

Hematologic values of normal Jindo dogs

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珍島犬의 血液像

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抄錄: 임상적으로 건강한 진도개 203두의 血液値를 조사하였다. 203두에는 암수가 다 포함되어 있었으며 개의 연령은 3개월에서 10세까지 이었다. 赤血球數, 血色素量, 赤血球容積 그리고 好酸球數 등은 개의 연령과 함께 증가하였다. 진도개에서 나타난 높은 好酸球數는 心臟絲狀蟲症과 벼룩의 감염에 의한 皮膚炎때문인 것으로 생각된다.

Key words: hematologic value, Jindo dogs, eosinophilia, dirofilariasis, flea-allergy dermatitis

Introduction

The information obtained from the blood examination is seldom diagnostic in itself. Examination of peripheral blood, however, can contribute significantly to a better understanding of the disease, and it can aid materially in the development of a prognosis.^{1,2} And to understand the pathologic conditions one must know the normal hematologic values.

Normal blood values for the dog were commonly developed from small numbers of dogs used in the study of physiologic, pharmacologic, or medical problems.^{3,4} Recent extensive use of the dog in biomedical research and the use of the electronic cell counter and the microhematocrit have provided more reliable values.^{5,6}

Hematologic values of Jindo dogs have been reported by several authors. The first work⁷ was

performed in 1972 using manual techniques and the second study⁸ has incorporated the dogs reared outside of Jindo island in 1980. The third work by Kim et al⁹ was conducted in 1988 while the present study was being done using different animals. The present study is concerned with hematologic values in different age groups of normal Jindo dogs.

Materials and Methods

Animals: a total of 207 clinically normal dogs were selected. The dogs had characteristics of Jindo dogs and were reared by farmers in Jindo island.⁷ The dogs were in different age groups and the colour of haircoat and sex of the dogs are summarized in Table 1.

Blood examination: Samples of blood were taken from cephalic vein during the period November 3 to December 8, 1987. The blood samples were preserved in dipotassium ethylenediaminetetraacetate

Table 1. The colour of haircoat and sex of the Jindo dogs from which the blood samples were taken

Colour of haircoat	Sex	No. of dogs	Remarks
Yellow	Male	37	
	Female	80	
White	Male	18	
	Female	51	
Miscellaneous	Male	6	Grey, black, tan, etc
	Female	15	
Total		207	

(EDTA) at a concentration of 2mg/ml of whole blood. Blood smears were made as soon as possible, using the slide method.¹ Total leukocyte and erythrocyte counts were determined by electronic cell counter (Sysmex CC-110). Hemoglobin concentra-

tions were determined by the cyanmethemoglobin method, using the Coulter (ZF) hemoglobinometer. Packed cell volumes(PCV) were determined by the microhematocrit method(Hanil H-25). Erythrocyte indexes (mean corpuscular volume, mean corpuscular hemoglobin and mean corpuscular hemoglobin concentration) were determined as previously described.¹ Differential leukocyte counts were performed on Giemsa-stained blood films previously fixed in absolute methanol.

Statistics: Means and differences were tested by T-TEST or ONE-WAY programs in Statistical Packages for the Social Sciences.¹⁰ Because this report concerns only clinically normal dogs, blood samples with a WBC count above 20,000 cells/ μ L were not included in statistical analyses.⁵

Results

No differences were found in the hematologic

Table 2. Influence of age on the canine hemogram in Jindo dogs (means \pm SD)

