

A ROSTER OF NORMAL VALUES FOR DOGS AND CATS (1)

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Age, sex, breed, diurnal periodicity, and emotional stress at the time of sampling can be expected to cause variation in normal values. The methodology will also affect the biologic parameters.

For these reasons practitioners are well advised to employ the normal values supplied by the laboratory that they patronize. However, this laboratory must have determined their normal ranges and means by a sufficient number of normal samples to provide statistical alidity. The laboratory should run control serum samples and provide other means of quality control.

Since biochemical results are most frequently determined on Technicon SMA, equipment values for this method are provided

(through the courtesy of Dr. A. I. Hurvitz and Dr. Robert J. Wilkins of the Animal Medical Center). Other data are derived from the New York State College of Veterinary Medicine, the Ralston Purina Corp., Biozyme Veterinary Laboratory (a division of Biozyme Medical Laboratories, Inc.), standard texts, and the literature. References are cited as footnotes within the tables and appear in full at the end of this appendix. Values for reptiles and exotic animals can be found on pages 748 and 749 and also in *Current Veterinary Therapy VI*, page 795.

Inappropriate collection and preparation, prolonged storage, hemolysis, lipemia, and hyperbilirubinemia may invalidate the laboratory results.

NORMAL BLOOD VALUES³¹

ERYTHROCYTES	ADULT DOG	AVERAGE	ADULT CAT	AVERAGE
Erythrocytes (millions/ μ l.)	5.5 - 8.5	6.8	5.5 - 10.0	7.5
Hemoglobin (g./dl.)	12.0 - 18.0	14.9	8.0 - 14.0	12.0
Packed Cell Volume (vol. %)	37.0 - 55.0	45.5	24.0 - 45.0	37.0
Mean Corpuscular Volume (femtoliters)	66.0 - 77.0	69.8	40.0 - 55.0	45.0
Mean Corpuscular Hemoglobin (picograms)	19.9 - 24.5	22.8	13.0 - 17.0	15.0
Mean Corpuscular Hemoglobin Concentration (g./dl.)				
Wintrobe	31.0 - 34.0	33.0	31.0 - 35.0	33.0
Microhematocrit	32.0 - 36.0	34.0	30.0 - 36.0	33.2
Reticulocytes (%) (excludes punctate retics.)	0.0 - 1.5	0.8	0.2 - 1.6	0.6
Resistance to hypotonic saline (% saline solution producing)				
Minimum	0.40 - 0.50	0.46	0.66 - 0.72	0.69
Initial and complete hemolysis				
Maximum	0.32 - 0.42	0.33	0.46 - 0.54	0.50

Erythrocyte Sedimentation Rate (mm. at 60 mn.)	PVC 37	13	PCV35-40	7-27
RBC life span (days)	PCV 50	0	66-78	
RBC diameter (μ)	100-120	7.0	5.5-6.3	5.8

LEUKOCYTES	ADULT DOG	AVERAGE	ADULT CAT	AVERAGE
Leukocytes (no./ μ l.)	6,000-17,000	11,500	5,500-19,500	12,500
Neutrophils - Bands (%)	0-3	0.8	0-3	0.5
Neutrophils - Mature (%)	60-77	70.0	35-75	59.0
Lymphocyte (%)	12-30	20.0	20-55	32.0
Monocyte (%)	3-10	5.2	1-4	3.0
Eosinophil (%)	2-10	4.0	2-12	5.5
Basophil (%)	Rare	0.0	Rare	0.0
Neutrophils - Bands (no./ μ l.)	0-300	70	0-300	100
Neutrophils - Mature (no./ μ l.)	3,000-11,500	7,000	2,500-12,500	7,500
Lymphocytes (no./ μ l.)	1,000-4,800	2,800	1,500-7,000	4,000
Monocytes (no./ μ l.)	150-1,350	750	0-850	350
Eosinophils (no./ μ l.)	100-1,250	550	0-1,500	650
Basophils	Rare	0	Rare	0

