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HEMATOLOGY OF THE NIGHT MONKEY, *AOTUS TRIVIRGATUS*[1,2]

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SUMMARY • *Hematological determinations for night monkeys, Aotus trivirgatus, are reported distributed by sex and by time of collection of blood samples. Collection times are distributed into 3 different groups; time of arrival at laboratory (shortly after capture); maintenance in the laboratory in 1967, primarily on a non-commercial diet; maintenance in the laboratory in 1968 on a commercial diet supplemented by fruits. Both females and males show significant increases ($P < 0.01$) in leukocytes for 1967 and 1968, respectively, in comparison to those for arrival at the laboratory. The respective values for females are 14.8 and 15.3 x 10^3 per cmm, in comparison to 8.6 x 10^3 per cmm; and for males 13.9 and 15.6 x 10^3 per cmm, in comparison to 9.4 x 10^3 per cmm.*

Except for the report of Taliaferro and Kluver (*2*) on the "normal" erythrocyte and leukocyte counts determined from 3 night monkeys, *Aotus trivirgatus*, no published reports on hematological parameters for this species could be found. Therefore, as part of malarial studies at Gorgas Memorial Laboratory, hematological determinations were made on night monkeys both shortly after capture and at various times after admission into the laboratory colony. This report presents the results.

MATERIALS AND METHODS

The data reported herein are from apparently healthy adults and from older juveniles. Obviously pregnant females and those nursing young are not included. The monkeys tested were representative of the population at the laboratory. Some, but not all, later became involved in malarial studies. Blood samples were collected generally within 24 hours of arrival at the laboratory. The night monkeys were freshly captured and apparently healthy at time of arrival. They were given fruits and water *ad libitum*. As time permitted, subsequent blood samples were collected at weekly intervals. Obviously, some of the values incorporated in the maintenance groups were from monkeys that had been in the laboratory but a short time; however, most were from monkeys that had been in the colony for at least several weeks. Because of a change in diet, determinations for the maintenance groups are presented separately for 1967 and for 1968. None of the data was collected after March 31, 1968.

Blood collections were made from the femoral vein between 7:30 a.m. and 9:30 a.m., and the laboratory procedures were carried out the same day. All laboratory procedures, with the exception of packed cell volume, were performed by the same technician. Erythrocyte and leukocyte counts were made using a hemocytometer with a Neubauer chamber. Packed cell volumes were determined by the micro-capillary method using an International Micro-Capillary Centrifuge Model MB and Reader. Hemoglobin concentrations were

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determined with a Sahli-type hemometer. Leukocyte differentials were made after dried blood films had been stained with Wright's stain. The *t* test was used in statistical analysis.

Methods of handling and feeding were detailed elsewhere (*1*). The original diet consisted of fruits supplemented by baby cereals, milk, eggs, suckling mice, and meal worms. In October, 1967 the feeding of Purina Monkey Chow 25 (Ralston Purina Company, St. Louis, Mo.) as a supplement was initiated. In 1968, the basic diet was changed to monkey chow 25, supplemented with fruits on weekdays.

Results and Discussion

The arrival values, theoretically, reflect the values of the night monkeys in their natural state. Our interest in these determinations was as a point of comparison with the maintenance values.

Results of the hematological determinations from female night monkeys are presented in Table 1 and from males in Table 2. There is no significant difference in values ($P < 0.01$) between the sexes, except for the mean percentage of neutrophils in the groups maintained in the laboratory in 1968.

Both females and males show a significant increase in the mean number of leukocytes in 1967 and in 1968 over the mean number in monkeys at time of arrival at the laboratory. For the females, the respective values are 14.8 and 15.3 x 10^3 per cmm, in contrast to 8.6 x 10^3 per cmm; and for the males, 13.9 and 15.6 x 10^3 per cmm, in contrast to 9.4 x 10^3 per cmm. This probably reflects an exposure in the laboratory to a more variable bacterial population than exists in the natural environment of the monkeys. The mean percentage of lymphocytes in females, not the absolute number, is significantly reduced in the 1967 group from the mean value for this group at time of arrival at the laboratory, i.e. 22.8 from 42.6. This is accompanied by an increase in the mean percentage, as well as the absolute number, of neutrophils for the 1967 group over the arrival group, i.e. 71.0 over 53.5.

Male night monkeys show significant increases in the mean values for mean corpuscular hemoglobin (MCH) index for 1967 over those for arrival; and for the mean corpuscular hemoglobin concentra-

TABLE 1

Hematological determinations from female Aotus trivirgatus *at Gorgas Memorial Laboratory*

