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Authors: GATES, C. C., and Samuel, W. M.

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PRENATAL INFECTION OF THE ROCKY MOUNTAIN BIGHORN SHEEP (*Ovis c. canadensis*) OF ALBERTA WITH THE LUNGWORM *Protostrongylus* spp.

C. C. GATES, Department of Animal Science, University of Alberta,
Edmonton, Alberta, Canada T6G 2E3

W. M. SAMUEL, Department of Zoology, University of Alberta,
Edmonton, Alberta, Canada T6G 2E9

Abstract: First- and third-stage (infective) larvae of *Protostrongylus* spp. were recovered from the livers of four fetuses of the Rocky Mountain bighorn sheep of Alberta. This record suggests a more cosmopolitan distribution of prenatal infection with lungworms in bighorn sheep than suspected previously.

INTRODUCTION

Observations of patent infections of young bighorn sheep lambs with lungworms of the genus *Protostrongylus* spp. led early workers to suspect prenatal transfer of the parasite.^{1,4,6,7} Proof of this phenomenon recently has been presented for bighorn sheep in Colorado.^{2,3} The latter paper³ was based on information from the sheep population at Pike's Peak where high levels of lungworm infection and lamb loss are known. The severe loss of lambs was attributed to heavy prenatal infection with *Protostrongylus* spp. and subsequent terminal verminous pneumonia.

Initially, the phenomenon of transplacental transmission of lungworms in Colorado was considered as an epizootiological anomaly and, hence, unique to that area. Sheep of the Pike's Peak area have a restricted range which may facilitate ingestion of high numbers of infective larvae and their subsequent transfer to the fetus. We knew of no similar area in Alberta where the loss of lambs during summer and fall was significant or even noticeable. In addition, Uhazy *et al.*⁸ found no evidence of prenatal infection in 9 bighorn sheep fetuses of Alberta and concluded that,

"under our ecological conditions, prenatal infection is not general". However, we have recently recovered lungworm larvae from fetuses of bighorn sheep in Alberta. This report summarizes the findings.

MATERIALS AND METHODS

Four bighorn sheep fetuses (3 from Jasper National Park of west central Alberta, 1 from the Sheep River area, 400 km south of Jasper Park in southwestern Alberta) were provided by the Alberta Fish and Wildlife Division and Parks Canada. Specimens were preserved by freezing. All were obtained during the last month of the usual gestation period for bighorn sheep of Alberta. Lung and liver tissue and placental cotyledons were macerated in a blender and then digested in a pepsin-HCl solution at 37 C for 2 h. Nematode larvae were recovered by washing the digested material through a series of screens, the smallest of which was 200 meshes per 25 mm. One pass of the digest through the screens resulted in total recovery of third-stage larvae. Morphometric measurements of recovered nematode larvae were compared with published values for *Protostrongylus* spp.^{2,5}

RESULTS AND DISCUSSION

First- and third-stage larvae indistinguishable from those of *Protostrongylus* spp. were recovered from fetal liver tissue only (Table 1). The mean length of 21 third-stage larvae was 546 (480-637) μm which compares favorably with data from snails⁵ and bighorn sheep fetuses.² Additional measurements which were similar to published data included: mean width (33 μm), mean length of the esophagus (140 μm), and mean distance from the anus to the posterior end of the worm (37 μm). The larvae were in a characteristic "C" shape previously noted by Pillmore.⁵

The technique used was effective for the quantitative recovery of the large third-stage larvae. Recovery of first-stage larvae was fortuitous since they could readily pass through the smallest sieve used. Recovery of both larval types from fetal liver tissue indicates that both are capable of transplacental movements from the ewe to the fetus.

According to Uhazy *et al.*⁸ the only

lungworms known from bighorn sheep of Alberta are *P. stilesi* (91% prevalence) and *P. rushi* (38% prevalence). Hibler *et al.*³ felt that the species of *Protostrongylus* that was transmitted transplacentally in Colorado was *P. stilesi*. Whether or not we are dealing with the parenchymal form (*P. stilesi*) and/or the bronchiole form (*P. rushi*) will depend upon further research.

The present discovery of prenatal infection of Alberta bighorn sheep with *Protostrongylus* spp. indicates that the transplacental mode of infection is more general in distribution than suspected previously. The potential significance of this phenomenon is evidenced by recorded excessive mortality of young bighorn lambs in the Pike's Peak herd of Colorado.³ Mortality of bighorn lambs in the summer-fall period is typically not significant in Alberta's populations; however, the evidence presented here suggests the potential for early postnatal losses of lambs given an as yet unidentified set of epizootiological contingencies.

TABLE 1. A summary of *Protostrongylus* spp. larvae recovered from bighorn sheep fetuses by *in vitro* digestion of liver.

Date	Collection		Larvae Recovered	
	Site		Third-stage	First-stage
May 23/74	Sheep River		46	0
June 4/74	Jasper National Park		14	0
April 17/75	Jasper National Park		14	7
May 11/75	Jasper National Park		60	6

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