HEMATOLOGIC AND SERUM CHEMISTRY VALUES OF PEN-RAISED COYOTES 1

Author: RICH, J. E.

Source: Journal of Wildlife Diseases, 15(1) : 115-119

Published By: Wildlife Disease Association

URL: https://doi.org/10.7589/0090-3558-15.1.115

HEMATOLOGIC AND SERUM CHEMISTRY VALUES OF PEN-RAISED COYOTES[1]

J. E. RICH, Agricultural Experiment Station, University of Idaho, Dubois, Idaho 83423, USA.
N. L. GATES, U.S. Department of Agriculture, Science and Education Administration, Dubois, Idaho 83423, USA.

Abstract: Blood samples obtained from 48, eighteen-month-old pen-raised coyotes *(Canis latrans)* were analyzed for 32 hematologic and serum chemistry parameters. Mean, standard deviation, and range were established for each parameter. No differences attributable to sex were observed for any parameter. The reported hematologic and serum chemistry values establish non-fasting baseline values for pen-raised coyotes.

INTRODUCTION

In recent years, coyotes *(Canis latrans)* have been used more frequently in research on predator control. Consequently, a need for baseline physiologic information has become essential. Previous work[2,3,5] on chemistry and hematologic values was done on captive wild coyotes. However, blood values have not been reported for pen-raised coyotes which Gates[2] indicated were preferred over wild coyotes for some aspects of research on predator control. The purpose of this study was to observe and record hematologic and serum chemistry values for coyotes raised under controlled environmental and nutritional conditions.

METHODS

Coyote pups were obtained from dens in various areas of Idaho in the spring, 1976; pups were estimated to be from 1-4 weeks old according to tooth eruption patterns established by Gier.[4] The pups were fed bitch's milk replacer [2] [3] by bottle until weaned. After weaning, the coyotes were maintained on commercial dog food [4] and water *ad libitum*. At approximately nine months of age the coyotes were confined as male-female pair in pens 1.8 × 1.8 × 6.2 m.

Early morning, non-fasting blood samples were collected from 24 male and 24 female coyotes during a two week period in October, 1977. Mean weight of the coyotes was 11.3 kg. Coyotes were restrained with their jaws held closed by hand during blood collection. Blood samples were taken from jugular veins with a vacutainer [5] holder and a disposable 20-gauge needle. Blood for hematologic studies was collected in 2 ml vacutainer tubes containing 0.05 ml of 15% potassium ethylenediaminetetraacetic acid. Blood for serum chemistry studies was collected in 15 ml vacutainer tubes. All tests were run within 24 h after blood collection.

[1] Approved for publication by the Director of the Idaho Agricultural Experiment Station, Moscow, as Experiment Station Publication No. 7846.

[2] Mention of a trade name, proprietary product, or specific equipment does not constitute a guarantee or warranty by the U.S. Department of Agriculture and does not imply approval to the exclusion of other products that may be suitable.

[3] Esbilac, Borden Chemical, Borden Inc., Norfolk, Virginia.

[4] Ralston Purina Co., St. Louis, Missouri.

[5] Becton, Dickinson and Co., Rutherford, New Jersey.

Total leucocyte (WBC) and erythrocyte (RBC) counts and hemoglobin (Hb) values were determined on an electronic counter. [6] Packed cell volumes (PCV) were determined by the microhematocrit method. [7] Differential WBC counts were obtained by classifying 100 cells on a Wright's stained blood film. Mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH) and mean corpuscular hemoglobin concentration (MCHC) were calculated.[6]

Non-fasting serum levels of glucose, blood urea nitrogen (BUN), total and direct bilirubin, uric acid, calcium, albumin, alkaline phosphatase, creatine phosphokinase (CPK), lactic dehydrogenase (LDH), glutamic oxalacetic transaminase (GOT) and glutamic pyruvic transaminase (GPT) were determined on a semiautomated blood chemistry analyzer. [8] Creatinine, inorganic phosphorus, and amylase values were determined by manual techniques. Sodium and potassium values were determined on a flame photometer. [9] Total protein values were obtained on a refractometer. [10] Globulin values were

TABLE 1. Hematologic values of coyotes (males and females combined).

