STANDARD BLOOD VALUES IN THE BEAGLE DOG

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Standard blood values for the Beagle are increasing in importance as this breed of dog is used more extensively in research work. Andersen and Gee (1958) reported pre- and postnatal normal blood values in this breed. This paper reports on blood values obtained over a two-year period during which time Beagles were maintained under optimum conditions of nutrition and housing.

Materials and Methods

The rations fed, housing, and design of the experiment in which the dogs were used have been described (Reber, *et al.*, 1959, 1960). Twelve males and 12 females were fed a complete ration. Analyses indicated the ration contained 64% total solids, consisting of 22% fat, 7.8% ash, 3.3% fiber and 27% protein.

Blood samples of each dog taken from the jugular vein were examined (Table 1). Red cell counts, white cell counts, and differential counts were made by standard clinical procedures (Coffin, 1953). Hemoglobin determinations were made by the cyanmethemoglobin method recommended by Crosby, *et al.* (1954). Five milliliters of diluent were placed in a 10 ml. test tube, 0.02 ml. of fresh blood was added, the tube was stoppered and the contents were mixed by inversion. The quantification of hemoglobin was based on absorption measurements (540 mμ) made with a Beckman spectrophotometer.

The raw data, representing 15 bleedings on each of 24 dogs, were statistically analyzed by the method of least squares to derive fitted constants which describe the changes in the data during the experimental period. The 24 values (one for each dog) of each fitted constant were analyzed in turn, also by least squares, to evaluate the effects of the experimental variables.

Results and Discussion

Feeding irradiated flour (Reber, *et al.*, 1959) or irradiated beef (Reber, *et al.*, 1960) had no apparent effect on the blood content of hemoglobin, or the red cell, white cell, or differential white cell counts, as compared to the blood values of dogs fed nonirradiated flour or beef.

The results of statistical analysis indicated that there was no difference between the blood values of male and female dogs or between the effects of feeding the rations containing beef and those containing flour. Therefore, the data from these experiments were combined for presentation in this paper.

The average hemoglobin content, red cell count and white cell count of the blood of 24 Beagles obtained from the time they were 14 to 118 weeks of age are shown in Table 1.

As the dogs reached maturity, there was an increase in hemoglobin level and red blood cell count. As the experiments progressed, there was a uniform increase in the average hemoglobin value from 13.4 gm.

per 100 ml. of blood at 14 weeks of age to 16.6 gm. at 29 weeks, and irregularly to 17.7 gm. at 118 weeks. The average red blood cell count increased from 5.62 X 10^6 per cubic mm. at 14 weeks of age to 7.88 X 10^6 per cubic mm. at 62 weeks and remained near the latter level throughout the subsequent period studied. The average total white blood cell count decreased from 22.0 X 10^3 per cubic mm. at 19 weeks of age to 10.8 X 10^3 per cubic mm. at 62 weeks and remained near the latter level for the next 56 weeks. The data presented here for the first year of life are in agreement with those reported by Andersen and Gee (1958). This report supplements their findings by supplying information on the second year of life.

The average differential white blood cell counts of the Beagles from 14 to 118 weeks of age are shown in Table 2. There were changes in the percentages of the different cell types as the dogs progressed from 14 to 118 weeks of age *(e.g.* eosinophils doubled in number and band neutrophils decreased 75%). These changes appear to be within standard physiological limits and they seem to be due to events associated with aging and with constantly improved conditions of nutrition and health. Total counts of the various types of white cells varied considerably with time and the changes were proportional to those which occurred in the total white blood cell count

TABLE 1.—The average hemoglobin content and number of red and white cells in the blood of 24 Beagle dogs from 14 to 118 weeks of age.