CANINE BLOOD PARAMETERS AT DIFFERENT AGES - AVERAGE VALUES¹

Age	millions/ μ l. RBC	Retic. %*	Nucl.RBC/ 100 WBC*	g./dl. Hb	Vol.% PCV	/dl. WBC	/dl. Neut.	/dl. Bands	/dl. Lymph.	/dl. Eos.
Birth	5.75	7.1	1.8	16.70	50	16,500	1,300	400	2,500	600
2 weeks	3.92	7.1	1.8	9.76	32	11,000	6,500	100	3,000	300
4 weeks	4.20	7.1	1.8	9.60	33	13,000	8,600	0	4,000	40
6 weeks	4.91	3.6	1.8	9.59	34	15,000	10,000	0	4,500	100
8 weeks	5.13	3.9	0.3	11.00	37	18,000	11,000	234	6,000	270
12 weeks	5.27	3.9	Rare	11.60	36	15,300	9,400	115	4,600	322

*See reference 13.

CANINE BLOOD PARAMETERS AT DIFFERENT AGES²⁶

	sex	Birth to 12mo.	Average	1-7yr.	Average	7yr. and Older	Average
Erythrocytes (million/ μ l)	Male	2.99-8.52	5.09	5.26-6.57	5.92	3.33-7.76	5.28
	Female	2.76-8.42	5.06	5.13-8.6	6.47	3.34-9.19	5.17
Hemoglobin (gm/dl)	Male	6.9-16.5	10.7	12.7-16.3	15.5	14.7-21.2	17.9
	Female	6.4-18.9	11.2	11.5-17.9	14.7	11.0-22.5	16.1
Packed Cell Volume (vol.%)	Male	22.0-45.0	33.9	35.2-52.8	44.0	44.2-62.8	52.3
	Female	25.8-55.2	36.0	34.8-52.4	43.6	35.8-67.0	49.8
Leukocytes (thousands/ μ l)	Male	9.9-27.7	17.1	8.3-19.5	11.9	7.9-35.3	15.5
	Female	8.8-26.8	15.9	7.5-17.5	11.5	5.2-34.0	13.4
Neutrophils Mature (%)	Male	63-73	68	65-73	69	55-80	66
	Female	64-74	69	58-76	67	40-80	64
Lymphocytes (%)	Male	18-30	24	9-26	18	15-40	29
	Female	13-28	21	11-29	20	13-45	29
Monocytes (%)	Male	1-10	6	2-10	6	0-4	1
	Female	1-10	7	0-10	5	0-4	1
Eosinophils (%)	Male	2-11	3	1-8	4	1-11	4
	Female	1-9	5	1-10	6	0-19	6

FELINE BLOOD PARAMETERS AT DIFFERENT AGES³¹

Age	millions/ μ l. RBC	g./dl. Hb	Vol. % PCV	/dl. WBC	/dl. Neut.	/dl Lymph.
Birth	4.95	12.2	44.7	7,500		
2 weeks	4.76	9.7	31.1	8,080		
5 weeks	5.84	8.4	29.9	8,550		
Average*	4.80	7.5	26.2	11,770	4,600	6,970
Range*	3.90-5.70	6.6-8.4	21.0-33.5	7,500-14,500		4,500-9,400
6 weeks	6.75	9.0	35.4	8,120		
8 weeks	7.10	9.4	35.6	8,120		
Average*	5.90	7.5	26.2	12,400	7,500	4,900
Range*	3.30-7.30	7.6-15.0	22-38	6,900-23,100		1,925-10,100

*See reference 2.

