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IVERMECTIN FOR TREATMENT OF PSOROPTIC SCABIES IN ROCKY MOUNTAIN BIGHORN SHEEP

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Abstract: Three herds of Rocky Mountain bighorn sheep (Ovis canadensis canadensis) in Wyoming are known to be infested with psoroptic scabies (Psoroptes spp.). Eight naturally infested bighorn sheep were captured from one of the known infested herds and fitted with radio collars. Six were treated with ivermectin, 2 served as controls. A year after treatment 5 treated and 2 control animals had no clinical signs of scabies while 1 treated animal had signs of scabies in the ears. Test of the efficacy of ivermectin for scabies control were continued with a captive study. Eight bighorn sheep with clinical signs of scabies were captured, treated with approximately 1000 ug/kg ivermectin, and were held in captivity for posttreatment sampling. Mites were found in samples taken from 6 of the 8 animals taken at the time of capture and treatment. Live mites were observed in samples taken from 1 animal 6 days after treatment and from a second animal 25 days after treatment. No mites were observed in posttreatment samples collected from the other six animals. These results suggest that 1 dose of ivermectin administered subcutaneously may not be effective for control of psoroptic scabies in bighorn sheep. However, other techniques may result in an effective single treatment regimen.

Psoroptic mange, or scabies, is caused by mites of the genus Psoroptes and was associated with the decline of bighorn sheep in the United States at the turn of the century (Ward 1915, Wright et al. 1933, Bailey 1936, Seton 1937, Packard 1946). In the late 1800's scabies was present in Rocky Mountain bighorn sheep herds across Wyoming. Major epizootics were reported in the Absaroka, Wind River (Seton 1937) and Bighorn Mountains (Honess and Frost 1942). However, Honess and Frost (1942) reported that there had been no authenticated reports of scabies in bighorn sheep for many years prior to 1942. No more cases were documented in Wyoming until 1963 (Hepworth 1963).

The history of scabies in bighorn sheep in North America is similar to that found in Wyoming. Until the last few decades there were few reports of scabies since the early epizootics. More recently, scabies was associated with population declines on the San Andres National Wildlife Refuge in New Mexico (Lange et al. 1980), in northwest Arizona (Welsh and Bunch 1983), and

on the Desert National Wildlife Range in Nevada (Decker 1970). Mites identified as Psoroptes ovis were collected from bighorn sheep transplanted from Idaho to Oregon in 1984 (Foreyt et al. 1985).

Three Wyoming herds of bighorn sheep are known to be infested P. cervinus; 2 that winter on the North Fork and the South Fork of the Shoshone River in the Absaroka Mountains (Howe and Hepworth 1964, Thorne and Walthall 1982) and the Camp Creek herd south of Jackson (Thorne et al. 1984). Animals from these herds may not be transplanted to other areas unless treatment is demonstrated to be effective. Effective treatment of domestic livestock has involved dipping in acaricide solutions including lindane, toxaphene, and coumaphos (Tarry 1974, Drummond 1985, Meleney 1985). Dipping is not practical for free-ranging wildlife. In New Mexico attempts to dip desert bighorn sheep (O. c. mexicana) infested with P. ovis by dipping resulted in high mortality (Kinzer et al. 1983).

Ivermectin (22,23 dihydroavermectin B^1)was introduced commercially in the United States in 1983 and has been used extensively to treat a variety of parasites in domestic animals with high levels of efficacy and safety (Campbell and Benz 1984). Ivermectin was used effectively to treat P. ovis in cattle (Meleney 1982), elk (Cervus elaphus) (Muschenheim 1988), and, at both 500 and 1000 ug/kg, bighorn sheep (Kinzer et al. 1983). However, in domestic rabbits 400 ug/kg was 100% effective against P. cuniculi but only 50% effective against P. ovis (Wright and Riner 1985).

Ivermectin is believed to act by paralyzing invertebrate parasites (Terada et al. 1984). It may also damage the endocrine system and inhibit reproduction in parasites (Glancey et al. 1982). In domestic cattle, serum levels of ivermectin of 5 ng/ml were present and effective against Psoroptes ovis 18 and 21 days after intramuscular injection of 200 ug/kg (Guillot et al. 1986). However, mites taken from animals 1-5 days after treatment with a single intramuscular injection of 200 ug/kg were infective to untreated animals (Guillot and Meleney 1982).

The objective of this study was to test the efficacy of ivermectin for the control of psoroptic scabies (P. cervinus) in Rocky Mountain bighorn sheep.

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METHODS

This study was conducted in 2 parts. Between 1986 and 1988, 8 Rocky Mountain bighorn sheep were captured and monitored in a free-ranging study conducted on the South Fork of the Shoshone River, approximately 64 km southwest of Cody, Wyoming. During February and March 1989, 8 additional

animals were captured on the South Fork of the Shoshone River and transported to the Sybille Wildlife Research and Conservation Education Unit, Wheatland, Wyoming for a captive study.

Bighorn sheep were captured by immobilization as in Muschenheim (1988). All animals exhibited clinical signs of scabies prior to capture including droopy ears; alopecia on the head, neck and back; and exudate in the ears.

