BioOne COMPLETE

Toxoplasma gondii Infection in Rodents and Insectivores from Montana

Author: Dubey, J. P.

Source: Journal of Wildlife Diseases, 19(2) : 149-150

Published By: Wildlife Disease Association

URL: https://doi.org/10.7589/0090-3558-19.2.149

BioOne Complete (complete.BioOne.org) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

Downloaded From: https://bioone.org/journals/Journal-of-Wildlife-Diseases on 28 Mar 2024
Terms of Use: https://bioone.org/terms-of-use

sage. None of the other six cats fed other bison tissues shed *T. gondii* oocysts. None of the mice inoculated with the bison tissues became infected with *T. gondii*.

Results of this preliminary study showed that bison, like ox (Fayer and Frenkel, 1979, J. Parasitol. 65: 756–762), may be resistant to *Toxoplasma* infection or can eliminate *T. gondii* from most of their tissues. The persistence of *T. gondii* cysts in the liver is similar to that in goats inoculated with the GT-1 strain of *T. gondii* (Dubey, 1980, op. cit.).

This study was supported by funds from the Montana State University Agricultural Experiment Station (MSUAES), Bozeman, Montana. The MSUAES Journal Series No. 1343. I thank Gary Lyons, Connie McDonald, and Kevin Wunderlich for technical assistance and the manager, National Bison Range, Moiese, Montana for providing the bison.

Journal of Wildlife Diseases, 19(2), 1983, pp. 149–150
© Wildlife Disease Association 1983

Toxoplasma gondii Infection in Rodents and Insectivores from Montana

J. P. Dubey,[1] Veterinary Research Laboratory, Montana State University, Bozeman, Montana 59717, USA

Felidae, the reservoir host of *Toxoplasma gondii*, are postulated to become infected in nature by ingesting tissues of small mammals and birds infected with the tissue cysts of *T. gondii*. Limited information is available regarding the prevalence of *T. gondii* in small mammals in the United States (Gibson and Eyles, 1957, Am. J. Trop. Med. Hyg. 6: 990–1000; Wallace, 1973, Am. J. Trop. Med. Hyg. 22: 456–464; Dubey et al., 1981, Am. J. Vet. Res. 42: 1007–1010). The objective of this report was to determine the prevalence of *T. gondii* in rodents and insectivores around Bozeman, Montana.

From April 1979 to February 1982 tissues were collected from 500 Richardson's ground squirrels (*Spermophilus richardsoni*), locally called gophers), 99 deer mice (*Peromyscus maniculatus*), 84 muskrats (*Ondatra zibethicus*), 52 meadow voles (*Microtus pennsylvanicus*), 27 beavers (*Castor canadensis*), six long-tailed voles (*Microtus longicaudus*), four red-backed voles (*Clethrionomys gapperi*), 13 house mice (*Mus musculus*), four Rocky Mountain jumping mice (*Zapus princeps*), three masked shrews (*Sorex cinereus*), four water shrews (*Sorex palustris*), five vagrant shrews (*Sorex vagrans*), and three yellow pine chipmunks (*Eutamias amoenus*). Animals other than gophers were trapped alive or were found dead in traps around Bozeman. Most gophers were shot in open range in June and July 1979. Animals were killed with ether and necropsied.

Samples of skeletal muscles, heart, brain, and spleen (total 5–10 g) of each animal (except beavers) were pooled and ground in a pestle with a mortar using about 5 volumes of 0.9% NaCl solution (saline). The homogenate from each animal was strained through gauze, and 1 ml (about 1/100 of pooled tissues) was mixed with 1 ml of saline containing 2,000 units of penicillin and 200 μg of streptomycin (antibiotic saline); 1 ml of the mixture was inoculated subcutaneously into each of two mice. Thus, 1,554 mice were inoculated with tissues from 777 animals, excluding beavers. The tissues of the beavers were digested in an acid-pepsin solution (Sharma and Dubey, 1981, Am. J. Vet. Res. 42: 128–130) before inoculation into mice. For this, samples of brain, heart, and skeletal muscle (total 50 g) were pooled for each beaver, homogenized in a blender, digested in

Received for publication 14 September 1982.
[1] Present address: U.S. Department of Agriculture, Agricultural Research Service, Animal Parasitology Institute, Beltsville, Maryland 20705, USA.

