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Authors: Spraker, Terry R., Collins, James K., Adrian, William J., and Otterman, James H.

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Earle's salt base supplemented with 10% heat-inactivated FBS. Gentamicin was added to the medium at a final concentration at 50 μg/ml. The microtiter plates were incubated at 37 C for 5 days. Antibody titers were expressed as the highest dilution of serum that prevented 50% RSV cytopathogenic effect.

Neutralizing antibodies to RSV were detected in 29 (42%) of the 69 mountain goats, including kids (25%), yearlings (28%), 2–4-yr-olds (43%), 5–7-yr-olds (75%), and 8–10-yr-olds (25%). Fifty-six percent of the males and 35% of the females were seropositive for RSV. Antibody titers ranged from 1:5 to 1:20 (median = 1:5). This is the first report on the occurrence of RSV antibodies in mountain goats and indicates enzootic transmission in the population. The importance of RSV infection in the epizootiology of respiratory disease in mountain goats is unknown.

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Terry R. Spraker and James K. Collins, Diagnostic Laboratory, College of Veterinary Medicine, Colorado State University, Fort Collins, Colorado 80523, USA; **and William J. Adrian and James H. Olterman,** 317 W. Prospect, Colorado Division of Wildlife, Fort Collins, Colorado 80526, USA

In December 1984, personnel of the Colorado Division of Wildlife began baiting Rocky Mountain bighorn sheep (*Ovis c. canadensis* Shaw) near Ouray, Colorado in order to treat them for *Protostrongylus stilesi* Dikmans. When the sheep began to visit the bait station, it was observed that approximately 50% of the herd were coughing and about 20% had a nasal discharge. Since a bighorn lamb had been found dead on the bait station the previous week, it was decided to collect and necropsy sick animals from this herd in order to investigate this possible respiratory problem.

On 4 January 1985, two clinically ill sheep exhibiting signs of coughing, slightly dull rough hair coat, and nasal discharge were collected and necropsied. One animal was an adult ewe and the other animal was an 8-mo-old ewe lamb. Gross necropsy findings were similar in both animals and included a moderate suppurative rhinitis/tracheitis and subacute suppurative bronchopneumonia. Approximately 5% of lung parenchyma was consolidated in both animals. The thymus was totally atrophied in the lamb. Gross lesions of the respiratory system were similar to those in bighorn sheep with early cases of bronchopneumonia observed during previous die-offs in Colorado (Spraker et al., 1984, J. Wildl. Dis. 20: 319–327). Tissue samples from posterior nasal septum lymphoid tissue, trachea, consolidated and normal lung parenchyma, and lungworm nodules were placed in viral transport media and transported on ice to the Diagnostic Laboratory, Colorado State University, Fort Collins, Colorado. These tissues were also cultured for bacteria.

A respiratory syncytial virus (RSV) was isolated from posterior nasal septum lymphoid tissue, trachea, and a lungworm nodule from the 8-mo-old lamb. The virus was identified by induction of characteristic syncytial cytopathic effect in fetal

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TABLE 1. Results of serological testing for bovine respiratory syncytial virus and parainfluenza type-3 virus in bighorn sheep from Ouray, Colorado during the winters of 1983 and 1985.

	1983			1985		
Virus	No. sheep tested	Antibody titer	No. positive	No. sheep tested	Antibody titer	No. positive
BRSV[a]	16	1:8[c]	4 (25%)	40	1:8[c]	1 (2%)
PI-3[b]	16	1:8[d]	7 (44%)	40	1:8[c]	9 (23%)
		1:16	7 (44%)		1:16	10 (25%)
		1:32	2 (12%)			

[a] Bovine respiratory syncytial virus.
[b] Parainfluenza type-3 virus.
[c] Neutralizing antibody titer against BRSV.
[d] Hemagglutination-inhibition antibody against PI-3.

lamb lung cell cultures and by fluorescent antibody (FA) testing on infected cells with a FA reagent specific for bovine respiratory syncytial virus (BRSV) (supplied by Dr. Merwin Frey, Virus Research Laboratories, University of Nebraska, Lincoln, Nebraska 68583, USA). Cytopathic effect developed within 3–5 days after inoculation of the specimens. No virus was isolated from the adult ewe. Routine FA tests were negative for both BRSV and parainfluenza type-3 (PI-3) virus on lung tissues from both animals. Sera from these two sheep were checked for antibody titers to PI-3 virus using a hemagglutination inhibition (HI) test, to infectious rhinotracheitis virus (IBRV) using the serum neutralization test, and to bluetongue virus (BTV) and ovine progressive pneumonia virus (OPPV) using the agar immunodiffusion test. Reagents were obtained from the National Veterinary Services Laboratories, Ames, Iowa 50010, USA. The adult ewe had a titer of 1:8 to BRSV and 1:32 to PI-3 virus. Antibody titers of <1:8 for BRSV and 1:16 for PI-3 virus were found in the lamb. All other serological tests were negative. *Pasteurella haemolytica* biotype T was isolated from nasal cavities, tonsils, and lungs of both sheep.