	Age(months)					Significance level
	3~6	7~12	13~24	25~36	>37	
Number of dogs	78	40	49	19	17	
Erythrocytes($\times 10^6/\mu$ L)	6.3 \pm 1.5	6.9 \pm 1.4	7.2 \pm 1.9	7.1 \pm 1.6	7.4 \pm 2.4	0.05
Hemoglobin(g/dL)	15.1 \pm 2.3	17.8 \pm 2.3	17.8 \pm 2.4	17.7 \pm 3.2	17.9 \pm 3.1	0.001
PCV(%)	38.8 \pm 4.9	45.4 \pm 6.3	45.4 \pm 5.7	45.6 \pm 7.4	47.5 \pm 7.8	0.001
MCV(f)	63.8 \pm 12.5	67.4 \pm 10.8	65.8 \pm 12.9	66.1 \pm 12.0	67.4 \pm 12.5	NS
MCH(pg)	24.8 \pm 5.2	26.5 \pm 4.4	25.9 \pm 5.5	25.8 \pm 5.6	25.5 \pm 5.6	NS
MCHC(%)	38.9 \pm 4.7	39.6 \pm 5.7	39.4 \pm 3.5	38.9 \pm 3.1	37.9 \pm 4.2	NS
Leukocytes/ μ L	10,955 \pm 3,261	11,037 \pm 3,178	11,258 \pm 3,621	11,993 \pm 3,267	9,972 \pm 3,067	NS
Percentage distribution of WBC						
Neutrophils(band)	0.1 \pm 0.4	0.2 \pm 0.5	0.1 \pm 0.4	0.1 \pm 0.2	0.4 \pm 0.6	NS
Neutrophils(mature)	57.6 \pm 13.5	57.5 \pm 10.4	54.7 \pm 10.6	60.3 \pm 11.7	54.7 \pm 15.2	NS
Lymphocytes	30.6 \pm 12.1	27.5 \pm 8.5	26.6 \pm 8.7	22.6 \pm 9.6	23.1 \pm 10.6	0.01
Monocytes	2.3 \pm 1.5	2.9 \pm 1.7	1.9 \pm 1.1	2.2 \pm 1.2	2.7 \pm 2.1	0.05
Eosinophils	9.3 \pm 7.2	11.9 \pm 5.5	16.6 \pm 9.3	14.7 \pm 5.5	19.1 \pm 10.7	0.001
Basophils	0	0	0	0	0	NS
Absolute numbers of WBC/ μ L						
Neutrophils(band)	15 \pm 44	21 \pm 54	20 \pm 65	4 \pm 20	37 \pm 57	NS
Neutrophils(mature)	6,382 \pm 2,676	6,340 \pm 2,173	6,183 \pm 2,469	7,211 \pm 2,378	5,468 \pm 2,219	NS
Lymphocytes	3,259 \pm 1,425	3,052 \pm 1,343	2,962 \pm 1,274	2,690 \pm 1,252	2,347 \pm 1,432	NS
Monocytes	254 \pm 194	311 \pm 205	211 \pm 154	263 \pm 159	234 \pm 167	NS
Eosinophils	1,036 \pm 941	1,309 \pm 769	1,882 \pm 1,259	1,817 \pm 967	1,885 \pm 1,161	0.001
Basophils	0	0	0	0	0	NS

NS, not significant.

values either between yellow and white dogs or between sexes. Mean values in different age groups are given with standard deviations (Table 2). Total red blood cell counts increased until 24 months of age and thereafter remained steady. Hemoglobin concentrations and packed cell volumes increased until 12 months of age and thereafter remained unchanged. Relative percentage of lymphocytes decreased with age and relative percentage of monocytes was lower in the age group of 13 to 24 months than in the other age groups. The number of eosinophils increased until 24 months of age and thereafter remained steady.

Discussion

Jindo dogs mainly consist of 2 colours, yellow and white (Table 1). In the present study there was no differences in the hematologic values between the dogs of these 2 colours and same results were obtained in a previous study.⁷ As was found in other studies^{3,7,8,11} no differences were found in the hematologic values between male and female Jindo dogs.

The hematologic values reported in this survey (Table 2) are, in general, comparable to those previously reported^{4,5-9,12,13} and compiled.^{1,14,15} The mean corpuscular hemoglobin concentrations were higher in the present study than in the other reports; the reason for this difference could be, in part, due to the amount of EDTA used. In this connection Perman and Schall (1983)¹⁶ indicated that the use of excessive amounts of the anticoagulant EDTA results in reduced PCV. In the present study PCV was low while hemoglobin concentrations were relatively high.

An interesting feature of this study is the eosinophilia in all age groups. The relative percentage of eosinophils in normal dogs is supposed to be 3~6%^{1,13} and sometimes it reaches 19%.¹⁷ In Jindo dogs the number of eosinophils significantly ($p < 0.001$) increased with age and a few dogs had a very high (42%) relative percentage of eosinophils. Same result was obtained in a previous work in German shepherds used as military dogs in Korea.¹⁸

Schalm (1963)² stated that the mean absolute number of eosinophils in clinically normal dogs was

550, with a maximum of 1,250/ μ L of blood. Significant eosinophilia with absolute numbers in excess of 1,500/ μ L is associated with diseases of the skin and respiratory tract and with parasitism.¹ Prasse (1983)¹⁹ noted that only those parasites that are migratory and invasive produce eosinophilia and cited parasitisms of dogs that quite consistently induce eosinophilia. Among them were dirofilariasis and flea-allergy dermatitis. The increased number of eosinophils in Jindo dogs appears to be due to these two conditions. It is known that a considerable number of Jindo dogs are infected with *Dirofilaria immitis*^{20,21} and many Jindo dogs were found to be infested with flea when the blood samples were taken.

Many authors reported the changes in the canine hematologic values with age.^{5,11,22,23} Examination of results (Table 2) reveals that the total erythrocyte count, hemoglobin content, and PCV increased with age until dogs were 12 months of age, when these values stabilized. These results are comparable to those reported previously.²³

Summary

Hematologic values were determined in blood samples obtained from 203 normal, healthy Jindo dogs of both sexes that ranged in age from 3 months to 10 years. Age-related differences were detected for the total erythrocyte count, hemoglobin content, PCV and the number of eosinophils. The persistent eosinophilia appears to be due to the dirofilariasis and flea-allergy dermatitis.

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