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ATTEMPTED EXPERIMENTAL TRANSFER OF SARCOPTIC MANGE (*Sarcoptes scabiei*, ACARINA: SARCOPTIDAE) AMONG RED FOX, COYOTE, WOLF AND DOG

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Abstract: Attempts to transfer sarcoptic mange from a red fox (*Vulpes vulpes*), four coyotes (*Canis latrans*), and a wolf (*Canis lupus*) to dogs (*Canis familiaris*) and apparent coyote-dog hybrids were unsuccessful. One coyote died of sarcoptic mange of red fox origin and two coyotes died of sarcoptic mange of coyote origin. Four suspected (i.e., mites were not demonstrated) human cases, all transitory in nature, resulted from handling infested coyotes.

INTRODUCTION

Sarcoptic mange, caused by *Sarcoptes scabiei*, is a common disease of coyotes (*Canis latrans*) and wolves (*Canis lupus*) in Alberta.^{1,4} During severe cold weather, wild canids, particularly coyotes, with severe cases of mange, are found seeking shelter in and around farm buildings.^{1,1} Farmers often express concern that the disease will spread to their livestock or pets. Because of this concern and interest in the relationship of host specificity to the current systematics of the genus *Sarcoptes*, attempts were made to infest various members of the Canidae with mange of red fox, coyote and wolf origin. This paper summarizes the findings.

EXPERIMENTAL DESIGN

Attempts were made to transfer sarcoptic mange mites from four infested coyotes, a red fox, and a wolf to five coyotes, four dogs, and three apparent coyote-dog hybrids (Table 1). Donors were either severely-infested wild animals submitted to our laboratory shortly before or after death or animals raised in captivity and experimentally-infested. Recipients were pups that were hand-reared and well-adapted to cage conditions. Only the dogs were born in

captivity. The hybrids were obtained from a local zoo. All animals were caged separately. Dogs and hybrids were roomed with others of the same experiment. Cages and rooms were thoroughly washed daily; there was no direct contact with animals post exposure until necropsy.

Experiment 1. A total of 1,000 live, unsexed, adult *Sarcoptes scabiei*[□] was removed from a red fox pup found near death in central Alberta. Crusted areas of the donor's skin were scraped with a scalpel and scrapings were examined in water under 100-250× magnification for mites. Mites were pipetted into a vial and syringed onto the back of the recipient as soon as possible (usually within an hour). Five hundred mites were placed on the mid-back of each of a 2-month-old beagle and a 2-month-old coyote.

Experiment 2. A total of 200 live, adult *S. scabiei* was removed from a severely mange-infested coyote pup found near death in central Alberta. A total of 100 mites was placed on the back of each of a 3-month-old beagle and a 3-month-old coyote.

Experiment 3. A total of 2500 live, adult *S. scabiei* was removed from the severely affected recipient coyote of Ex-

[□] See Pence *et al.*⁸ for a review of the morphometrics used to identify the mite of this study.

TABLE 1. Experimental design and results of mite transfers.

Experiment No.	Host		No. mites transferred	Days post-exposure when first observed		
	Donor	Recipient		Papules	Alopecia	Extensive alopecia
1	Red fox	Beagle	500	19	—	—
		Coyote	500	8	32	46
2	Coyote	Beagle	100	18	—	—
		Coyote	100	17	47	68
3	Coyote	Hybrid*	500	—	—	—
		Hybrid*	1500	—	—	—
		Coyote	500	—	—	—
4	Coyote	Hybrid*	200	—	—	—
		Coyote	200	13	25	33
5	Coyote	Dog**	100	—	—	—
6	Wolf	Dog**	<250	—	—	—
		Coyote	<250	—	—	—

*Coyote-dog.

**Shepherd-Airdale (experiment 5) and mongrel (experiment 6).

periment 1. Five hundred mites were placed on a 4-month-old coyote; 500 and 1500, on two apparent coyote-dog hybrids.

Experiment 4. Approximately 400 live, adult *S. scabiei* were removed from a young coyote found near death in central Alberta; 200 were placed on a 6-month-old coyote and 200 were placed on an apparent coyote-dog hybrid.

Experiment 5. A total of 100 live, adult *S. scabiei* was removed from the severely affected recipient coyote of Experiment 4 and placed on a German shepherd-Airedale hybrid.

Experiment 6. An unrecorded number (<500) of live, adult *S. scabiei* was removed from a severely infested wolf from Banff, Alberta and placed on an unaged coyote and a young dog. The dog had a long, thick coat of hair.

RESULTS

Experiment 1. Eight days post-exposure (PE) a crusting red papule 0.7 cm in diameter was observed on the rump of the coyote. The size increased to 1.5 cm by day 19 PE. The dog had 5 to 6 very

small scabs in the mid-back area, but there was no alopecia. Hair was found commonly in the feces of the coyote after day 32. The pelage was matted, with extensive amounts of scale on the mid-dorsal region on day 34. Mites were numerous in hair found on the floor of the coyote pen after day 41. The animal was very restless and spent much time licking and scratching infested areas. By day 46 PE, alopecia had occurred on the rump, back, tail, flank, and around the eyes, ears and nose. An aromatic odor originating around day 40 PE persisted throughout the experiment. Lesions on the legs were crusted and the back had 4 or 5 small wet scabs. Alopecia was extensive by day 49 PE; food consumption decreased slightly. The animal spent much time scratching or chewing infested regions of the body. Lesions were encrusted and had coalesced, covering most of the body; serous exudate was extensive. The coyote died on day 73 and was in very poor condition, having eaten very little the preceding week. Its weight was 2.25 kg compared to 12.5 kg for an uninfested littermate. The dog lost a small amount of hair but mites were not recovered from scrapings.

