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Authors: Gese, Eric M., Schultz, Ronald D., Rongstad, Orrin J., and Andersen, David E.

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Prevalence of Antibodies against Canine Parvovirus and Canine Distemper Virus in Wild Coyotes in Southeastern Colorado

Eric M. Gese,[1] **Ronald D. Schultz,**[2] **Orrin J. Rongstad,**[1] **and David E. Andersen,**[3,4] [1] Department of Wildlife Ecology, University of Wisconsin, Madison, Wisconsin 53706, USA; [2] Department of Pathobiological Sciences, School of Veterinary Medicine, University of Wisconsin, Madison, Wisconsin 53706, USA; [3] U.S. Fish and Wildlife Service, Colorado Fish and Wildlife Assistance Office, Golden, Colorado 80401, USA; [4] Present address: U.S. Fish and Wildlife Service, Minnesota Cooperative Fish and Wildlife Research Unit, Department of Fisheries and Wildlife, University of Minnesota, St. Paul, Minnesota 55108, USA

ABSTRACT: Serum from 72 wild coyotes (*Canis latrans*) in southeastern Colorado (USA) was collected and analyzed for prevalence of antibody to canine parvovirus (CPV) and canine distemper virus (CDV) from 1985 to 1988. The prevalence of antibodies to CPV and CDV was 71% and 57%, respectively, for the 4 yr of the study. Prevalence of antibody to CPV did not differ among years, between sexes, or with age. Prevalence of antibody to CDV did not differ among years or between sexes, but was significantly higher in adults (62%) than juveniles (33%). Prevalence of antibodies against CPV and CDV in southeastern Colorado was comparable to results reported in other serologic surveys in the western United States.

Key words: Canine distemper virus, canine parvovirus, *Canis latrans*, coyotes, seroprevalence, survey.

The prevalence of antibodies against canine parvovirus (CPV) and canine distemper virus (CDV) has been reported for populations of many species in the family Canidae. Exposure to CPV and/or CDV has been reported in wolves (*C. lupus*) (Goyal et al., 1986; Mech et al., 1986), coyotes (Gier et al., 1978; Evermann et al., 1980; Thomas et al., 1984; Guo et al., 1986), and red foxes (*Vulpes vulpes*) (Barker et al., 1983). Evidence of CPV and/or CDV in free-ranging coyotes has been reported in Kansas (Gier and Ameel, 1959; Gier et al., 1978), Texas (Trainer and Knowlton, 1968; Thomas et al., 1984; Guo et al., 1986), Utah (Thomas et al., 1984), and Idaho (Thomas et al., 1984). The prevalence of CPV and CDV exposure in coyotes from Colorado is unknown. We report the results of a serologic survey for antibodies against CPV and CDV in wild coyotes in southeastern Colorado.

Blood samples were collected from 72 free-ranging coyotes on the U.S. Army Piñon Canyon Maneuver Site (1,040 km^2), Las Animas County, Colorado (USA; 37°20′N, 103°40′W). Collections were made in March and December 1985 (18 adults, four juveniles); March and November 1986 (five adults, one juvenile); January, May, and September 1987 (18 adults, two juveniles); and March and April 1988 (19 adults, five juveniles). Thirty-five coyotes were captured with a hand-held net gun fired from a helicopter (Barrett et al., 1982), or by manual capture following aerial pursuit (Gese et al., 1987). Thirty-seven coyotes were killed by aerial gunning during a coyote removal program. A 10 ml blood sample was extracted from the cephalic or saphenous vein of live coyotes, or from the chest cavity of coyotes that had been shot. The blood was placed into a glass serum tube (Vacutainer, Becton Dickinson, Rutherford, New Jersey 07070, USA), centrifuged for 45 min, and the serum harvested and stored at −20 C. Age of live coyotes was determined by tooth wear (Gier, 1968). Dead animals were aged by cementum analysis (Linhart and Knowlton, 1967) of a lower canine. Age classes were juvenile (<12-mo-old) and adult. Contact between coyotes and domestic dogs may have occurred prior to 1983 when ranching operations were present on the study area. After 1983, only four dogs were present on the study area, plus an occasional hunter with a dog in the fall hunting season.

Within 2 to 3 mo of blood sampling, the serum was analyzed for antibodies against

CPV and CDV at the School of Veterinary Medicine, University of Wisconsin (Madison, Wisconsin 53706, USA), or the Colorado Veterinary Laboratory (Broomfield, Colorado 80020, USA). We used the hemagglutination inhibition test (HI) following procedures outlined by Carmichael et al. (1980) to detect antibodies against CPV. A titer of ≥1:100 was considered positive for CPV antibodies. Canine distemper virus antibody was determined by serum virus neutralization test described by Appel and Robson (1973). A titer of ≥1:20 was considered positive for antibodies against CDV.

