

## **COMPARATIVE PHYSIOLOGIC VALUES IN CAPTIVE AND WILD BIGHORN SHEEP**

Author: FRANZMANN, ALBERT W.

Source: Journal of Wildlife Diseases, 7(2) : 105-108

Published By: Wildlife Disease Association

URL: <https://doi.org/10.7589/0090-3558-7.2.105>

---

BioOne Complete ([complete.BioOne.org](https://complete.BioOne.org)) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at [www.bioone.org/terms-of-use](https://www.bioone.org/terms-of-use).

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

---

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

## COMPARATIVE PHYSIOLOGIC VALUES IN CAPTIVE AND WILD BIGHORN SHEEP

ALBERT W. FRANZMANN, Idaho Cooperative Wildlife Research Unit, College of Forestry, Wildlife, and Range Science, University of Idaho, Moscow, Idaho 83843

**Abstract:** The need for establishing physiologic values for a species was recognized and the many variables affecting these must be considered. The physiologic value differences and similarities between captive and wild bighorn sheep (*Ovis canadensis*) was discussed from values obtained from 71 captive and 65 wild bighorns. Similar values between captive and wild sheep occurred with; calcium, blood urea nitrogen, cholesterol, packed cell volume, total protein, albumin, total globulin, alpha globulin, beta globulin, gamma globulin, albumin/globulin ratio, magnesium and hemoglobin. Dissimilarity occurred with; phosphorus, calcium/phosphorus ratio, serum glutamic oxalacetic transaminase, glucose, and rectal temperature values. Other variables potentially influencing these values were recognized and the difficulty of separating some variables from the wild/captive classification was discussed.

### INTRODUCTION

Physiologic values are necessary criteria for disease study of a species. Most domestic species and some wild species have established physiologic values.<sup>1</sup> The bighorn sheep has limited published physiologic and hematologic values.<sup>3,6</sup> To establish base line values for a species, diverse and multiple sampling with consideration of measurable variables is necessary. During the winter of 1969-1970, 71 captive and 65 wild bighorn sheep were sampled on 19 occasions from 6 populations. The sheep classified captive were those confined and cared for by man for at least one month.

The captive bighorn sheep sampled consisted of Rocky Mountain bighorns (*Ovis canadensis canadensis*) and California bighorns (*Ovis canadensis californiana*). Forty-one samples from bighorns were obtained from a University of British Columbia project at Wasa, British Columbia, and 6 from the Wyoming Game and Fish Research Unit at Sybille, Wyoming. Twenty-four California bighorns were sampled at the Okanagan Game Farm, Penticton, British Columbia.

The wild bighorn sheep sampled were Rocky Mountain bighorns from: Banff National Park, Canada (26 head); Mon-

tana Fish and Game Departments' Sun River Game Range, Augusta, Montana (13 head); Wyoming Game and Fish Departments' Whiskey Basin Game Range, Dubois, Wyoming (26 head).

The age/sex structure for the captive bighorn sheep was; 5 male lambs, 5 female lambs, 8 male yearlings, 33 female yearlings, 3 male adults and 17 female adults.

The age/sex structure for the wild bighorn sheep was 11 male lambs, 5 female lambs, 3 male yearlings, 2 female yearlings, 10 male adults and 34 female adults.

A field laboratory was established utilizing the Unitest System (Bio-dynamics Inc., Indianapolis, Ind.) to obtain these values: blood glucose; blood urea nitrogen; cholesterol; serum glutamic oxalacetic transaminase; hemoglobin; and total protein. The packed cell volume was determined using the microhematocrit method (Clay-Adams, N.Y.).

After completing field laboratory procedures blood serum was frozen and held for further testing. Blood mineral values were done at Washington State University, College of Veterinary Medicine Clinical Pathology Laboratory, Pullman, Washington. The calcium and magnesium

determinations were done by microtitration (Oxford Laboratories, San Mateo, Calif.), and the phosphorus determination was Phospho-Pak (Uni Tech Chemical Ffg. Co.) Sun Valley, Calif. Protein fractions were obtained from electrophoretic patterns done by The Endoparasite Vector Pioneering Research Laboratory, Animal Disease and Parasite Research Division, Agriculture Research Service, Pullman, Washington.

Data obtained from sampling was transferred to IBM cards and a program

was written and used to handle data and obtain reported values.

It was recognized that there are many variables that could influence physiologic values, but in attempting to establish base line physiologic values for bighorn sheep the separation of wild from captive sheep would be necessary.

After sampling 136 bighorns a comparison of wild and captive values was made to determine the validity of this separation (Table 1).

TABLE 1. Physiologic values from 136 captive and wild bighorn sheep.

	GRAND TOTAL		CAPTIVE (71)		WILD (65)	
	MEAN	S.D.	MEAN	S.D.	MEAN	S.D.
Rectal Temp. F.	102.9	1.9	101.9	1.3	104.0	1.8
Magnesium mg/100 ml	1.4	1.0	1.2	1.0	1.7	1.2
Calcium mg/100 ml	8.9	1.6	9.0	1.6	8.8	1.7
Phosphorus mg/100 ml	4.7	1.6	5.3	1.7	4.0	1.3
Ca/P Ratio	2.14	0.99	1.83	0.6	2.46	1.2
Glucose mg/100 ml	143.6	67.8	124.9	59.6	164.0	70.8
B.U.N. mg/100 ml	24.2	12.2	24.8	14.9	23.5	8.3
Cholesterol mg/100 ml	78.5	36.7	74.0	42.7	83.4	28.4
S.G.O.T. Karmen units	281.4	263.4	155.3	119.6	419.2	306.2
Hemoglobin grams/100 ml	18.1	3.3	17.1	3.6	19.3	2.7
Packed Cell Volume %	45.2	6.6	45.3	7.9	45.1	4.8
Total Protein grams/100 ml	6.5	1.5	6.3	1.4	6.8	1.6
Albumin %	52.8	9.0	52.9	8.6	52.6	9.4
Total Globulin %	47.8	8.9	47.1	8.6	47.6	9.2
Alpha Globulin %	17.5	7.8	17.1	7.2	17.8	8.4
Beta Globulin %	15.5	6.7	16.8	7.6	14.2	5.4
Gamma Globulin %	14.4	5.4	13.2	5.3	15.5	5.2
A/G Ratio	1.19	4.42	1.19	0.41	1.18	0.42

