophil count, etc. are now widely used, and few investigations of these indices have been carried out on healthy guinea pigs. Interesting studies have been made of the erythrocytometric curve and of the mean diameter of the erythrocytes. The data published on these indices were obtained by measuring the diameters of erythrocytes in fixed, stained films by means of an ocular micrometer. The Swedish "Celloscope" apparatus is being used more and more widely in clinical and laboratory practice for measuring the diameter of erythrocytes suspended in an isotonic solution. In this connection it has become necessary to compare the results obtained by these two methods.

The object of the present investigation was to make a quantitative study of the hemopoietic indices in normal guinea pigs.

EXPERIMENTAL METHOD

To determine the normal hematological indices the peripheral blood of 200 healthy guinea pigs weighing 350-450 g was investigated. The erythrocyte count and the erythrocytometric curve were determined by means of the Celloscope, diluting the blood with 0.9% sodium chloride solution with the addition of double phosphate buffer and formalin.

The hemoglobin concentration was determined by means of a type FEK-M1 photoelectric colorimeter. The reticulocyte, platelet, and leukocyte counts were determined by the usual methods. The eosinophils were counted in a Fuchs-Rosenthal chamber using Hinkleman's reagent.

To study the hemopoietic organs, 20 guinea pigs weighing 320-400 g and 34 animals weighing 600-855 g were killed by decapitation. The volume of the femoral marrow and the number of erythrocytes per mm^3 were determined by Mantz's method [9]. The spleen was weighed and the ratio between its weight in milligrams and the body weight in grams calculated. Differential counts of the marrow and spleen cells were obtained from impression films.

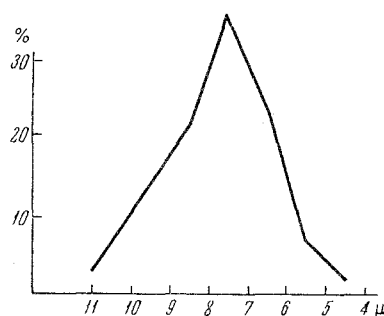


Fig. 1. Number of erythrocytes of different diameters (in μ) in blood of guinea pigs (in %) of the total erythrocyte count.

TABLE 1. Changes in Leukocyte, Neutrophil, and Lymphocyte Counts of Guinea Pigs during Growth

Age of animals	Weight (in g)	No. of animals	Leukocytes (in thousands)	Neutrophils (in thousands)	Lymphocytes (in thousands)
3-4 weeks	195 \pm 10	11	5.4 \pm 0.5	2.1 \pm 0.4	3.4 \pm 0.3
1½-2 months	324 \pm 4	40	6.6 \pm 0.5	2.0 \pm 0.2	3.6 \pm 0.3
3 "	437 \pm 8	28	8.3 \pm 0.9	3.8 \pm 0.5	5.2 \pm 0.4
3½-7 months	450-600	66	9.9 \pm 0.3	4.2 \pm 0.3	6.2 \pm 0.6
8-10 "	670-800	71	12.5 \pm 0.4	5.0 \pm 0.5	6.5 \pm 0.5
10-18 "	800 and more	28	14.4 \pm 0.7	5.9 \pm 0.7	7.3 \pm 0.4

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TABLE 2. Morphological Indices of the Peripheral Blood for Guinea Pigs

Index	M±m	σ
Erythrocytes (millions)	5.59±0.05	0.55
Hemoglobin (in g %)	14.8±0.1	0.95
Reticulocytes (in %)	17.7±0.56	8.1
Mean diameter of erythrocytes (in μ)	7.46±0.04	0.43
Leukocytes (in thousands)	8.9±0.21	3.1
Lymphocytes % Number (in thousands)	64.86±0.80 5.6±0.21	11.5 3.02
Monocytes % Number	3.06±0.10 269±13.18	1.54 188.52
Granulocytes stab neutrophils (in %) polymorphonuclear neutrophils (in %) basophils (in %) eosinophils (in %)	0.08±0.025 30.53±0.71 0.61±0.08 0.67±0.09	0.36 10.2 1.17 1.36
Total granulocytes (thousands)	2.9±0.09	1.38
Platelets (thousands)	497±7.75	110.9