Prevalence of antibody positive samples against CPV was 71% for all years combined. Prevalence of CPV antibodies was 71, 71, 70, and 71% for the years 1985 to 1988, respectively. Prevalence of antibodies against CPV was 67% for males (n = 40) and 75% for females (n = 32) (χ^2 = 0.48, 1 df, $P > 0.25$). The geometric mean titer for CPV was 177 ± 27 (SE) (range = <20 to 1,280) for males and 159 ± 24 (range = <20 to 640) for females (T = 0.49, $P > 0.50$). Prevalence of antibody against CPV was 58% for juveniles (n = 12) and 73% for adults (n = 60) (χ^2 = 1.09, 1 df, $P > 0.25$). The geometric mean titer was 152 ± 47 (range = <20 to 640) for juveniles and 172 ± 20 (range = <20 to 1,280) for adults (T = −0.39, $P > 0.50$). Two adult males had CPV titer levels >1:1,280 which likely indicates an active infection (Carmichael et al., 1980).

Prevalence of antibody to CDV for all years combined was 57%. Prevalence of antibodies against CDV was 52, 57, 55, and 62% for the years 1985 to 1988, respectively (χ^2 = 0.51, 3 df, $P > 0.90$). Prevalence of CDV antibody was 55% for males and 59% for females (χ^2 = 0.14, 1 df, $P > 0.50$). The geometric mean titer was 31 ± 4 (range = <20 to 160) for males and 35 ± 6 (range = <20 to 160) for females (T = −0.65, $P > 0.50$). Prevalence of antibodies against CDV was 33% for juveniles and 62% for adults (χ^2 = 3.28, 1 df, $P < 0.10$). Geometric mean titer was 43 ± 15 (range = <20 to 160) for juveniles and 31 ± 3 (range = <20 to 100) for adults (T = −0.78, $P > 0.250$).

Thomas et al. (1984) sampled 1,184 coyotes from Texas, Utah, and Idaho, and found no evidence of parvoviral infection before 1979, then increasing to over 70% incidence in all three states by 1982. No differences in the prevalence of CPV between sexes were found, and only minor differences were found between age groups and sites. Thomas et al. (1984) concluded that the onset of CPV infection in coyotes coincided with the epizootic outbreak of CPV in domestic dogs in the fall of 1978. However, Goyal et al. (1986) reported inconclusive evidence of antibodies against CPV in wild wolf serum as early as 1975, prior to the outbreak in domestic dogs and coyotes.

We found ≥70% seroprevalence of antibody to CPV in wild coyotes in southeastern Colorado which is comparable to the high levels found by Thomas et al. (1984). These high levels are typically associated with a highly contagious, but nonfatal infection, because prevalence is measured among survivors (Thomas et al., 1984). Canine parvovirus was first diagnosed in dogs in Otero County, Colorado, adjacent to the study area in 1980. We found no significant differences in CPV prevalence among years, between sexes, or with age.

The prevalence of antibody to CDV in wild coyotes in southeastern Colorado was high, comparable to levels reported for other areas in the United States. Trainer and Knowlton (1968) reported antibody to CDV in 11 of 30 (37%) free-ranging coyotes in western Texas. Guo et al. (1986) reported that 56% of coyotes had antibodies against CDV in west Texas, ranging from 30% in 1975 to 86% in 1984. Williams et al. (1988) reported that 50% of coyotes in Wyoming were positive for antibodies against CDV. Gier and Ameel (1959) reported that all captive coyote pups died when exposed to CDV, but none of seven adult coyotes exposed to CDV developed

clinical signs. We found CDV antibody in 57% of wild coyotes on the study area. There was no difference among years or between sexes. Adults had a higher prevalence of CDV antibody than juveniles. The higher prevalence in adults may be due to several reasons including: animals that survived the viral infection, adults being more likely to survive exposure, adults having a longer life to become exposed to the virus and develop a long-persisting titer, or declining maternal antibodies as pups grow older (Gorham, 1966).

Knowledge of the prevalence of CPV and CDV in free-ranging coyotes in southeastern Colorado is important because the coyote could serve as a possible reservoir for viral infection for other susceptible species. Other wild canids known to occur in the area include swift fox (*Vulpes velox*), gray fox (*Urocyon cinereoargenteus*), and red fox (*Vulpes vulpes*). Coyotes might also serve as a source of infection for domestic dogs, or vice versa. Reintroduction efforts for black-footed ferrets (*Mustela nigripes*), a species highly susceptible to CDV (Williams et al., 1988), should consider serologic surveys of wild canids in any proposed reintroduction area.

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