Investigating And Interpreting Population Health In Dall's Sheep In The Mackenzie Mountains, Northwest Territories, Canada

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Abstract: Monitoring infectious agents in both diseased and healthy animals in a wildlife population allows us to identify and differentiate significant pathogens and bacteria, viruses, and parasites that are normally present in the population. Since 1999, from the Mackenzie Mountains, we have examined carcasses of 9 Dall's sheep found dead and 5 healthy sheep, and samples from 2 sick sheep and 29 hunter-killed sheep. Pneumonia was present in all 11 Dall's sheep found dead or observed to be sick. In 10 cases, bacteria including *Arcanobacterium pyogenes*, *Mannheimia haemolytica*, and *Pasteurella multocida* were cultured from the lungs. These bacteria were not recovered from the lungs of healthy animals, although *Arcanobacterium pyogenes* was present in the tonsils of 2 of 12 healthy animals. Of four healthy sheep that were tested, all had very low (essentially negative) serum titers for leukotoxin, A1, A2, and T10 serotypes of *Mannheimia/Pasteurella*. Bovine respiratory viruses (bovine respiratory syncytial virus, infectious bovine rhinotracheitis virus, parainfluenza-3 virus) were not detected on immunohistochemistry of lungs of 5 sick/dead sheep, nor was bovine viral diarrhea virus detected in 2 sick/dead sheep. These viruses and ovine progressive pneumonia virus were not detected on serological testing of 11 healthy sheep. Histologically, inflammation surrounded the eggs and larvae of protostrongylid parasites in the lungs of both healthy and sick animals; in one case, this proved fatal in the absence of any bacterial involvement. Ninety percent of the sick/dead sheep and 72% of the healthy animals were infected with the lungworm *Protostrongylus stilesi*, and 70% of the sick/dead and 97% of the healthy sheep were infected with the muscleworm *Parelaphostrongylus odocoilei*. Fecal shedding of eggs of gastrointestinal parasites was higher in the sick/dead animals (n=9) than in the healthy ones (n=30). In eggs per gram of feces for sick/dead vs healthy sheep: *Marshallagia* spp. 39 vs 4; *Nematodirus* spp. 7 vs 2; *Trichuris* spp. 2 vs 1; *Eimeria* spp. 72 vs 57; and trichostrongyles 18 vs 0.92. Similarly, fecal shedding (larvae or eggs per gram of feces) of *Protostrongylus* spp. larvae (521 vs 129), *Marshallagia* spp. (4 vs 2.6), and *Nematodirus* spp. (4 vs 1.8) was greater in sheep in poor (n=5) versus good (n=20) body condition. The microbiological fauna (bacteria, viruses, and parasites) and health of Dall's sheep in the Mackenzie Mountains can be compared to the past (e.g. the Simmons collection of parasites from these sheep in 1971-72) and to other wild sheep populations, particularly bighorn sheep affected by pneumonia.