TABLE 3. Morphological Indices of Bone Marrow of Guinea Pigs of Different Ages

Index	Weight (in g)		Index	Weight (in g)	
	600-855	320-400		600-855	320-400
Total volume of femoral marrow (mm ³)	137.6±5.27	104±4	Megakaryocytes (in %)	0.10±0.03	0.08±0.608
Total number of femoral marrow cells (millions)	169.13±10.491	184.6±9	Myeloblasts (in %)	1.60±0.12	1.98±0.2
Number of cells per mm ³ marrow (millions)	1.238±0.054	1.78±0.09	Promyelocytes (in %)	1.18±0.12	1.2±0.1
Reticulo-endothelium (in %)	3.0±0.46	3.4±0.54	Myelocytes (in %)	3.46±0.36	1.28±0.1
Hemohistioblasts (in %)	0.10±0.03	0.86±0.12	Neutrophils metamyelocytes (in %)	5.08±0.40	2.48±0.25
Erythroblasts	0.68±0.06	0.5±0.06	stab cells (in %)	12.05±0.76	11.84±1.2
Pronormoblasts (in %)	1.91±0.13	1.08±0.2	polymorphonuclear (in %)	21.18±1.34	21.88±2.2
Basophilic normoblasts (in %)	5.03±0.44	4.0±0.67	Basophils (in %)	1.21±0.14	0.88±0.09
Polychromatophilic normoblasts (in %)	14.40±0.69	10.84±0.92	Eosinophils (in %)	6.32±0.78	3.64±0.37
Oxyphilic normoblasts (in %)	0.28±0.11	0.02	Total number of granulocytes (in %)	52.25±1.89	45.18±2.8
Total number of erythroblastic cells (in %)	22.34±1.08	16.44±1.33	Lymphocytes (in %)	18.34±1.37	28.82±2.8
Mitoses in erythroid series (in %)	0.43±0.03	0.7±0.14	Monocytes (in %)	2.65±0.13	4.36±0.44
			Plasma cells of erythroid series (in %)	0.08±0.02	0.24±0.02
			Plasma cells of myeloid series (in %)	0.17±0.02	
			Mitoses in myeloids series (in %)	0.42±0.04	0.84±0.09

TABLE 4. Morphological Indices of the Spleen for Guinea Pigs

Index	M \pm m	σ
Weight of spleen (in mg)	888.4 \pm 33.26	119.76
Ratio between weight of spleen (in mg) and body weight (in g)	1.25 \pm 0.06	0.22
Reticulo-endothelium (in %)	5.55 \pm 0.34	1.98
Prolymphoblasts (in %)	0.13 \pm 0.02	0.14
Lymphoblasts (in %)	0.73 \pm 9.10	0.57
Prolymphocytes (in %)	4.99 \pm 0.37	2.12
Medium lymphocytes (in %)	61.98 \pm 1.15	6.52
Small lymphocytes (in %)	12.65 \pm 0.95	5.41
Total number of lymphocytes (in %)	80.50 \pm 0.80	4.54
Monocytes (in %)	3.07 \pm 0.19	1.13
Basophils (in %)	0.21 \pm 0.02	0.14
Eosinophils (in %)	0.99 \pm 0.31	1.78
Neutrophils (in %)	7.84 \pm 0.55	3.14
Total number of granulocytes (in %)	9.03 \pm 0.55	3.14
Erythroblasts (in %)	0.28 \pm 0.07	0.43
Fibroblasts (in %)	0.85 \pm 0.10	0.62
Mitoses (in %)	0.18 \pm 0.01	0.09
Plasma cells (in %)	0.14 \pm 0.02	0.14

EXPERIMENTAL RESULTS

The results obtained are given in Tables 1-4 and in the figure.

Periodic investigation of the peripheral blood indices showed that during growth of the guinea pigs (from 195 to 850 g, or from 3-4 weeks to 1-1.5 years) the erythrocyte, reticulocyte, and platelet counts showed little change, while the leukocyte count increased (see Table 1).

It is clear from the values of the quantitative and qualitative indices of the bone marrow of the guinea pigs given in Table 3 that the total number of marrow cells in the femur was essentially the same in guinea pigs weighing 350-400 and 600-855 g. In the myelogram of the younger animals (320-400 g) the lymphocyte count was raised, but the number of erythroblastic and myeloid cells was smaller than in the older animals (600-850 g).

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