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Authors: Conlogue, G. C., and Foreyt, W. J.

Source: Journal of Wildlife Diseases, 20(1) : 31-33

Published By: Wildlife Disease Association

URL: https://doi.org/10.7589/0090-3558-20.1.31

Journal of Wildlife Diseases, 20(1), 1984, pp. 31–33

EXPERIMENTAL INFECTIONS OF *EIMERIA MCCORDOCKI* (PROTOZOA, EIMERIIDAE) IN WHITE-TAILED DEER

G. C. Conlogue and W. J. Foreyt
Departments of Veterinary Microbiology and Pathology, and Zoology,
Washington State University, Pullman, Washington 99164, USA

ABSTRACT: White-tailed deer (*Odocoileus virginianus*) were experimentally inoculated with 60,000 or 100,000 oocysts of *Eimeria mccordocki*. Seven infected deer did not exhibit signs of coccidiosis although large numbers of oocysts were observed in feces after inoculation. The mean prepatent period of the parasite was 10.7 days in three deer inoculated with 60,000 oocysts and 10.0 days in four deer inoculated with 100,000 oocysts. Patent periods in these groups were 7.3 and 9.8 days, respectively.

INTRODUCTION

Four species of *Eimeria*, *E. mccordocki*, *E. odocoilei*, *E. madisonensis* and *E. virginianus* have been reported from white-tailed deer (Anderson and Samuel, 1969). Of the four, two, *E. mccordocki* and *E. odocoilei*, have also been reported from mule deer, *O. hemionus* (Kingston, 1981). Reports of *Eimeria* spp. in white-tailed deer primarily relate to descriptions and prevalence of species present (Anderson and Samuel, 1969; Levine and Ivens, 1970; Pellerdy, 1974; Kingston, 1981), but controlled experimental infections have not been reported. Species of *Eimeria* have been reported from white-tailed deer in Texas, Pennsylvania, Wisconsin, Iowa and several of the southeastern states (Kingston, 1981), and it is likely that *Eimeria* spp. are present in deer populations throughout North America.

The purpose of this study was to investigate the prepatent and patent periods and pathogenicity of *E. mccordocki* in experimentally infected white-tailed deer.

MATERIALS AND METHODS

A total of nine 3- to 5-day-old white-tailed deer fawns was obtained in eastern Washington during June 1982, and raised on goat milk, until weaning at 3 mo of age. Following weaning, their diet consisted of a free choice pelleted ration of 69% alfalfa and 31% barley, supplemented with straw, corn, alfalfa hay and free choice mineralized salt and water. Fawns were housed in two non-heated buildings with concrete floors until they were 8 mo old. Ten days before initiation of the experiment, the two groups were moved into a heated building, 19 C, and placed into two 5-m × 6-m pens with concrete floors. Each room was cleaned daily by flushing with water. Group I contained five fawns (3 males and 2 females); Group II contained four fawns (1 male and 3 females).

Examination of 1 g of feces from each deer with a fecal flotation technique (sugar solution, sp. gr. = 1.27) every 2 wk did not reveal oocysts or parasite eggs from any of the fawns prior to the study.

The initial, experimental inoculum of coccidia was prepared from feces obtained from a white-tailed deer on the Welder Wildlife Refuge, Sinton, Texas. *Eimeria mccordocki* was the only species of coccidia present. Oocysts were separated from coarse fecal material by passing the infected feces through a 200-mesh screen. The oocysts were mixed with 3% potassium dichromate solution, and the suspension was aerated in 1-liter containers and oocysts allowed to sporulate at 20 C. Twice weekly, during the process, 1-ml aliquots were withdrawn from the culture and examined by the sugar flotation method. At the end of 4 wk, 80% of the oocysts had sporulated. Oocysts were washed and concentrated by adding water, allowing the oocysts to settle for 2 hr, decanting two-thirds of the supernatant and adding more water. This procedure was repeated three times until the supernatant was clear.

