SEROLOGIC, HEMATOLOGIC, AND BLOOD CHEMISTRY VALUES OF DESERT BIGHORN SHEEP IN SONORA, MEXICO

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ABSTRACT

Blood samples from eighteen desert bighorn (Ovis canadensis mexicana) live-captured in Sonora, Mexico, were collected for serologic, hematologic, and blood chemistry analyses. Significant serologic titers were found to bluetongue, parainfluenza-3, epizootic hemorrhagic disease, and bovine virus diarrhea. Suspect titers were found to contagious ecthyma and Leptospira interrogans serovar pomona. No titers were found to infectious bovine rhinotracheitis or Brucella abortus. Blood chemistry and hematological results are presented.

INTRODUCTION

Eighteen bighorn were captured between January 30 and February 4, 1984, sixteen from the Posada-Pico Johnson range in Sonora, Mexico, and two from Tiburon Island in the Gulf of California. Thirteen of these bighorn were captured by herding the animals into standing linear nets with a helicopter. Two were captured with a net capture gun fired from a helicopter. Three were captured by chemical immobilization from a helicopter using a CO_2 Cap-Chur rifle. Complete capture information is presented in DeForge et al. (1984). Body condition and health of all animals appeared good.

METHODS

Whole blood was collected from each animal by jugular puncture and was transferred into sterile tubes to be used for serological, virus isolation and blood chemistry analyses, into potassium oxalate - sodium fluoride tubes for glucose determination, and into liquid EDTA (K_3) tubes for hematology. Whole blood in sterile tubes was allowed to clot for 2-5 hours at room temperature, then centrifuged for 20 minutes for serum separation. Fecal samples were collected to evaluate parasitic diseases, and nasal swabs were collected to survey respiratory pathogens. All medical samples were flown daily to veterinary laboratories in the United States.

Hematology and blood chemistry analyses were conducted by Veterinary Reference Laboratory, Anaheim, California, as well as hemagglutination inhibition tests for parainfluenza-3 and agar gel immunodiffusion tests for bluetongue. Veterinary Reference Laboratory also ran bacterial cultures from nasal swabs.

Veterinary Laboratory Services, Fresno, California did serological testing for Brucella abortus and Leptospira interrogans serovars pomona, hardjo, grippotyphosa, canicola, and icterohaemorrhagiae by plate agglutination; for bluetongue and epizootic hemorrhagic disease by agar gel immunodiffusion; and for parainfluenza-3, bovine virus diarrhea, and infectious bovine rhinotracheitis by virus neutralization. They also attempted virus isolation from blood clots and nasal swabs, and cultured bacteria from nasal swabs.

Central Animal Health Laboratory, Madison, Wisconsin conducted complement fixation tests for bluetongue, and National Veterinary Services Laboratories, Ames, Iowa, conducted complement fixation tests for epizootic hemorrhagic disease and contagious ecthyma.

RESULTS AND DISCUSSION

Results of serological tests are presented in Table 1. Fifty percent of the sheep were seropositive to parainfluenza-3. These titers were also high (1:64 to 1:256), indicating probable previous infections. Parainfluenza-3 virus destroys the mucociliary cells that line the lower respiratory tract, hindering the clearance of infective agents, and when coupled with stress and bacteria it can trigger fatal pneumonia in both lambs and adults (Heuschele 1981, Salsbury 1981, Dyer 1982). Exposure to parainfluenza-3 has been found in other bighorn populations (Parks et al. 1972, Parks and England 1974, DeForge 1980), and is considered an important factor in a pneumonia complex that is causing high lamb mortality in the Santa Rosa Mountains of California (DeForge et al. 1982). This population should be monitored for signs of disease that could be the result of parainfluenza-3 virus. Parainfluenza-3 is common in cattle and domestic sheep. Cattle were observed in the study area.

Table 1. Results of serological tests for antibodies to selected animal pathogens in 18 desert bighorn from the Posada-Pico Johnson Range in Sonora, Mexico, and on Tiburon Island in the Gulf of California.

	Percent Positive	Percent Suspect
Parainfluenza-3	50	-
Bovine Virus Diarrhea	50	-
Epizootic Hemorrhagic Disease	44	-
Bluetongue	22	-
Leptospira interrogans serovar pomona	-	39
Contagious Ecthyma	-	11
Infectious Bovine Rhinotracheitis	-	-
Brucella abortus	-	-

Table 2. Hematologic values for 18 desert bighorn from the Posada-Pico Johnson Range in Sonora, Mexico, and on Tiburon Island in the Gulf of California.

