

THE BLOOD INDICES OF THE HEALTHY GUINEA PIG

E. D. Gol'dberg

Department of Pathophysiology (Head, Prof. D. I. Gol'dberg)

Tomsk State Medical Institute

(Presented by Academician V. N. Chernigovskii)

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The guinea pig is a convenient animal to study. However, up till now there has been a disagreement between the different reports of the mean values of its blood indices [1,4-8].

We have therefore set out to determine their normal mean values.

METHOD

A study was made of the blood of 100 guinea pigs of both sexes whose weight ranged from 400 to 720 g. The following quantities were determined: hemoglobin; number of erythrocytes, leucocytes, reticulocytes and thrombocytes, and erythrocyte sedimentation rate. Counts were also made of the relative and absolute number of the blood cells. The results were treated statistically.

RESULTS

The values obtained are shown in Table 1.

TABLE 1. Indices for Healthy Guinea Pig Blood

Index	$M \pm m$	$\pm \sigma$	Normal range $M \pm 1\sigma$
Hemoglobin, %	85 ± 0.76	7.64	74.4-92.6
Erythrocytes (millions)	5.15 ± 0.06	0.57	4.58-5.72
Reticulocytes, %	12.8 ± 0.62	6.25	6.55-19.05
Thrombocytes (thousands)	298.35 ± 0.1	72.0	226.3-370.3
Erythrocyte sedimentation rate	2.1 ± 0.16	1.15	1.0-3.2
Leucocytes (thousands)	14.584 ± 0.48	4.78	9.8-19.3
Basophils:			
%	0.4 ± 0.08	0.59	0-1.0
Absolute number	79.5 ± 15.8	112.0	0-191.5
Eosinophils:			
%	3.2 ± 0.54	3.8	0-7.0
Absolute number	700 ± 133.0	944	0-1644
Neutrophils with rod-shaped nuclei:			
%	0.3 ± 0.06	0.42	0-0.7
Absolute number	81.6 ± 14.2	99.8	0-181.4
Polymorphonuclear neutrophils:			
%	29.7 ± 2.69	19.05	10.65-48.75
Absolute number	5951.6 ± 658.0	4660	1291.6-10611.6
Lymphocytes:			
%	63.0 ± 2.82	20.0	43.0-83.0
Absolute number	10426.1 ± 666.0	4720.0	5706.1-15146.1
Monocytes:			
%	3.7 ± 0.33	2.36	1.3-6.1
Absolute number	636.2 ± 64.4	456.0	180.2-1092.2

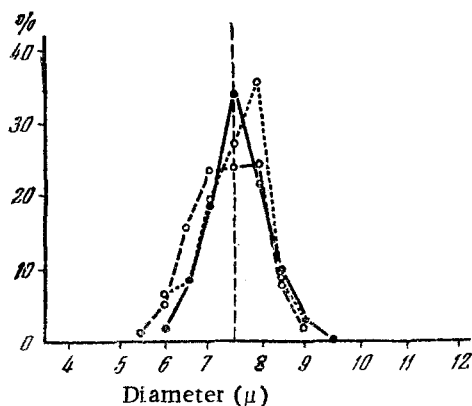


Fig. 1. Price-Jones curves for the healthy guinea pig.

Mean red cell diameter was measured with an AM-9-2 eyepiece, to an accuracy of 0.1μ . The average of studies on 50 animals was $7.50 \pm 0.025\mu$, with a normal range of variation ($M \pm 1\sigma$) from 7.33 to 7.69μ . Price-Jones curves for the healthy guinea pig are given in Fig. 1.

Bone marrow smears were made from the iliac crest of 40 animals. In each case, 400 cells were measured, and the mean value found. The results were treated statistically (Table 2).

In 1957, I. I. Gitel'zon and I. A. Terskov [2] proposed the method of acid fragility tests, which enabled a morphologically homogeneous mass of erythrocytes to be divided according to their stability, and allowed their age and condition to be determined.