The author and two technicians developed numerous, small, red papules on the arms, chest, stomach, back and legs within hours of handling the carcass. Itching was extremely severe until treatment with a proprietary ectoparasiticide was initiated 3 days after exposure. No attempts were made to recover mites.

Experiment 2. Very small papules developed on the rump of the coyote (day 17 PE) and on the mid-back of the dog (day 18). Slight scaling and alopecia developed on the coyote by day 36 PE. A large, wet crust 15 cm in diameter was noticed on the right rear flank on day 47. By day 68, alopecia was severe in the posterior regions of the body and wet, encrusted lesions were extensive in this region. The animal was in very poor condition and was killed on day 75 PE. It had not eaten for 3 days, spending most of the time nipping and chewing mange affected areas. The papules on the dog healed by day 30 PE and it remained in good health. No attempt was made to recover mites from the dog.

Experiment 3. The coyote and hybrids remained normal during the 2 months of close observation. No mites were recovered from scrapings taken periodically.

Experiment 4. Dry, small, red papules and scales were evident on the mid-back of the coyote on day 13 PE. Bloody areas 3 to 4 mm in diameter appeared on the rump, and alopecia and encrusted lesions appeared on the tail and hind legs at day 25 PE. The coyote began chewing the infested regions on day 33 PE. As a result of scratching, the area around the eyes became raw. All of the lateral aspects of the hind-quarters and much of the tail were severely encrusted; the right side of the body was affected more severely than was the left. The coyote was in very poor condition and was killed day 52 PE. The only regions with normal pelage were the neck and shoulders. The hybrid remained normal.

One technician developed a few small papules on the wrist and forearm shortly after handling the carcass.

Experiments 5 and 6. Animals in Experiments 5 and 6 remained normal during 2 months of observation.

DISCUSSION

Many species or varieties have been described in *Sarcoptes* Latreille, 1802 and *Sarcoptes scabiei* (Linnaeus, 1758), respectively (see Fain¹). Such designations apparently reflect a belief in strict host specificity within the genus *Sarcoptes*; thus, discovery of *Sarcoptes* on a new host often resulted in a description of a new species or a variety designation within *S. scabiei*. However, most workers agree with Fain¹ that there is one highly variable species, *S. scabiei*, which has "undergone evolution and adaptation to a particular host".² Nutting⁶ cautioned that the question of host specificity among acarines can be resolved only by study of the "total biology of individual species".

Transmission of mange of red fox origin to coyotes in the present study is in agreement with much recent literature,^{2,3,11,13} indicating that host specificity among these mites is not as strict as thought previously. Stone *et al.*¹¹ successfully transmitted sarcoptic mange of red fox origin to red fox (all 14 died), 4 dogs and 4 "wild canids" (= coyote-like canids with dog-like characters derived through hybridization). Two red fox died of mange of wild canid origin. The authors concluded that since mites of red fox and dogs were morphologically identical and readily interchanged among fox, dogs and wild canids, "it appears that red foxes are parasitized by the *S. scabiei* var. *canis* of dogs".

One possible important fact that likely applies to the present study is that, although animals were reared in captivity and were somewhat tame, they were probably under stress. This could have

resulted in predisposition to mange. Ondersheka *et al.*⁷ and Kutzer⁸ indicated that some predisposition of the host was necessary to produce mange. Predisposing factors included: deficiency of vitamin A; proteins and phosphorus; surplus of calcium; and parasitism or other disease. Type of pelage was less likely involved in results presented here. Schwartzmann⁹ indicated that "a long, thick, dirty haircoat is more favorable to infestation"; two of the four dogs and all three coyote-dog hybrids of the present study had long hair. I have no explanation why the coyote recipient of experiment 3 did not get mange. Mites used were active when placed on the animal.

The inability to produce mange in dogs and coyote-dog hybrids with *S. scabiei* of coyote origin, dogs from red fox and coyote and dog from wolf in the present study suggests a degree of host resistance below the family level. Stone *et al.*¹¹ felt that the gray fox (*Urocyon*

cinereoargenteus) was a poor host for *S. scabiei* because of the transitory infestation produced with mites of red fox origin. Hyland² proposed that host susceptibility of sarcoptiform mites ended at the family level.

The course and severity of infestation on coyotes were remarkably similar to those reported by Stone *et al.*¹¹ for red fox. The onset of the appearance of lesions, alopecia and death were similar.

Reports of human mange from many species of animals are common.^{4,9,10,12,13} In addition to the four suspected cases contracted during the present study, one probable natural case occurred when a field biologist handled a trapped, mange-infested coyote (Todd, pers. comm.). Trappers and farmers of Alberta often come in close contact with mangy wild canids (Dorrance, Todd, Gunson, pers. comm. and unpub.). A transitory, bothersome dermatitis is probably a common result.

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