	$\bar{x} \pm s$
Leukocytic series	
Total white blood cells ($10^3/mm^3$)	8.39 ± 3.16
Band neutrophils (%)	0
Segmented neutrophils (%)	61.4 ± 14.8
Lymphocytes (%)	28.1 ± 15.0
Monocytes (%)	2.9 ± 1.8
Eosinophils (%)	7.5 ± 5.9
Basophils (%)	0
Erythrocytic series	
Total red blood cells ($10^6/mm^3$)	12.1 ± 0.8
Total Hemoglobin (g/dl)	16.1 ± 1.0
Packed cell volume (%)	45.6 ± 3.7
Mean corpuscular volume (fl)	38.2 ± 3.0
Mean corpuscular hemoglobin (pg)	13.4 ± 0.9
Mean corpuscular hemoglobin concentration (g/dl)	35.3 ± 1.3

Bovine virus diarrhea is primarily an immunosuppressant disease that attacks white blood cells and reduces an animal's resistance to disease. Infection in pregnant ewes with the bovine virus diarrhea virus can cause abortion and birth defects including mummified fetuses, hydrocephaly, porencephaly, cerebellar hypoplasia and dysplasia, and "hairy shakers" (lambs with abnormal birth coats and incoordination) (Salsbury 1981, Salsbury 1984). Bovine virus diarrhea titers were relatively low (median 1:16). However, similar titers have been found in domestic sheep exhibiting signs of disease (Salsbury 1984). Low bovine virus diarrhea titers have been found in other bighorn populations (DeForge, unpub. data on bighorn in Arizona; David A. Jessup, Calif. Dept. of Fish and Game, Sacramento, unpub. data on bighorn in California), but have not been associated with disease.

Bluetongue and epizootic hemorrhagic disease are both insect borne noncontagious viral diseases that may cause systemic disease and death. Bluetongue has been related to bighorn losses (Robinson et al. 1967, Hailey et al. 1972, Blaisdell 1975, DeForge et al, 1982). Although 4 of 18 samples were positive by agar gel immunodiffusion testing for bluetongue, only one sample had a titer by complement fixation testing (1:20). Complement fixation titers for epizootic hemorrhagic disease were low (median 1:5), probably indicating previous exposure rather than infection.

Titers to Leptospira interrogans serovar pomona were found in 39 percent of the samples; however all titers were at the 1:40 level, which can be considered only suspect (Chilelli et al. 1982). Likewise the two animals with detectable titers to contagious ecthyma were only at a suspect level (1:5). All samples were seronegative to infectious bovine rhinotracheitis and Brucella abortus.

Hematologic values and blood chemistry values are presented in Tables 2 and 3 respectively. Hematologic values are similar to normal values for domestic sheep (Schalm et al. 1975) and published data on desert bighorn (McDonald et al. 1981, DeForge and Scott 1982). Blood chemistry values are also similar to published data on desert bighorn (McDonald et al. 1981, DeForge and Scott 1982) except serum glutamic oxaloacetic transaminase and serum glutamic pyruvic transaminase are lower and phosphorus is higher. These values will help establish normals for desert bighorn sheep.

Aerobic nasal flora cultured from swabs are presented in Table 4. None of these organisms should be considered particularly pathogenic from nasal swabs. No Pasteurella sp. was cultured. This organism has been associated with diseased bighorn (Rosen 1970, Spraker 1977, Spraker and Hibler 1977, Foreyt and Jessup 1982), but it may be part of the normal flora of the upper respiratory tract.

No viruses were isolated from nasal swabs or from blood clots. No fecal parasites were found.

Table 3. Blood chemistry values for 18 desert bighorn from the Posada-Pico Johnson Range in Sonora, Mexico, and on Tiburon Island in the Gulf of California.

	$\bar{x} \pm s$
Serum glutamic oxaloacetic transaminase (U/l)	156.3 ± 45.5
Serum glutamic pyruvic transaminase (U/l)	25.1 ± 20.0
Alkaline phosphatase (U/l)	548.0 ± 469.0
Cholesterol (mg/dl)	84.3 ± 71.8
Glucose (mg/dl)	129.2 ± 36.7
Blood urea nitrogen (mg/dl)	20.9 ± 3.44
Creatinine (mg/dl)	1.8 ± 0.3
Total Bilirubin (mg/dl)	0.32 ± 0.28
Total Protein (g/dl)	7.2 ± 0.6
Albumin (g/dl)	3.9 ± 0.3
Calcium (mg/dl)	9.9 ± 1.5
Phosphorus (mg/dl)	7.3 ± 1.7
Sodium (meg/l)	153.8 ± 5.6
Potassium (meg/l)	5.2 ± 0.9
Creatine phosphokinase (U/l)	369.8 ± 314.8
Lactic dehydrogenase (U/l)	596.3 ± 169.4
Gamma glutamyl transferase (U/l)	66.2 ± 107.2
Cortisol (mg/dl)	4.6 ± 1.6

Table 4. Incidence of aerobic nasal flora cultured from swabs of 17 desert bighorn sampled from the Posada-Pico Johnson Range in Sonora, Mexico, and on Tiburon Island in the Gulf of California.

	Incidence (%)
Acinetobacter anitratus	6/17 (35)
Alternaria sp.	5/17 (29)
Bacillus sp.	4/17 (24)
Citrobacter freundii	2/17 (12)
Corynebacterium sp.	6/17 (35)
Cryptococcus albidus var. *albidus*	1/17 (6)
Enterobacter agglomerans	13/17 (76)
Enterobacter cloacae	7/17 (41)
Hormondendrum (Fonsacaea) sp.	1/17 (6)
Klebsiella ozaenae	2/17 (12)
Micrococcus sp.	1/17 (6)
Pseudomonas fluorescens / putida group	8/17 (47)
Pseudomonas maltophilia	2/17 (12)
Pseudomonas stutzeri	2/17 (12)
Serratia plymuthia	2/17 (12)
Staphylococcus aureus	4/17 (24)
Staphylococcus epidermidis	2/17 (12)

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