Determination	*Arrival at lab. (1966-1968)* No.	Mean ± S.D.	Range	*Maintained in lab. (1967)* No.	Mean ± S.D.	Range	*Maintained in lab. (1968)* No.	Mean ± S.D.	Range
Erythrocytes (10^6/mm^3)	126	4.19 ± 0.81	1.49 – 6.23	85	4.23 ± 0.55	1.70 – 5.60	29	4.53 ± 0.58	3.55 – 5.73
Leukocytes (10^3/mm^3)	126	8.6 ± 3.4	3.2 – 23.6	85	14.8 ± 5.5*	4.6 – 37.2	29	15.3 ± 4.5*	7.5 – 23.2
Packed cell volume (%)	161	40.6 ± 8.3	14 – 61	72	40.9 ± 7.2	15 – 54	28	42.8 ± 4.9	33 – 50
Hemoglobin (g/100 ml)	94	12.7 ± 2.0	7.8 – 17.0	78	12.5 ± 1.9	5.0 – 16.0	29	13.4 ± 1.3	10.5 – 15.2
Neutrophils (%)	49	53.5 ± 13.9	18 – 82	4	71.0 ± 5.0	65 – 77	19	63.5 ± 8.3	49 – 86
Lymphocytes (%)	49	42.6 ± 12.4	12 – 73	4	22.8 ± 5.6*	17 – 30	19	34.4 ± 7.8	12 – 48
Monocytes (%)	49	1.9 ± 2.2	0 – 14	4	3.3 ± 1.9	2 – 6	19	1.6 ± 1.2	0 – 4
Eosinophils (%)	49	2.4 ± 2.9	0 – 16	4	2.0 ± 1.2	1 – 3	19	1.5 ± 2.7	0 – 9
Basophils (%)	49	0.6 ± 1.0	0 – 4	4	1.0 ± 1.2	0 – 2	19	0.2 ± 0.5	0 – 2
MCV (cubic microns)	113	98.7 ± 8.2	62.9 – 133.3	72	95.9 ± 6.5	64.6 – 105.6	28	94.0 ± 7.2	76.8 – 108.6
MCH (picograms)	93	29.1 ± 1.2	25.6 – 32.7	78	29.4 ± 0.6	28.0 – 32.2	29	29.5 ± 1.0	26.5 – 33.6
MCHC (%)	82	30.6 ± 3.0	23.3 – 46.8	67	31.4 ± 3.2	27.6 – 48.3	28	31.6 ± 2.1	28.6 – 37.6

No. Number of determinations.
* Differs from corresponding value for arrival, $P < 0.01$.

TABLE 2

Hematological determinations from male Aotus trivirgatus *at Gorgas Memorial Laboratory*

Determination	*Arrival at lab. (1966-1968)* No.	Mean ± S.D.	Range	*Maintained in lab. (1967)* No.	Mean ± S.D.	Range	*Maintained in lab. (1968)* No.	Mean ± S.D.	Range
Erythrocytes (10^6/mm^3)	129	4.27 ± 0.68	1.77 – 5.90	73	4.24 ± 0.77	1.95 – 5.49	18	4.64 ± 0.63	3.60 – 5.95
Leukocytes (10^3/mm^3)	129	9.4 ± 5.2	3.0 – 46.0	73	13.9 ± 5.3*	4.0 – 27.9	18	15.6 ± 3.8*	11.5 – 25.3
Packed cell volume (%)	172	42.0 ± 6.9	17 – 57	66	42.1 ± 7.2	18 – 55	18	44.6 ± 6.2	34 – 52
Hemoglobin (g/100 ml)	93	12.6 ± 3.4	9.0 – 16.0	58	12.4 ± 2.1	6.0 – 16.0	18	13.6 ± 1.5	10.7 – 15.7
Neutrophils (%)	57	57.6 ± 16.5	15 – 96	10	69.6 ± 5.1	58 – 75	12	56.1 ± 3.5**	34 – 72
Lymphocytes (%)	57	37.8 ± 15.1	2 – 75	10	24.7 ± 6.4	14 – 36	12	39.0 ± 10.1**	24 – 58
Monocytes (%)	57	1.7 ± 1.6	0 – 7	10	1.3 ± 1.2	0 – 3	12	2.8 ± 2.1	1 – 8
Eosinophils (%)	57	3.2 ± 4.0	0 – 19	10	2.2 ± 1.8	0 – 5	12	1.8 ± 2.5	0 – 7
Basophils (%)	57	0.8 ± 1.5	0 – 7	10	1.8 ± 1.5	0 – 4	12	0.1 ± 0.3**	0 – 1
MCV (cubic microns)	93	97.9 ± 5.8	76.6 – 128.0	66	98.1 ± 12.3	80.3 – 188.7	17	93.9 ± 5.7	85.0 – 108.4
MCH (picograms)	70	29.1 ± 0.9	25.6 – 31.1	58	29.6 ± 0.8*	28.4 – 33.6	18	29.1 ± 1.0	26.0 – 29.9
MCHC (%)	60	29.7 ± 1.6	22.6 – 33.6	53	30.8 ± 2.1*	25.6 – 37.7	17	31.1 ± 1.7*	27.1 – 34.3

No. Number of determinations.
* Differs from corresponding value for arrival, $P < 0.01$.
** Differs from corresponding value for 1967, $P < 0.01$.

tion (MCHC) indices for 1967 and for 1968 over those for arrival. Numerically, these differences are small and may reflect the inaccuracies of the methods used to determine erythrocyte and hemoglobin determinations. Though significant, they should be accepted reservedly.

A significant difference in the mean percentage values for several of the types of leukocytes in males between 1967 and 1968 is also shown. The 1968 values are remarkably similar to those for arrival. A somewhat similar situation exists in the females, as the 1968 mean percentage values for this sex more nearly approximate the arrival values than do the 1967 values. Most likely, the 1968 mean values rather than the 1967 values more truly represent the true values for differential leukocyte percentages that should exist in night monkeys held in captivity.

Of interest are the mean increases, even though not at a significant level, in erythrocyte counts, packed cell volume percentages, and hemoglobin values in both females and males in 1968 in comparison to the mean values at arrival.

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