FELINE BLOOD PARAMETERS AT DIFFERENT AGES³⁵

	Sex	Birth to 12mo	Average	1-5 yr	Average	6yr. and Older	Average
Erythrocytes (millions/ μ l)	Male	5.43-10.22	6.96	4.48-10.27	7.34	5.26-8.89	6.79
	Female	4.46-11.34	6.90	4.45-9.42	6.17	4.10-7.38	5.84
Hemoglobin (gm/dl)	Male	6.0-12.9	9.9	8.9-17.0	12.9	9.0-14.5	11.8
	Female	6.0-15.0	9.9	7.9-15.5	10.3	7.5-13.7	10.3
Packed Cell Volume (vol. %)	Male	24.0-37.5	31	26.9-48.2	37.6	28.0-43.8	34.6
	Female	23.0-46.8	31.5	25.3-37.5	31.4	22.5-40.5	30.8
Leukocytes (thousands/ μ l)	Male	7.8-25.0	15.8	9.1-28.2	15.1	6.4-30.4	17.6
	Female	11.0-26.9	17.7	13.7-23-7	19.9	5.2-30.1	14.8
Neutrophils Mature (%)	Male	16-75	60	37-92	65	33-75	61
	Female	51-83	69	42-93	69	25-89	71
Lymphocytes (%)	Male	10-81	30	7-48	23	16-54	30
	Female	8-37	23	12-58	30	9-63	22
Monocytes (%)	Male	1-5	2	1-5	2	0-2	1
	Female	0-7	2	0-5	2	0-4	1
Eosinophils (%)	Male	2-21	8	1-22	7	1-15	8
	Female	0-15	6	0-13	5	0-15	6

EFFECT OF PREGNANCY AND LACTATION ON BLOOD PARAMETERS OF THE DOG¹

	GESTATION				TERM	LACTATION		
	2 Weeks	4 Weeks	6 Weeks	8 Weeks	0 Weeks	2 Weeks	4 Weeks	6 Weeks
RBC (millions/dl.)	8.85	7.48	6.73	6.26	4.53	5.13	5.65	6.15
PCV (Vol. %)	53	47	44	37	32	34	38	42
Hb (g./dl)	19.6	16.4	14.7	13.8	11.0	11.7	12.8	13.4
Sedimentation Rate (mm. at 60 mm.)	0.6	11.0	31.0	14.0	12.0	14.0	14.0	13.0
	12.0	12.2	15.7	19.0	18.9	16.9	17.1	15.9

EFFECT OF PREGNANCY AND LACTATION ON BLOOD PARAMETERS OF THE CAT⁶

	GESTATION				TERM	LACTATION	
	1 Day Past Conception	2 Weeks	4 Weeks	6 Weeks	8 Weeks	0 Weeks	2 Weeks

RBC (millions/dl.)	8.0	7.9	7.1	6.7	6.2	6.2	7.4	7.4
PCV (Vol. %)	36.1	37.0	33.0	32.0	28.0	29.0	33.0	33.0
Hb (g./100ml.)	12.5	12.0	11.0	10.8	9.5	10.0	11.5	11.2
Reticulocytes (%) (includes punctate retics.)	9	11	9	10	20.1	15	9	6
	ADULT DOG			AVERAGE	ADULT CAT		AVERAGE ³¹	
Thrombocytes $\times 10^5/\mu$	2 - 5		3 - 4		3 - 8		4.5	
Icterus Index	2 - 5 units				2 - 5 units			
Plasma Fibrinogen (eg./l.)	2.0 - 4.0				0.50 - 3.00			

NORMAL BONE MARROW (Percentage)

ERYTHROCYTIC CELLS	DOG ³¹	CAT ²³
Rubriblasts	0.2	1.71
Prorubricytes	3.9	12.50
Rubricytes	27.0	
Metarubricytes	15.3	11.68
Total Erythrocytic Cells	46.4	25.89
GRANULOCYTIC CELLS		
Myeloblasts	0.0	1.74
Progranulocytes	1.3	0.88
Neutrophilic Myelocytes	9.0	9.76
Eosinophilic Myelocytes	0.0	1.47
Neutrophilic Metamyelocytes	7.5	7.32
Eosinophilic Metamyelocytes	2.4	1.52
Band Neutrophils	13.6	25.80
Band Eosinophils	0.9	-
Neutrophils	18.4	9.24
Eosinophils	0.3	0.81
Basophils	0.0	0.002
Total Granulocytic Cells	53.4	58.542
M:E Ratio - Average	1.15 : 1.0	2.47 : 1.0
M:E Ratio - Range (Schalm)	0.75 - 2.50 : 1.0	0.60 - 3.90 : 1.0
OTHER CELLS		
Lymphocytes	0.2	7.63
Plasma Cells	0	1.61
Reticulum Cells	0	0.13
Mitotic Cells	0	0.61
Unclassified	0	1.62
Disintegrated Cells	0	4.60

BLOOD, PLASMA, OR SERUM CHEMICAL CONSTITUENTS

(B) = Blood, (P) = Plasma, (S) = Serum

Chemical constituents are liable to show markedly different values, depending on the methodology employed.