Age Weeks	Hb, gm./100 ml.		RBC, 10^6/mm.^{3}		WBC, 10^3/mm.^{3}	
	Av.	Range	Av.	Range	Av.	Range
14	13.4	9.7-17.4	5.62	4.53- 6.97	16.8	7.6-32.2
19	13.6	11.0-15.1	6.07	4.53-10.03	22.0	10.9-48.5
24	15.6	13.9-17.8	6.83	5.66- 8.13	20.1	10.5-40.2
29	16.6	15.0-18.9	7.17	5.94- 8.41	16.0	7.6-32.6
34	16.8	14.7-20.0	7.66	6.30-10.26	14.0	8.7-22.5
39	16.8	13.0-19.6	7.70	6.52- 9.26	14.2	5.5-32.1
44	16.9	13.3-19.2	7.70	6.39- 8.95	14.8	7.9-20.3
54	17.0	14.0-19.5	7.73	5.75-11.04	12.0	5.9-21.4
62	16.2	11.9-19.6	7.88	6.30-10.70	10.8	4.5-26.1
71	16.7	13.0-18.8	7.81	6.18-10.18	11.0	5.3-17.7
80	16.4	11.7-20.0	7.62	4.80- 9.83	10.4	4.3-19.7
89	17.3	12.9-20.2	7.38	6.02- 9.43	10.7	5.6-15.9
98	17.3	12.7-18.9	7.52	6.28- 8.90	10.3	6.4-16.0
108	17.3	12.9-21.3	7.75	5.41-10.07	11.3	5.4-16.4
118*	17.7	14.0-20.5	8.12	5.58-10.43	10.9	6.0-23.8
Av.	16.4		7.37		13.7	

* 23 dogs

TABLE 2.—The average differential count* of the white cells of the blood of 24 Beagle dogs from 14 to 118 weeks of age.

Age Weeks	Eosinophils		Band Neutrophils		Segmented Cells		Lymphocytes		Monocytes		Denegerated Cells	
	Av.	Range	Av.	Range	Av.	Range	Av.	Range	Av.	Range	Av.	Range
14	2	0-7	5	1-10	63	50-82	28	14-44	2	0-4	0	0-1
19	2	0-9	6	2-18	60	28-71	29	15-63	3	1-7	1	0-3
24	4	1-8	7	2-17	56	38-79	30	17-47	2	0-6	2	0-13
29	5	0-10	7	3-22	51	33-61	28	19-41	4	1-8	5	1-13
34	6	2-14	5	1-13	50	20-67	29	20-42	4	1-10	4	0-15
39	6	2-14	5	2-14	52	38-65	29	21-41	3	1-5	5	1-11
44	7	2-14	4	1-10	56	45-73	26	10-35	2	0-7	5	0-11
54	6	1-10	3	0-10	58	48-73	27	13-37	2	0-6	4	0-7
62	6	1-14	1	0-2	61	47-75	24	15-35	3	1-7	5	0-10
71	5	0-10	1	0-2	59	45-74	24	17-48	4	2-8	7	1-20
80	5	0-12	3	0-4	59	24-73	23	15-33	5	0-8	5	0-16
89	5	2-12	1	0-3	64	48-74	21	11-32	4	2-7	4	0-11
98	5	1-12	1	0-7	59	45-75	23	14-39	5	2-9	6	1-24
108	6	0-25	1	0-3	61	41-77	23	14-35	5	2-10	4	0-12
118**	4	1-9	2	0-5	61	50-78	22	11-34	6	3-12	4	1-9
Av.	5		3		58		26		4		4	

* 200 cells counted
** 23 dogs

as the dogs aged (Table 1).

Summary

The average hemoglobin content, red cell count, white cell count, and the differential count of the white cells of the blood have been presented for 24 Beagle dogs from 14 to 118 weeks of age. There was a steady increase in the hemoglobin (gm. per 100 ml. of blood) from 13.4 at 14 weeks of age to 16.6 at 29 weeks, and irregularly to 17.7 at 118 weeks of age. The total white blood cell count decreased with age from 22.0 X 10^3 per cubic mm. at 19 weeks of age to 10.8 X 10^3 at 64 weeks of age and remained near that level for the next 56 weeks. The changes which appear in the percentages of eosinophils, band neutrophils, lymphocytes, monocytes and degenerated cells during the 118-week study appear to be within standard physiological limits, as influenced by age and constantly improved conditions of nutrition and health. The animals were maintained under optimal conditions with regard to housing, care and nutrition.

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