During the last week of January 1985, the Ouray herd was trapped with a drop net (Schmidt et al., 1978, Wildl. Soc. Bull. 6: 159–163) and blood samples were collected from the sheep for serology and nasal swabs were taken for bacterial culture. Sera had been collected previously from this herd in February 1983, and at that time the herd appeared to be healthy. Sera collected during the winters of 1983 and 1985 were tested for antibody to BRSV using the serum neutralization (SN) test (reagents obtained from Dr. Merwin Frey) and PI-3 virus using the HI test. Results of the serological survey for these two viruses demonstrated higher prevalences of antibodies to both BRSV and PI-3 virus in 1983 when compared to 1985 (Table 1). *Pasteurella haemolytica* biotype T was isolated from nasal swabs from 17 of 40 animals during the trapping of January 1985.

Results of this investigation document the presence of a bighorn sheep respiratory syncytial virus within the Ouray herd. The serological results can be interpreted in at least two ways. First, it is evident from the prevalences that viral activity was higher for BRSV and PI-3 virus in the winter of 1983 than during the winter of 1985. Since more of the observed animals were sick during the winter of 1985 than in 1983, the seropositives could suggest that these viruses did not play a role in the pathogenesis of the respiratory problem in 1985. Alternatively, the antibody titers may have decreased and animals

may have lost detectable antibody due to natural decline or to chronic stress occurring during the last several years. The sheep could have then become susceptible to infections with these agents, predisposing them to bacterial (*Pasteurella*) pneumonia. The exact role of this respiratory syncytial virus or of PI-3 virus in the pathogenesis of illness of sheep of the Ouray herd could not be elucidated, but further serologic testing should help to clarify their roles.

Viruses were first implicated as being a possible predisposing factor to bacterial pneumonia in bighorn sheep in the mid 1960's (Howe et al., 1966, Bull. Wildl. Dis. Assoc. 2: 34–37). The first respiratory virus isolated from bighorn sheep was PI-3 virus from a captive herd in Wyoming (Parks et al., 1972, J. Wildl. Dis. 6: 669–672). Later PI-3 virus was isolated from free-ranging bighorn lambs from Colorado (Spraker, 1979, Ph.D. Thesis, Colorado State University, Fort Collins, Colorado, 232 pp.). Respiratory syncytial virus has been isolated from domestic sheep (Evermann et al., 1985, Am. J. Vet. Res. 46: 947–952) and pneumonic lesions have been induced experimentally in sheep using challenges of both respiratory syncytial virus and *Pasteurella haemolytica* (Al-Barraji et al., 1982, Am. J. Vet. Res. 43: 236–240). Isolation of a respiratory syncytial virus from this 8-mo-old bighorn lamb and serological evidence of this virus within the herd documents the presence of another respiratory virus of bighorn sheep. The primary role of this bighorn sheep respiratory syncytial virus in the pathogenesis of bacterial bronchopneumonia observed in these two sheep and in producing the rhinitis and coughing in the herd was undetermined.

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Serologic Studies of Select Infectious Diseases of Moose (*Alces alces* L.) from Alaska

A. Alan Kocan,[1] Albert W. Franzmann,[2] Kenneth A. Waldrup,[1] and Gary J. Kubat,[1] [1]Department of Veterinary Parasitology, Microbiology, and Public Health, College of Veterinary Medicine, Oklahoma State University, Stillwater, Oklahoma 74078, USA; and [2]Alaska Department of Fish and Game, Moose Research Center, Soldotna, Alaska 98669, USA

Few serologic studies have been conducted on moose from Alaska. Serologic reactivity has, however, been demonstrated in moose from Alaska to select arboviruses (Zarnke et al., 1983, J. Wildl. Dis. 19: 175–179) and antibody to contagious ecthyma was detected in an experimentally exposed moose calf (Zarnke et al., 1983, J. Wildl. Dis. 19: 170–174). Sera of moose from Alaska were also positive for antibodies to bovine viral diarrhea virus and infectious bovine rhinotracheitis virus (Dieterich, 1981, *In* Alaskan Wildlife Diseases, Dieterich (ed.), Univ. of Alaska Press, Fairbanks, pp. 28–29). The present serologic survey was designed to determine the prevalence of certain infectious agents of free-ranging moose from Alaska.

Serum samples were obtained between 1974 and 1982 from 110 free-ranging moose from Alaska. Samples were obtained from one location on the Alaska Peninsula (12 samples), three locations

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