Hematologic value[a]	Range	Mean	S.D.
Total WBC (μl)	6,200.0 - 14,100.0	9,050.0	1,870.0
Total RBC ($10^6/\mu$l)	5.7 - 8.4	7.2	0.6
Hb (g/dl)	14.4 - 19.8	17.1	1.2
PCV (%)	42.0 - 58.0	50.5	3.4
MCV (fl)	57.5 - 80.1	70.4	4.5
MCH (pg)	19.4 - 27.4	23.8	1.6
MCHC (g/dl)	32.5 - 35.7	33.9	0.6
Neutrophils			
Number	2,728.0 - 12,126.0	5,602.0	622.0
Percentage	44.0 - 86.0	61.9	11.1
Lymphocytes			
Number	496.0 - 5,499.0	2,307.8	186.9
Percentage	8.0 - 39.0	25.5	8.1
Monocytes			
Number	62.0 - 1,410.0	425.4	9.8
Percentage	1.0 - 10.0	4.7	2.3
Eosinophils			
Number	62.0 - 2,115.0	552.1	17.7
Percentage	1.0 - 15.0	6.1	3.2
Bands			
Number	0 - 423.0	54.3	0.4
Percentage	0 - 3.0	0.6	0.8

[a]WBC, white blood cells; RBC, red blood cells; μl, microliters; Hb, hemoglobin; g/dl, grams per deciliter; PCV, packed cell volume; MCV, mean corpuscular volume; fl, femtoliters; MCH, mean corpuscular hemoglobin, pg, picograms, MCHC, mean corpuscular hemoglobin concentration.

[6] Hycel Counter-300, Hycel Inc., Houston, Texas.

[7] Readacrit Centrifuge, Clay Adams Division of Becton, Dickinson and Co., Parsippany, New Jersey.

[8] Clinicard Analyzer, Instrumentation Laboratory Inc., Lexington, Massachusetts.

[9] Model 21 Coleman Flame Photometer, Coleman Instruments Inc., Maywood, Illinois.

[10] TS Meter, American Optical, Buffalo, New York.

obtained by subtracting albumin values from total protein values.[1]

The means of baseline blood values of pen-raised coyotes in this report were compared to the means of blood values of captive wild coyotes reported by Gates[2] and Gates and Goering[3] for those parameters where the same method of analysis was used. All comparisons were made using the students "t" test (α=0.05).

RESULTS AND DISCUSSION

Hematologic values for all coyotes used in this report are summarized in Table 1. All serum chemistry values are summarized in Table 2. Range, mean and standard deviation are given for each value. No significant differences were attributable to sex for any of the hematologic or serum chemistry values observed.

In an attempt to reduce the variable factors affecting the baseline physiologic information reported here, coyotes used in this study were conditioned as pups to continuous confinement, human presence and handling and provided with a nutritionally adequate diet.

PCV and WBC differential counts were analyzed using the same methodology used by Gates and Goering.[3] No significant difference was observed between the mean PCV of pen-raised coyotes and the mean PCV of captive wild coyotes. The means of the lymphocytes and the monocytes were significantly higher in pen-raised coyotes. The mean of neutrophils was significantly lower in pen-raised coyotes, although the absence

TABLE 2. Serum chemistry values of coyotes (males and females combined).

Chemistry values[a]	Range	Mean	S.D.
Glucose (mg/dl)[b]	79.0 - 191.0	125.0	28.0
Blood Urea Nitrogen (mg/dl)	12.4 - 40.4	26.6	7.1
Total Bilirubin (mg/dl)	0.1 - 0.4	0.25	0.09
Direct Bilirubin (mg/dl)	0.01 - 0.11	0.04	0.02
Creatinine (mg/dl)	0.8 - 2.1	1.3	0.3
Uric Acid (mg/dl)	0.1 - 1.2	0.4	0.3
Calcium (mg/dl)	8.3 - 11.1	9.8	1.4
Inorganic Phosphorus (mg/dl)	2.0 - 6.3	3.8	1.0
Sodium (meq/l)	135.0 - 154.0	145.0	3.8
Potassium (meq/l)	4.1 - 6.2	4.9	0.4
Total Protein (gm/dl)	5.5 - 7.2	6.5	0.3
Albumin (gm/dl)	1.9 - 3.4	2.7	0.3
Globulin	2.9 - 4.3	3.7	0.3
Albumin/Globulin Ratio	0.5 - 1.2	0.7	0.1
Amylase (units/dl)[c]	136.0 - 504.0	320.0	88.0
Alkaline Phosphatase (I.U./l)	20.0 - 119.0	35.0	15.0
Creatine Phosphokinase (I.U./l)	41.0 - 339.0	105.0	52.0
Lactic Dehydrogenase (I.U./l)	54.0 - 443.0	143.0	86.0
Glutamic Oxalacetic Transaminase (I.U./l)	15.0 - 114.0	47.0	19.0
Glutamic Pyruvic Transaminase (I.U./l)	21.0 - 92.0	49.0	17.0