## RESULTS

The means for the following physiologic values were similar for captive and wild bighorn sheep; calcium, blood urea nitrogen, cholesterol, packed cell volume, total protein, albumin, total globulin, alpha globulin, beta globulin, gamma globulin, albumin/globulin ratio, magnesium and hemoglobin (Table 1).

Major observable differences between mean values for captive and wild sheep were noted for; rectal temperature, glucose, phosphorus, calcium / phosphorus ratio, and serum glutamic oxalacetic transaminase (Table 1).

## DISCUSSION

The physiologic values that are similar can aid us, because if their similarity is maintained with future sampling, we know that captive animals and their physiologic values will be useful in building a stronger base for values applicable to all bighorn sheep.

The values that appear dissimilar may or may not be due to the wild/captive variable, but major differences in the classification should not be overlooked.

Excitability effects certain physiologic values,<sup>8</sup> and each herd was evaluated for excitability on a scale from 1 to 5 (1 none, 2 slight, 3 moderate, 4 excited, 5 very excited). Captive sheep herd evaluations were never above moderate excitement while wild sheep herd evaluations were never below excited except for a group of 6 which were immobilized with M-99 (American Cyanamid Co. N.Y.)<sup>8</sup> This difference in excitability may account for the dissimilarity between rectal temperature<sup>2</sup> and blood glucose values.<sup>1</sup>

Since S.G.O.T. (serum glutamic oxalacetic transaminase) values are a measure of cell necrosis and muscle myopathy,<sup>5</sup> it can be assumed that the wild sheep with an S.G.O.T. mean value of 419.2 mg/100 ml are experiencing more cell damage at handling than are captive sheep with an S.G.O.T. value of 155.3 mg/100 ml. Included in this sampled group of wild bighorns was a group of 12 sheep which were stressed prior to sampling and their S.G.O.T. values all exceeded 1100 mg/100 ml. The S.G.O.T. values are erratic and other factors influencing this must be considered when evaluating and applying results.

The captive bighorn mean phosphorus level of 5.3 mg/100 ml was greater than the wild bighorn level of 4.0 mg/100 ml. This also affected the calcium/phosphorus ratio (captive 1.83, wild 2.46). It is possible that these wild sheep had some difficulty maintaining blood phosphorus levels since their value was also lower than the 5.21 mg/100 ml for domestic sheep.<sup>4</sup>

We may conclude that the variables wild and captive in their total concept influence physiologic values, not as entities in themselves, but as related to variables associated with them such as stress associated with excitability and handling.

Many other potential variables related to the wild/captive classification such as quality of protein and mineral intake and the physical environment may influence physiologic values. Hopefully as physiologic data from bighorn sheep accumulates these variables can be more accurately assessed.

## Acknowledgements

Cooperation and assistance from many individuals and organizations was necessary to obtain this information and those not listed in the text are: Dr. M. G. Hornocker and Mr. E. G. Bizeau, Idaho Cooperative Wildlife Research Unit; Drs. K. E. Hungerford and R. J. Knight, College of Forestry, Wildlife and Range Science, University of Idaho Dr. J. R. Gorham, Endoparasite Vector Pioneering Research Laboratory, Animal Disease and Parasite Research Division Agriculture Research Service, Pullman, Washington; Daryl Hebert, University of British Columbia; Dr. E. T. Thorne, Wyoming Game and Fish Department; Idaho Fish and Game Department; and The National Wildlife Federation, Washington, D.C.

## LITERATURE CITED

1. COLES, E. H. 1967. Veterinary Clinical Pathology. W. B. Saunders, Philadelphia, Pa. 455 pp.
2. DUKES, H. H. 1955. The Physiology of Domestic Animals. Cornell Univ. Press, Ithaca, N.Y. 817 pp.
3. FRANZMANN, A. W., and E. T. THORNE. 1970. Physiologic values in wild bighorn sheep (*Ovis canadensis canadensis*) at capture, after handling, and after captivity. J. Am. Vet. Med. Assoc. 157: 647-650.
4. HACKETT, P. L., D. W. GAYLORD, and L. K. BUSTAD. 1957. Blood constituents in Suffolk ewes and lambs. Am. J. Vet. Res. 18: 338-341.
5. WHANGER, P. O., P. H. WESWIG, O. H. MUTH, and J. E. OLDFIELD. 1969. Tissue lactic dehydrogenase, Glutamic-oxalacetic transaminase, and peroxidase changes of selenium-deficient myopathic lambs. J. of Nutrition. 99: 331-337.
6. WOOLF, A., and D. C. KRADEL. 1970. Hematological values of captive Rocky Mountain Bighorns. J. Wildl. Dis., 6: 67-68.

*Received for publication August 21, 1970*

---