Skin scrapings and ear swabs were taken from all animals at capture. Skin scrapings were taken from the peripheral region of the most encrusted lesions, at the junction with normal skin, on the head, body and in the ears. Hair over the sample sights was clipped to approximately 1 cm. Mineral oil was applied to hold debris together. Using a fresh scalpel blade, a skin scraping approximately 1.5 by 1.5 cm was taken until blood showed. Scraped debris was stored in plastic bags (Whirl-Pak Bags, Nasco West Inc., Modesto, CA 95352) and kept refrigerated. Ear swabs were collected from both ears using cotton tipped swabs. Swabs were stored in glass vials and kept refrigerated. All samples were examined within 48 hours of collection for the presence of psoroptic mites. Drawings were made to record areas with lesions and physical appearance.

Mites from skin scraping and ear swab samples were identified by F. C. Wright, (Knipling-Bushland U.S. Livestock Insects Research Laboratory, USDA, Agricultural Research Service, Kerrville, Texas) and R. L. Smiley, (Biosystematics and Beneficial Insects Institute, USDA, Agricultural Research Service, Beltsville, Maryland) (Muschenheim et al., in press).

Free-ranging Sheep

Four bighorn sheep, 3 ewes and 1 yearling ram, were captured during February and March 1986 and 4 additional ewes were captured at the same time during the following year for the free-ranging study. Each year 3 were treated with 30 mg (or 500 ug/kg) ivermectin (Ivomec, Merk and Co. Inc., Rahway, New Jersey 07065) administered subcutaneously at capture and 1 served as a control. All were fitted with radio transmitter collars (Telonics, Telemetry Electronics Consultants, Mesa, AZ 85201-6699) and released.

All animals were relocated during February - April 1987 and 1988. Observations were made on foot at distances of 30 to 200 m for signs of scabies lesions on the body or in the ears.

Captive Sheep

Eight bighorn sheep (7 ewes, 1 yearling ram, and 2 lambs) were captured for the captive study during February - March 1989. At capture all animals were treated with 1000 ug/kg ivermectin administered subcutaneously. The 8 bighorns were transported to the Sybille Wildlife Research Unit, Wheatland, Wyoming. Animals captured and treated on different dates were held in pens separated by 1 empty pen, approximately 15 m. Posttreatment samples were taken as at capture on March 24, one month after treatment at capture. One animal was retreated approximately 90 days after initial treatment. This second treatment consisted of removal of the plugs from both ear canals and infusion of one-half tube ivermectin oral paste into each external auditory meatus.

RESULTS

Free-ranging Sheep

Mites (P. cervinus) were found in samples collected at capture from 7 of 8 free-ranging animals. In observations during the 2 year posttreatment period no lesions were seen on the 2 control animals. One animal treated with ivermectin had lesions in the ears from 50 m 1 year after treatment. No lesions were observed on any of the other 5 free-ranging animals.

Captive Sheep

Mites (P. cervinus) were observed in the initial samples from 6 of 8 animals brought to the Sybille Wildlife Research Unit. The other 2 sheep had minor lesions indicating scabies, however no mites were found. Most lesions were in the ears or on faces and heads. Two animals had lesions in 10-cm diameter areas around the anus. Lesions on the ear were present from the external auditory meatus to the outer surface and were characterized by yellowish-white dried serous exudate, exfoliated epidermis containing loosened hairs, and offwhite mites. When this crusty layer was removed, the epidermis underneath was red and raw with serous exudate. In some cases the meatus was blocked with a solid plug. Lesions in other areas were similar but generally less severe or extensive.

Live mites were found in samples taken from the ears of 2 of 8 animals during the first month after treatment. No live mites were found in samples from the other 6 animals 25 days after treatment. Positive samples were taken from the ears of a ewe at necropsy when she died 6 days after capture and treatment. Another ewe had live mites in samples from the ears 25 days after treatment and was retreated on May 30. Plugs from both ear canals were removed and one-half of a tube ivermectin oral paste was infused into each external auditory meatus. No live mites were found in samples from this animal on June 23.

DISCUSSION

With free-ranging animals, sheep could not be periodically sampled after treatment for the presence of live mites. Also, a treated sheep could be reinfested from an untreated animal in the herd. To address the first problem we brought animals into captivity where they could be sampled periodically. To address the second problem we treated all animals brought into captivity.

Although Wyoming bighorn sheep have been observed dead or dying with extensive scabies lesions due to P. cervinus, morbidity and mortality has not been as high as described with P. ovis infestation of desert bighorn sheep in New Mexico and Arizona, or in historic accounts of scabies epizootics throughout the American West. However, scabies poses a threat to 3 infested herds in Wyoming and restricts transplanting of animals from or into these herds.

Reports of scabies in bighorn sheep across North America are increasing. Considering the impact of scabies on wild sheep populations historically this

causes concern. Preliminary studies using ivermectin to control psoroptic scabies in desert bighorn sheep were encouraging (Kinzer et al. 1983). However, the limited results of this study contradict the results of previous studies and question the efficacy of a single dose of ivermectin for the treating Psoroptes spp. infestation of bighorn sheep.

Mechanical cleaning of debris from the external auditory meatus followed with topical application of ivermectin paste may be an effective treatment in severely affected animals. Continuation of this study may indicate whether higher doses, prolonged release vehicles, additional injections and/or topical treatments are required to cure animals of Psoroptes spp. and insure against translocation of the disease organism along with it's host.

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