[a]mg/dl, milligrams per deciliter; meq/l, milliequivalents per liter; gm/dl, grams per deciliter; units/dl, amylase units per deciliter; I.U./l, international units per liter.

[b]Glucose values on non-fasting animals.

[c]The amylase unit is defined by Caraway as the amount of enzyme that will hydrolyze 10 mg. of starch in 30 min. to a stage at which no color is given by iodine.

of band neutrophils in the report of captive wild coyotes may reflect a combining of segmented and band neutrophils which could approximate the difference between the neutrophils of pen-raised and captive wild coyotes. No other significant differences were noted between the means of the other WBC differential parameters.

Serum chemistry parameters analyzed using the same methodology were creatinine, inorganic phosphorus, amylase, sodium and potassium. The means of creatinine, inorganic phosphorus and potassium were significantly lower for pen-raised coyotes. The mean of amylase was significantly higher for pen-raised coyotes. No significant difference was observed for the mean values of sodium.

Albumin values reported appear lower than expected when compared to other species of canids and may be due to the method of analysis although a standard technique was used.

Differences between blood values of pen-raised and captive wild coyotes perhaps are due to variable factors such as health and nutritional status, age, seasonal variances and environmental stress. It has been shown that such factors are important to the physiologic state of other canids. Seal *et al.*[7] reported abnormal physiologic values in wolf pups *(Canis lupus)* in poor health as a result of nutritional stress. Thomas and Kittrell[9] reported that RBC, Hb, and PCV of dogs were significantly higher during the winter months. Soave and Boyle[8] reported that hematologic values of dogs were more likely to be within established normal limits after environmental stress was reduced by conditioning the animal to the environment. The age of the captive wild coyotes used by Gates[2] and Gates and Goering[3] were not determined other than they were adults.

Acknowledgement

The authors thank Mr. Douglas Barnum for assistance with data analysis.

LITERATURE CITED

1. COLES, E.H. 1974. *Veterinary Clinical Pathology*. 2nd ed. W.B. Saunders Co., Philadelphia, Pa.
2. GATES, N.L. 1977. Chemosterilant evaluation in coyotes: Parameters for animal selection and laboratory methodology. *Test Methods for Vertebrate Pest Control and Management Materials,* ASTM STP 625. W.B. Jackson and R.E. Marsh, Eds. Am. Soc. Testing Mat.: 106-113.
3. —— and E.K. GOERING. 1976. Hematologic values of conditioned, captive wild coyotes. J. Wildl. Dis. 12: 402-404.
4. GIER, H.T. 1975. Ecology and behavior of the coyote, In: *The Wild Canids: Their Systemic Behavioral Ecology and Evolution.* M.W. Fox, Ed. Van Nostrand-Reinhold Co. N.Y. pp. 247-262.
5. GOERING, E.K., C.S. CARD, D.F. BROBST and N.L. GATES. 1976. Electrophoretic protein analysis in the conditioned captive wild coyote. J. Wildl. Dis. 12: 498-503.
6. SCHALM, D.W., N.C. JAIN and E.J. CARROLL. 1975. *Veterinary Hematology*. 3rd ed. Lea and Febiger, Philadelphia, Pa.
7. SEAL, U.S., L.D. MECH and V.V. BALLENBERGHE. 1975. Blood Analyses of wolf pups and their ecological and metabolic interpretation. J. Mammal. 56: 64-75.

8. SOAVE, O.A. and C.C. BOYLE. 1965. A comparison of the hemograms of conditioned and non-conditioned laboratory dogs. Lab. An. Care. 15: 359-362.
9. THOMAS, R.E. and J.E. KITTRELL. 1966. Effect of altitude and season on the canine hemogram. J. Am. vet. med. Ass. 148: 1164-1167.

Received for publication 12 May 1978