Approximately 25,000 sporulated oocysts were administered with a dosing syringe per os to one deer. When oocysts were detected by sugar flotation of fecal samples, the fawn was isolated in a separate room and all feces collected. Oocysts recovered from this animal, served as a source for future infections.

Received for publication 13 May 1983.

Subsequent inoculation of the two groups consisted of 60,000 sporulated oocysts to three of four deer in Group I and 100,000 sporulated oocysts to each of the four deer in Group II. A dosing syringe was used for the oral administration of the coccidia. One animal in Group I was an uninoculated control.

Fecal samples from each deer were collected daily for 7 days before inoculation and 60 days after inoculation. One gram of feces from each daily sample for each deer was examined for oocysts as described previously, and the oocysts present were counted. Hematest (Miles Laboratories, Inc., P.O. Box 70, Elkhart, Indiana 46515, USA) reagent tablets were used to test for the presence of occult blood in feces during the patent period. Deer were observed on a daily basis for signs of disease.

RESULTS

Eimeria mccordocki was recovered from all inoculated deer in this study and was the only species of coccidia found. Non-sporulated oocysts ($n = 102$) measured 37.8 μm × 25.8 μm (range = 33.6–42.0 × 23.4–28.2). The mean prepatent period in Group I and Group II was 10.7 days and 10.0 days, respectively (range 10–11). Patent periods in Groups I and II were 7.3 and 9.8 days, respectively (range 6–13). Peak oocyst production occurred on days 13–15 postinoculation in Group I and on days 11–12 postinoculation in Group II. Mean intensities during the peak periods were 2,614 oocysts per gram (opg) of feces (range 650–10,168) for Group I, and 3,258 opg (range 212–9,396) for Group II. Neither diarrhea nor blood in the feces were detected in any of the infected deer, and signs of disease were not observed.

Five oocysts per gram of feces were detected in the control animal, in Group I, 10 days following the inoculation of the other animals in that group. Oocysts (up to 1,050 opg) were detected for 5 consecutive days.

DISCUSSION

Results of our study indicated that well nourished 8-mo-old, parasite-free, white-tailed deer fawns were susceptible to infection with *E. mccordocki*, but the infections did not result in diarrhea or obvious signs of disease such as rough hair coat, weakness, dehydration, prolapse, emaciation or death which have been described in cattle or sheep with clinical coccidiosis (Foreyt et al., 1979; Todd and Guterbock, 1981).

A lack of clinical signs in the present study contrasted with the observations made by Abbas and Post (1980) who studied experimental infections of *E. mccordocki* in mule deer. They inoculated young debilitated mule deer with 15,500 to 24,000 sporulated oocysts and reported a resulting elevation of body temperature and copius diarrhea. However, their results may have been due to the condition and age of the deer in their study. The fawns in that study were reportedly in "poor body condition" and required "careful husbandry" for 3 to 6 wk prior to experimentation. Sporulated oocysts were added to their daily milk ration indicating the animals had not been weaned. Young, debilitated deer might therefore be more susceptible, or mule deer could be more susceptible than white-tailed deer to the effects of *E. mccordocki*.

Samuel and Trainer (1971) reported *E. mccordocki* in 26% of the fawns, 18% of the yearlings and 7% of the adult white-tailed deer examined in southern Texas, indicating a higher prevalence in young animals. It is likely that deer of all ages can be infected. Our data indicated a relatively short patent period of the parasite which would lend credibility to the low prevalence figures reported for this parasite in white-tailed deer populations, because the probability of detecting the parasite would be low at any one time in a population.

Infection in the control deer in this study indicated probable oral transmission from inoculated deer when the control deer licked the mouth of inoculated deer. Another possible explanation is that spor-

ulated oocysts were transmitted by fecal-oral transmission from inoculated deer. A percentage of sporulated oocysts undoubtedly passed through the inoculated deer and ingestion of feces would account for infection in the control deer.

The importance of *E. mccordocki* in wild deer populations has not been determined, but our data indicated that this species may not be highly pathogenic in well nourished white-tailed deer. The importance of other species of *Eimeria* found in white-tailed deer or the effect of coccidia in populations where debilitating factors are present was not determined.

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