SOME CHEMICAL CHARACTERISTICS OF ELK BLOOD

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CASE REPORTS AND BRIEFER ARTICLES

SOME CHEMICAL CHARACTERISTICS OF ELK BLOOD

During the winter of 1963-64, blood samples were drawn from elk *(Cervus canadensis nelsonii)* in the Sun River area of Montana. The primary purpose was to determine pregnancy in cow elk by testing for chorionic gonadotropins. A test for 17-hydroxycorticosteroid (17-OH) was also performed to assess possible stressful effects of trapping and handling.

The Montana Livestock Sanitary Board wished to make routine checks for Brucellosis, since part of the herd comes in contact with livestock during winter and spring. Several other serum constituents (carotene, vitamin A, magnesium, phosphorus and calcium) were tested also as a matter of record. Due to the lack of similar data from other herds and imperfect knowledge of elk physiology, no analyses were made nor conclusions drawn from these data. They are reported here for the reference of future investigators.

Samples were taken from elk trapped in the Bob Marshall Wilderness Area during December, 1963 and January and February, 1964. Elk forage at the time of sampling was mainly three species of grasses: *Agropyron spicatum, Festuca idahoensis and F. scabrella.* No artificial supplements of any kind were available to the animals and natural licks in the area were not used by them at that time of the year.

Chemical analysis for vitamin A, carotene, phosphorus, magnesium and calcium was performed by E. F. Gibbons, Diagnostic Laboratory, Livestock Sanitary Board. Analyses for chorionic gonadotropins and 17-OH were performed by the Bio-Assay Laboratory, Dallas, Texas. Dr. G. C. Halver, Montana Livestock Sanitary Board, drew most of the samples.

All samples sent to the Livestock Sanitary Board were kept at approximate body temperatures and flown to the laboratory by light aircraft. Samples sent to the Bio-Assay Laboratory were allowed to clot, refrigerated, and air-mailed in insulated containers.

Results of analysis are given in Table 1. Brucellosis tests were negative and are not listed. Values for carotene were extremely inconsistent. There does not appear to be any correlation between carotene and vitamin A levels in the same animal. It is possible that the conversion from carotene to vitamin A is extremely rapid in elk. Haugen and Hove (1960, J. Mamm. 41:410-411) reported the complete absence of carotenoids in the blood of white-tailed deer *(Odocoileus virginianus)* in Alabama.

Values for vitamin A ranged from 0 to 85 mcg%, exceeding the ranges reported for white-tailed deer (Haugen and Hove *op. cit.).* January mean values for both carotene and vitamin A were less than half the December values, possibly reflecting similar declines in the winter forage species.

TABLE 1. *Values of some female elk blood serum constituents.*

Month	Carotene mgc %	Vit. A.	Mg. mg %	P.	Ca.	17-OH mgc %
December (24)[1]						
Mean	20	43	30	31	128	22 (35)
High	8	85	39	47	244	28
Low	0	0	19	17	93	15
January (20)						
Mean	9	20	25	30	124	—[2]
High	38	49	39	43	226	
Low	0	11	19	20	97	
February (16)						
Mean	—[2]	—[2]	23	44	152	—[2]
High			25	51	310	
Low			22	40	88	

[1] Sample size
[2] No samples taken

Mean values for magnesium declined from December through February while those for calcium declined from December to January and increased in February. Mean values for phosphorus were essentially the same in December and January but rose sharply in February.

Seventy-five cows (yearling and older) were tested for pregnancy by presence of chorionic gonadotropins in the blood; 39 in December, 20 in January and 16 in February. Howe (1963, Job Comp. Rpt. Wyo. Project FW-3-R-10) has previously reported some success from bio-assay of urine-chorionic gonadotropins in elk. The "Frog" *(Rana pipiens)* test (Gradwohl, 1963, Clinical Lab. Meth. and Diagnosis 6th Ed: 278) was used in the bio-assay of December and January samples and the rat method (Gradwohl, *op. cit.*:280) was used for February samples. Percentages of pregnant cows were 10, 15, and 44 for December, January and February, respectively.

Although the Sun River herd is characterized by low calf production, the observed pregnancy rates are much lower than expected. The percent of pregnant cows killed during the hunting season averaged 70% from 1960 through 1965.

The February test using rats did appear to be more sensitive than the "Frog" test as evidenced by the much improved results obtained from the February sample. There was no evidence that the February sample was a unique population accounting for the higher pregnancy rate. Subsequent observations of tagged animals indicated that all three samples were heterogenous groups representing several wintering and summering areas. Most animals from the December sample would have been near the end of their first trimester of gestation and should have yielded better results than the January and February animals, which were in their second trimester. The mean Ca:P ratios changed between samples, being 4.18:1, 4.06:1, and 3.09:1 for December, January and February, respectively, but changes were not statistically significant at the 5% level using a t test. There did not appear to be any correlation between pregnant animals and low Ca:P ratios.

Further opportunity to test the method was offered in March, 1964, when several animals were autopsied in connection with another investigation. Blood was drawn from seven animals immediately prior to slaughter and sent to the laboratory for bio-assay. Autopsy revealed that 5 of the 7 were pregnant but the bio-assay indicated that only 2 were pregnant. Rectal palpation (Greer and Hawkins, 1967, J. Wildl. Mgmt. 31:145-149) appears to be the most satisfactory method for determining pregnancy in elk.

Blood levels of 17-OH were tested by the Glenn-Nelson method (Glenn and Nelson, 1953, Clin. Endocrin. and Metab. 13:911) using the Porter-Silber reaction (Porter and Silber, 1950, J. Biol. Chem. 185:201-207). It was assumed that 17-OH levels would increase under psychological stress. There are no previous records or standards for comparison of 17-OH levels in elk, so these may have their greatest value when used in future comparisons. The sequence of sampling did appear to have a slight effect on 17-OH levels, with animals sampled near the beginning of the sample period showing higher average values than those sampled in the middle or near the end of the sample period. A regression line comparing 17-OH levels with the sequence of sampling indicated a slight downward trend ($b = -.25$) over the 5 hour period of sampling, beginning immediately after the animals were trapped. Correlation between 17-OH and sample sequence was computed as $r = -.55$. This indicates that the high levels of 17-OH produced while the animals were being driven into the trap with helicopters, were not sustained during the handling period.

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REVIEW

MARKLEY, MERLE H. *Wild Turkey Diseases and Parasites.*

This is part of a chapter on Limiting Factors in a book *The Wild Turkey and Its Management,* edited by Oliver H. Hewitt. It was published in 1967 by *The Wildlife Society,* 3900 Wisconsin Avenue, Washington, D.C. 20016, 589 pages, price $6.00. The section on diseases and parasites covers pages 230-243.

The wild turkey of North and Central America is steeped in history and tradition. These birds provided stock for the extensive commercial domestic turkey production not only in North America but in many other parts of the world. It is still an important wild game bird.

In this chapter Markley has attempted to document all published reports of diseases in both wild and domesticated turkeys. This chapter provides an excellent compendium of the parasites and other disease-causing organisms that have been reported. It should serve as important source material for any future investigator confronted with disease problems in this species.

Carlton M. Herman.