We have made fragility tests on 50 animals*. A 0.004 N solution of HCl was used as the hemolytic agent. The following

TABLE 2. Myelogram of the Healthy Guinea Pig

Type of cell	$M \pm m$	$\pm\sigma$	Normal range $M \pm 1\sigma$
Reticulo-endothelial cells	1.41 ± 0.170	1.08	0.33—2.49
Hemocytoblasts	0.95 ± 0.129	0.82	0.03—1.77
Promyelocytes	0.76 ± 0.098	0.62	0.14—1.38
Neutrophil myelocytes	3.16 ± 0.166	1.05	2.11—4.21
Eosinophil myelocytes	1.0 ± 0.118	0.75	0.25—1.75
Neutrophil metamyelocytes	5.55 ± 0.162	1.03	4.52—6.58
Eosinophil metamyelocytes	0.70 ± 0.102	0.65	0.05—1.35
Neutrophils with rod-shaped nuclei	16.06 ± 0.822	5.20	10.86—21.26
Eosinophils with rod-shaped nuclei	3.66 ± 0.176	1.11	2.55—4.77
Polymorphonuclear neutrophils	23.33 ± 0.623	3.94	19.39—27.27
Polymorphonuclear eosinophils	1.22 ± 0.135	0.85	0.37—2.07
Basophils	0.48 ± 0.090	0.57	0—1.05
Monocytes	3.16 ± 0.350	2.25	0.91—5.41
Lymphocytes	16.88 ± 0.790	4.98	11.9—21.86
Plasma cells	0.89 ± 0.110	0.74	0.15—1.63
Megacaryocytes	1.12 ± 0.032	0.19	0—0.31
Proerythroblasts	0.29 ± 0.038	0.24	0.05—0.53
Macroblasts	1.43 ± 0.181	1.15	0.28—2.58
Normoblasts	17.88 ± 0.876	5.54	12.34—23.42
Broken cells	0.95 ± 0.330	1.97	0—2.92

indices were found: duration of hemolysis: 7-8 min (mean value $7\frac{1}{2}$ min); greatest number of cells lysed after 2.5 min, and occasionally after 2 min.

After the results had been treated statistically, they were plotted as shown in Fig. 2.

The agranulocytes of the guinea pig contained inclusions which were first described in 1888 by the Tomsk therapist M. G. Kurlov, and which are known as Kurlov bodies. Various figures have been given for the number of these inclusions. M. G. Kurlov himself thought that the bodies were present in 15-20% of the cells, Shilling reported 1-8%, Laione — 5%, and Schermer gives figures from 0 to 4%.

Our studies have shown that the bodies are present in 1-10% of the cells (and on average in 5-7%).

We have found no account of the nucleic acids in the cells of the circulating guinea pig blood. Our studies were made on 25 normal guinea pigs, and the nucleic acid content of the blood cells was determined by the method of Brachet and Feulgen.

We found that the ribonucleic acid (RNA) is contained in the cytoplasm of the monocytes and lymphocytes as small dark red granules. The cytoplasm of the monocytes is very rich in RNA, which is diffusely distributed, and frequently obscures the nucleus. The lymphocytes may be divided into two groups, according to their RNA content.

* This part of the work was carried out together with O. S. Golosov.

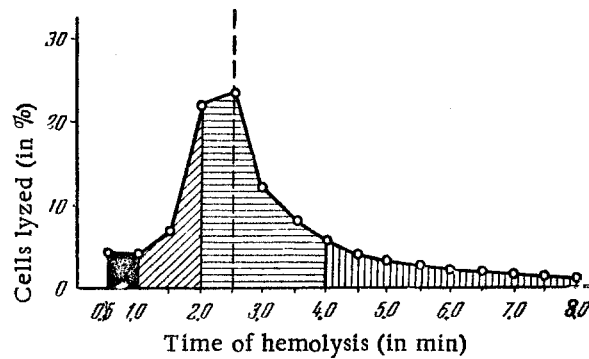


Fig. 2. Curve of acid hemolysis, obtained by statistical treatment of 50 cases. Different kinds of shading distinguish the groups according to their degree of stability.

The first group comprises lymphocytes having a thick band of cytoplasm. In them, the RNA is distributed throughout the whole of the cytoplasm, but is concentrated chiefly in two zones, one at the edge of the cell and the other round the nuclear membrane. The second and larger group is composed of cells with a large nucleus and a narrow band of cytoplasm. In these lymphocytes the RNA forms a narrow band round the nucleus. The nuclei of all the blood cells are rich in DNA; the nucleoli of the lymphocytes contain RNA.

In this account we have attempted to determine more completely the blood indices of the guinea pig.

SUMMARY

Statistical results on the blood indices of healthy guinea pigs are given. For the first time a distribution curve has been obtained which shows the stability of healthy guinea pig erythrocytes to lysis in acid solution; the measurements were made by the method of Gitel'zon and Terskov.

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