Downloaded From: https://bioone.org/journals/Journal-of-Wildlife-Diseases on 28 Mar 2024
Terms of Use: https://bioone.org/terms-of-use

10 volumes of the acid-pepsin solution for 90 min (Sharma and Dubey, 1981, op. cit.), and after washing were inoculated subcutaneously into mice (6 mice per beaver).

Five gophers, six deer mice, and four house mice were trapped alive and their serum samples were examined for *T. gondii* antibody by the Sabin-Feldman dye test (Sabin and Feldman, 1948, Science 108: 660–663); none of them had antibody at 1:4 dilution. Each of the five gophers was inoculated orally with 100 infective oocysts of the GT-1 strain of *T. gondii* (Dubey, 1980, Am. J. Vet. Res. 41: 427–429). The six deer mice, four house mice, and six Swiss white laboratory-raised mice were each inoculated intraperitoneally with 100 infective oocysts of a *T. gondii* strain, originally isolated from a cat (cat No. 5) during an acute outbreak of toxoplasmosis in Atlanta (Dubey et al., 1981, op. cit.). The number of infective oocysts in the inoculum was determined by inoculating 10-fold dilutions of oocysts into white laboratory mice (Dubey, 1980, op. cit.).

Impression smears of mesenteric lymph nodes, intestines, lungs, and brains of all mice that died after inoculation with animal tissues were examined for *Toxoplasma* parasites after staining with Giemsa's stain. The mice were exsanguinated 30 or more days postinoculation (DPI), their blood was collected for serology, and their brains were examined microscopically (squash preparations) for *Toxoplasma* cysts. Serum samples were examined for antibody to *T. gondii* by the Sabin-Feldman dye test. Mice were considered negative when antibody was not detected in undiluted serum.

Toxoplasma gondii was isolated in mice inoculated with tissues of 1 of 27 beavers. The six mice inoculated with pooled tissues of the infected beaver developed an antibody titer of >1:256, and *T. gondii* cysts were found in the brains of three of six inoculated mice killed 41 DPI. Tenfold titrations of the bradyzoites from the brains showed that the mice inoculated with 10,000 infective bradyzoites remained clinically normal. Thus, bradyzoites of the isolate of *T. gondii* from the beaver were of low virulence to mice. *Toxoplasma gondii* was not isolated from the tissues of the remaining animal species.

Of the six deer mice, four house mice, and six Swiss white mice inoculated with *T. gondii* oocysts, the white mice died between 9 and 11 days (average day of death 10.3), the house mice died between 9 and 15 days (average day of death 13.2), but the deer mice survived. Numerous cysts of *T. gondii* were found in the brains of deer mice killed at 160 DPI. One of the deer mice had a litter born approximately 2 mo after inoculation. *Toxoplasma gondii* cysts were found in the brains of two of the four mice born to the infected deer mouse. The gophers died of acute enteritis and mesenteric lymphadenitis 6–10 days after inoculation; numerous tachyzoites were found in the lesions.

The absence of *T. gondii* in 500 gophers and 303 other animals is surprising in view of its common infection in warm-blooded animals. The results of the experimental infection showed that *S. richardsoni* was highly susceptible to *T. gondii* oocysts. It may be that *S. richardsoni* infected with *T. gondii* died of acute disease and thus were not available for this survey. However, the same argument could not apply to the deer mice who developed chronic toxoplasmosis. The results of this study indicate a low prevalence of *Toxoplasma* infection in small mammals in Montana. To my knowledge *T. gondii* infection has not been reported previously in beavers.

This study was supported by research grant RR-09135 from the National Institutes of Health, Public Health Service; and funds from the Montana State University Agricultural Experiment Station (MSUAES), Bozeman, Montana. The MSUAES Journal Series No. 1307. I thank Janice Robertson, Gregory A. Markellis, Scott Lozier, Gary Lyons, Cindi Casagranda, Mary K. Logan, Andrew Olecott, Pete Feigley, and Connie McDonald for technical assistance.

Downloaded From: https://bioone.org/journals/Journal-of-Wildlife-Diseases on 28 Mar 2024
Terms of Use: https://bioone.org/terms-of-use