CONSTITUENT	ADULT DOG		ADULT CAT	
	Coulter Chemistry ³⁴	Technicon SMA ³⁴	Coulter Chemistry ³⁴	Technicon SMA ³⁴

Urea N(S) (mg/dl)	8-23	10-22	18-32	5-30
Glucose(S) (mg/dl)	71-115	50-120	66-95	70-150
Total bilirubin(S) (mg/dl)	0.1-0.6	0-0.6	0.15-0.3	0-0.8
Total protein(S) (gm/dl)	5.2-7.0	5.4-7.8	5.9-7.3	5.5-7.5
Albumin(S) (gm/dl)	2.7-3.8	2.2-3.4	2.2-3.0	2.2-3.5
Alkaline phosphatase(S) (IU/l)	10-82	20-120	7-30	10-80
Calcium(S) (mg/dl)	9.8-11.4	9-11.6	8.9-10.6	7.6-11.0
Inorganic phosphorus(S) (mg/dl)	2.8-5.1	3.9-6.3	4.3-6.6	3.2-6.3
LDH(S) (IU/l)	8-89	40-200	33-99	10-200
AST or SGOT(S)	13-93°	5-80*	32-58°	10-60*
ALT or SGPT(S) (IU/l)	15-70	5-25	10-50	10-60
Total CO ₂ (S) (mEq/l)	18-25	17-25**	18-25	16-25**
Creatinine(S) (mg/d)	0.5-1.2	0.4-1.5**	0.5-1.7	1.3-2.1**
Uric acid(S) (mg/dl)		0.2-0.8**		0.1-0.7**
Total cholesterol(S) (mg/dl)	82-282	156-294**	41-225	116-126**
Triglycerides(S) (mg/dl)		10-42**		6-58**
CPK(S) (IU/l)	12-84	27-93**	6-130	62-262**
CHEMICAL PARAMETERS AFFECTED BY AGE		DOG<6MO-SMA ³⁶	CAT<6MO-SMA ³⁶	
Inorganic phosphorus(S) (mg/dl)		3.9-9.0	3.9-8.1	
Calcium(S) (mg/dl)		7.0-11.6	7.0-11.0	
Alkaline phosphatase(S) (IU/l)		20-200	10-120	
LDH(S) (IU/l)		40-400	10-300	

DOGS²⁶ AND CATS²⁵

	SEX	Birth to 12mo.	Average	1-5yr.	Average	6yr and Older	Average
Total Protein(S) (gm/dl)	Male	3.90-5.90	5.15	4.90-9.60	6.33	5.5-7.3	6.4
(Dogs)	Female	4.00-6.40	5.58	5.50-7.80	6.34	4.7-7.5	6.2
Total Protein(S) (gm/dl)	Male	4.3-10.0	6.4	6.8-10.0	8.1	6.2-8.5	7.2
(Cats)	Female	4.8-9.1	6.4	6.6-8.9	7.4	6.0-9.0	7.3

ELECTROPHORESIS		DOG	CAT
Albumin(S) (gm/dl)		2.3-3.4	2.3-3.5
Globulin(S) (gm/dl)		3.0-4.7	2.6-5.0
Alpha 1(S) (gm/dl)		0.3-0.8	0.3-0.5
Alpha 2(S) (gm/dl)		0.5-1.3	0.4-1.0
Beta(S) (gm/dl)		0.7-1.8	0.6-1.9
Gamma(S) (gm/dl)		0.4-1.0	0.5-1.5
Albumin/globulin ratio, A/G(S)		0.7-1.1	0.5-1.0

° Trans Act Units/liter(General Diagnostics). 1 Trans Act Unit of GOT activity is the amount of enzyme in 1 liter of sample that will form 1 mM of oxalic acid in 1 minute under specified conditions.

* IU/liter.

**See reference 7

-다음호 계속-